Feasibility of Using Prompts to Reduce Sedentary Behavior in Office Workers with Sit-Stand Workstations: A Randomized Cross-Over Trial

by

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ABSTRACT

The purpose of this study was to examine the feasibility and preliminary efficacy of a theory-driven and a atheoretical reminder point-of-choice (PoC) prompt interventions on reducing workplace sedentary behavior in office workers with self-reported low usage (<4 hours per day) of their sit-stand workstations in the standing position. The design of this study was a cross-over trial including randomization into either the theory-driven or atheoertical reminder condition, after completion of a no prompt control condition. Participants (N=19) included full-time, primarily female, Caucasian, middle-aged office workers. The primary aim of this study was to assess the feasibility of these two PoC prompt conditions on reducing sedentary behaviors through the use of a Therapy Evaluation Questionnaire. The secondary aim of this study was to assess the preliminary efficacy of the two PoC prompt conditions on reducing sedentary behaviors relative to no-prompt control using the activPAL micro device. For the primary aim, descriptive means adjusted for ordering effect were computed. For the secondary aim, mixed-effects regression models were used to cluster for observations within-persons and were adjusted for age, gender, race, job-type, and ordering effects. During the no-prompt control, participants spent 267.90 ± 68.01 sitting and 170.20 ± 69.34 min/8hr workday standing. The reminder PoC prompt condition significantly increased sanding time (b[se] = 24.52 [11.09], p=0.034) while the theory-driven PoC condition significantly decreased time spent in long sitting bouts b[se] = -34.86 [16.20], p=0.036), both relative to no prompt control. No statistically significant reductions in sitting time were seen in either PoC prompt condition. Furthermore, no statistically significant differences between the two PoC prompt conditions were observed. This study provides feasibility insight in addition to objective measures of sedentary behaviors regarding the use of PoC prompt interventions in the workplace.

Keywords: sedentary behavior, workplace intervention, prompts

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CHAPTER 1

INTRODUCTION

Occupations in office settings are predominately desk-based, ultimately confining office-workers to a seated position for the majority of their working day (Ryan, Grant, Dall, & Granat, 2011). It has been estimated that office workers spend approximately 70 - 80 percent of their working day seated, placing them at greater risk for the negative effects of sedentary behavior (McCrady & Levine, 2009). This is alarming given that higher levels of sedentary behavior are associated with an increase in the relative risk for diabetes, cardiovascular events, and cardiovascular mortality (Katzmarzyk, Church, Craig, & Bouchard, 2009; Wilmot et al., 2012), as well as an increased risk for all-cause mortality (Wilmot et al., 2012). More specifically, the associations for all-cause mortality and cardiovascular disease are maintained even when controlling for age, sex, smoking status, alcohol consumption, and leisure time physical activity (Katzmarzyk et al., 2009). In contrast, sedentary behaviors are considered to be purposeful and less structured as they are performed repetitively, habitually and unconsciously i.e., being seated while working at a desk (Pedersen, Cooley, & Mainsbridge, 2014), and are therefore considered separate from physical inactivity. In contrast, sedentary behaviors are considered to be purposeful and less structured as they are performed repetitively, habitually and unconsciously i.e., being seated while working at a desk (Pedersen, Cooley, & Mainsbridge, 2014), and are therefore considered separate from physical inactivity. Thus, even those with sedentary professions and who are physically active are at risk due to sedentary behavior being an independent predictor of health status (Katzmarzyk et al., 2009).

The nature of sedentary behavior accumulation is important, in addition to total sedentary time (Buckley et al., 2014; Dempsey et al., 2017; Dunstan et al., 2013; Healy et al., 2008; Thorp et al., 2014). Despite the association between sedentary behaviors and chronic disease, there is evidence to suggest that the interruption of sedentary time is beneficial for metabolic risk (Wilmot et al., 2012). This is of particular importance within the workplace environment where individual (e.g. job demands), cultural (e.g. levels of face-to-face interaction), environmental (e.g. office type) and organizational (e.g. sector) factors, may influence the ability to interrupt sedentary time

(Mullane et al., 2017) and long bouts of sitting may be unavoidable. One potential strategy used to combat workplace sedentary behavior is the use of sit-stand workstations, which provide office workers with the opportunity to alternate between a sitting and standing position throughout their working day (Chau et al., 2014). Early studies examining the use of sit-stand workstations emerged from ergonomic research, reporting improvements in musculoskeletal health, physical health, reduced fatigue, and increased energy expenditure, all without deleterious effects on work performance (Straker, Abbott, Heiden, Mathiassen, & Toomingas, 2013). More recent studies have reported improvements in reducing sitting time after installing sit-stand workstations for office-workers (Healy et al., 2013; Pronk et al., 2012).

Even so, several studies indicate that simply installing a sit-stand workstation may not be sufficient to reduce sedentary behavior, as a lack of compliance when using the workstation in the standing position has been reported (Graves, Murphy, Shepherd, Cabot, & Hopkins et al., 2015; Grunseit, Chau, van Der Ploeg & Bauman, 2013; Straker et al., 2013). As such, there are a growing number of studies implementing environmental change with supporting behavioral strategies to cultivate more sustainable and longer-term behavior change (Buman et al., 2016, Dunstan et al., 2013, Pronk, et al., 2012). Supporting behavioral strategies may include weekly e-newsletters or group-based activities (Buman et al., 2016, Dunstan et al., 2013; Pronk et al., 2012), all of which directly and indirectly prompt individuals to use their sit-stand workstation. However, there is a need to interrupt sitting time several times on a daily basis, for which more regular ‘reminders’ may be required.

An effective strategy to provide more regular reminders to interrupt sitting time during the workday may be point-of-choice prompts, which are used as a tool to change perceptions of the physical environment in hopes of influencing individuals into making more ‘active’ decisions over sedentary ones (Russell, Dzewaltowski, & Ryan, 1999). Point-of-choice prompts may facilitate behavior change in office workers with sit-stand workstations by serving as a cue to stand more frequently to combat habitual sitting. Past studies have used visual cues (signage), emails (set as reminders), computer software, and more recently, wearable devices, as prompts to promote

behavior change in the workplace. Such tools have been reported to be inexpensive, yet effective for eliciting behavior change (Donath, Faude, Roth, & Zahner, 2014; Hager, Hardy, Aldana, & George, 2002; Pedersen, Cooley, & Mainsbridge, 2014; Russell et al., 1999; Swartz et al., 2014).

However, in order to evoke effective behavior change, it has been suggested that interventions should be based on a theoretical framework to be the most effective and sustainable (National Cancer Institute, 2005; Straker et al., 2013). For example, a meta-analytic review of tailored print health behavior interventions by Noar, Benac, and Harris (2007) examined interventions tailoring to theoretical (e.g., social cognitive theory, theory of planned behavior, transtheoretical model), and behavioral factors (e.g., smoking prevention, diet, exercise), and those accounting for demographic factors (e.g., gender, age, education, race, ethnicity). The largest effect size was seen for studies tailoring to theoretical and behavioral concepts and demographics (r = .122) with a progressive decrease in effect size with reductions in tailoring: theoretical and behavior (r = .092), theoretical and demographics (r = .087), theoretical only (r = .065), and behavior only (r = .026). Furthermore, Noar et al. suggested that interventions should tailor to multiple (i.e. 4 to 5) theoretical concepts (e.g., self-efficacy, attitudes, stage of change, social support) as they have significantly larger effect sizes than those tailored to only 0 – 3. Furthermore, it has been suggested that basing interventions on theoretical models is necessary to adequately predict physical activity (Rovniak, Anderson, Winett, & Stephens, 2002). Moreover, it is critical for intervention effectiveness to understand the feasibility of proposed interventions and the efficacy of actual changes as a result of their delivery.

The Surgeon General recommends using social cognitive theory due to its ability to organize, understand, and promote physical activity. Social cognitive theory functions on the premise that a personal sense of control can lead to behavior change and considers influences from the social environment i.e. reciprocal determinism (Bandura, 1978). Large scale studies targeting sedentary behavior in the workplace have utilized social cognitive theory in the development of their intervention strategies (Buman et al., 2016; Dunstan et al., 2013). Therefore, integrating the social cognitive theory into workplace interventions may help to elicit behavior

change. The social cognitive theory has yet to be utilized in a point-of-choice prompt intervention for deterring sedentary behavior. Moreover, no research has looked at the integration of the social cognitive theory into point-of-choice prompts for the specific purpose of targeting sedentary behaviors. By integrating the social cognitive theory into a point-of-choice prompt message the effectiveness of reducing sedentary behavior may increase through the facilitation of behavior change by aiding individual's abilities to cope with barriers hindering behavior change. In addition, by examining theory-driven point-of-choice prompts encompassing the social cognitive theory compared to an atheoretical reminder point-of-choice prompt, we can further explore the feasibility of different point-of-choice prompt interventions. Understanding whether office-workers require point-of-choice prompts driven by theoretical behavior change constructs or a simple reminder to stand can help to inform future intervention design and implementation efficacy.

In summary, the habitual nature of sitting may compromise the capacity of office workers with sit-stand workstations to stand. Environmental change alone (i.e., sit-stand workstation) may not be enough to promote long-term behavior change (Graves et al., 2015; Grunseit et al., 2013; Straker et al., 2013). Short prompt messages sent throughout the working day are highly unlikely to disrupt work performance (Straker et al., 2013), are inexpensive and can provide a regular cue to stand at an individual level. In addition, interventions are typically more effective when based on theory (Straker et al., 2013); therefore, individuals with poor compliance for using the workstation in a standing position may benefit from a theory-driven point-of-choice prompt intervention focused on fostering self-efficacy and mastery to break up their sitting time throughout their working day. The feasibility of using point-of-choice prompts based on the social cognitive theory versus a basic reminder to deter sedentary behaviors have yet to be assessed in office workers with reported low compliance for sit-stand workstation usage. Furthermore, the efficacy of these two point-of-choice interventions on reducing sedentary behavior measured objectively has yet to be assessed.

Purpose, Hypotheses and Aims

The purpose of this study was to examine the feasibility and preliminary efficacy of two different 1-week point-of-choice prompt interventions on reducing workplace sedentary behavior in office workers with self-reported low usage (<4 hours per day) of their sit-stand workstations in the standing position.

Primary Aim: To assess the feasibility of a 1-week theory-driven point-of-choice prompt intervention and a 1-week atheoretical reminder-based point-of-choice prompt intervention on reducing sedentary behaviors in office workers with sit-stand workstations.

Hypothesis: Relative to the atheoretical reminder point-of-choice prompt intervention, the theory-driven point-of-choice prompt intervention will report higher feasibility scores as measured by the Therapy Evaluation Questionnaire.

Secondary Aim: To assess the preliminary efficacy of a 1-week theory-driven point-of-choice prompt intervention and a 1-week atheoretical reminder point-of-choice prompt intervention on reducing sedentary behaviors relative to a no-prompt control as measured objectively using activPAL micro device.

Hypothesis: Relative to a no-prompt control condition, the theory-driven point-of-choice prompt and the atheoretical reminder point-of-choice prompt interventions will result in a reduction of sitting time, and an increase in standing time as measured by the activPAL micro accelerometer.

Definition of Terms

1. Sedentary Behavior: any waking behavior characterized by an energy expenditure ≤ 1.5 metabolic equivalents (METs), while in a sitting, reclining, or lying posture (Tremblay et al., 2017).
2. activPAL micro: a thigh-worn accelerometer that objectively measures sedentary and more active behaviors (i.e., sitting time, standing time, light-intensity physical activity, sit-stand

transitions, and moderate-vigorous physical activity) (PAL Technologies Limited, Glasgow, UK).

3. Sitting time: (activPAL micro); the time spent sitting (i.e., minutes of sitting).
4. Standing time: (activPAL micro); the time spent (i.e., minutes of standing).
5. Number of sit-stand transitions: (activPAL micro); a change in posture from a sitting or lying position to a standing position.
6. Long sit bouts: (activPAL micro); a period of continuous sitting time greater than 30 minutes.

Limitations

Possible study limitations include an environmental bias if other individuals located around the participant in the workplace have a sit-stand workstation influencing the subjects (environmental prompt) sitting and standing behaviors (i.e., reciprocal determinism). For example, the participant may be cued to stand by another person standing. This would invalidate the results as it may appear that a participant is responding to one of the study prompts, when they are actually responding to an environmental prompt in the workplace. However, this can be accounted for through randomization of each participant into one of the two groups. In addition, an effort was made to recruit participants through different worksites to minimize more than one person completing the study at the same work location simultaneously. Another threat to internal validity is a possible maturation effect in which over time participants become used to and less receptive to receiving the prompts. However, this was minimized by randomizing the time within each hour that participants receive prompts. While the sample size is relatively small, limiting the statistical power to identify causal relationships, similar prompt-based studies in the workplace have utilized similar sample sizes with even shorter intervention durations (Evans et al., 2012) and our primary goals are related to feasibility and establishing preliminary efficacy (e.g., acquiring effect sizes) for future trials. Lastly, due to the first intervention week immediately following the no-prompt control condition week, inclusion into the study in regard to sit-stand workstation utilization was dependent on self-report (i.e., reporting <4 hours) and not on more

reliable accelerometer data. In addition, the activPAL device is an objective measure of sedentary behavior and therefore reduces measurement error compared to self-report methods.

Delimitations

Previous interventions using point-of-choice prompts have included an educational component at the start of the studies intervention. However, this will not be utilized in order to specifically analyze participant reactions to the prompt interventions and to ensure that sedentary behavior responses are not due to educational reinforcement.

CHAPTER 2

REVIEW OF LITERATURE

Workplace Sedentary Behavior

Interest in the field has shifted from physical activity to sedentary behavior in light of literature displaying that even physical active individuals who are sedentary are at risk for the negative effects of sedentary behavior (Healy et al., 2011; Lynch et al., 2010). Indeed, research is shifting away from focusing on increasing moderate-vigorous physical activity (MVPA) and towards displacing sedentary activities (Dempsey et al., 2014), despite the fact that over half of the adult population (52%) does not meet MVPA recommendations (Center for disease, 2014) and that less than 3% of the waking day is spent in this activity (Matthews et al., 2008). As such, American adults spend on average 7.5 hours a day being sedentary, with office workers allocating 70 – 80% of work time to a seated position (Matthews et al., 2008; McCrady & Levine, 2009). Thus, focusing on decreasing sitting time by increasing standing time instead of promoting physical activity in the workplace may be a more feasible approach. Sedentary behavior represents a dangerous habitual behavior that has become a normal part of workplace culture as positions have moved from labor and manufacturing to desk-based positions. The modern workplace therefore provides an opportune setting for reallocating time away from sitting, and into standing behaviors. In addition, focusing on reallocating sedentary time to standing is more conducive for the workplace environment and is unlikely to interfere with workers daily tasks and productivity (Husemann et al., 2009; Straker et al., 2009).

Providing sit-stand workstations for office workers gives the opportunity to break up sedentary behavior by transitioning from a seated to standing position throughout the day without impacting productivity (Chau et al., 2014). This is important given that engaging in sedentary behavior for prolonged periods has been found to be associated with deleterious health outcomes regardless of physical activity (Owen, Healy, Matthews, & Dunstan, 2010). Large scale trials have installed sit-stand workstations (Buman et al., 2016; Dunstan et al., 2013) to give office workers this opportunity to combat the deleterious effects of sedentary behavior. These studies

been multi-facet in nature, including multi-level behavioral intervention strategies (e.g., individual, social, environmental, organizational, and policy levels) in addition to the installation of sit-stand workstations. Studies that have included behavioral components within their interventions in addition to the installation of sit-stand workstations have used the following mottos within their designs: “increase time spent standing to 50% of the workday” (Buman et al., 2016), “Stand Up, Sit Less, Move More,” or “Stand Up,” (Dunstan et al., 2013). More specifically, Healy et al. (2008) examined the impact of sedentary breaks in a sample that was comprised of 54.2% full time employees (N = 168) and found that independent of total sedentary time, MVPA, and mean intensity of the sedentary breaks, the more interruptions an individual had was beneficial for metabolic risk variables. Similarly, Jalayondeja et al. (2017) examined a population of petroleum workers and found that individuals with fewer breaks throughout the day were more likely to have noncommunicable diseases and cardiometabolic risk factors than those with more breaks (p = .042 [1.02, 2.31]). While a clear benefit in breaking up sedentary time has been established, the minimum time needed and frequency for interrupting sedentary time to obtain beneficial effects has been debated with no current definitive solution proposed (Chastin, Egerton, Leask, & Stamatakis, 2015; Healy et al., 2008). Traditionally, a 5-minute break every hour has been suggested to minimize prolonged sitting (Owen et al., 2010). Even so, multi-facet approaches are not always feasible due to cost and time constraints. Therefore, suggesting breaking up sedentary time every hour in the workplace may represent a more feasible approach that is perceived as attainable and not as bothersome as more frequent reminders.

A qualitative study by Hadgraft et al. (2016) assessed the feasibility and acceptability of reducing workplace sitting time in office workers from Australia and found that the demands of the workplace (e.g., distractions, computer-based tasks, email, meetings) may pose a barrier to reducing sedentary time. Interestingly, regarding sit-stand workstations, one manager acknowledged the popularity of the workstations, but claimed that within “a week or so” individuals will return to sitting and no longer use their workstation. More specifically, low compliance has been noted between 6-month and 1-year follow-up assessments, with qualitative

data indicating that even when the workstations are being perceived positively, they are still not frequently used in the standing position (Straker et al., 2013; Wilks et al., 2006). In addition, while Chau et al. (2014) found reductions in sitting time after the installation of sit-stand workstations for 42 office-employees, desks were removed shortly after the 4-week follow-up assessment which may have increased participant motivation for using the desk, due to a known limited availability. There are clearly many barriers involved for using sit-stand workstations successfully, suggesting that simply installing the workstation is insufficient. In addition, feasibility knowledge regarding the acceptability of interventions to deter sedentary behavior is lacking. However, providing routine daily reminders to use the one's sit-stand workstation may help to facilitate behavior change by helping individuals to utilize the desk more frequently.

Point-of-Choice Prompts

Point-of-choice (also known as point-of-decision) prompts have been used as an environmental method for individual behavior change by encouraging more active behaviors over sedentary ones (Russel et al., 1999). Point-of-choice prompt messages have been delivered in the format of signs, but have evolved with technology to include emails, computer software, text messages, and real-time prompt devices, such as wrist-worn devices, or sitting pads (Evans et al. 2012; Hager et al., 2002; Gilson, Ng, Pavey, Ryde & Brown, 2016; Russell et al., 1999; Swartz et al., 2014; van Nieuw-Amerongen, Kremers, de Vries, & Kok, 2011). Prompts were first studied in the research context in the 1980s by examining changes in the natural environment to health promotion signs and have also been used in university campuses and public areas (e.g., malls, libraries, universities, office buildings), often by deterring escalator or elevator use in favor of taking the stairs (Brownell, Stunkard., & Albaum, 1980; Nocon, Muller-Riemenshneider, Nitzschke, & Willich, 2010). Given that workplace culture is conducive for habitual sitting behaviors, the workplace provides an opportune setting for examining point-of-choice prompts on deterring sedentary behaviors (Gardner, Smith, & Mansfield, 2017). This opportunity has led to research examining the impact of point-of-choice prompts in desk-based workers (Buckley et al., 2014; Chau et al., 2014; Cooley & Pedersen, 2013; Pedersen, Cooley, & Mainsbridege, 2014;

Swartz et al., 2014; Taylor et al., 2016; Urda, Lynn, German, & Larouere, 2016). However, there is lacking information regarding the feasibility of these prompt-based interventions. Furthermore, no studies to date have examined the impact of theoretical-driven point-of-choice prompts versus an atheoretical reminder point-of-choice prompt in office employees with sit-stand workstations.

Visual prompts

Some of the first studies used observational methods to examine the impact of point-of-choice prompts in the format of signs. For example, Russell et al. (1999) examined the impact of a point-of-choice prompt using a sign with language reducing the value of a sedentary option in hopes of in hopes of deterring elevator use and increasing stair use by observing 6,216 individuals. A significant increase in stair use was found from 39.7% to 41.9% ($\chi^2 = 488.06$ (3), $p < .05$), similar to previous studies conducted at the time. Though the effects found in this study are small, special consideration must be given to the accumulation of increases in standing time that can have meaningful long-term impact on health outcomes (Chau et al., 2014). Interestingly, the authors suggested that self-efficacy towards standing may have contributed to the differences seen between the younger and older cohorts in this study. However, more direct information from participants themselves is warranted to truly understand the feasibility of using prompts.

A similar study by Russell and Hutchinson (2000) compared a health promotion-based prompt to a deterrent prompt on stair and escalator use, also in the format of a sign. Results of the 3,369 observations revealed that both prompt types led to a rise in stair use, with the health promotion sign and deterrent sign resulting in an increase of stair use of 6.67% and 6.18%, respectively. However, no significant differences were found between the two point-of-choice prompt signs in stair use. Comparable to the previous study by Russell et al. (1999), self-efficacy was thought to have played a role in the displayed changes, with older individuals possibly perceiving the deterrent sign as an indicator to not take the stairs. However, similarly, no method was used to determine participant feedback regarding what drove responses to the health promotion and deterrent prompt signs. In a similar observational study, researchers van Nieuw-Amerongen et al. (2011) used prompts (i.e., banners, posters, and footstep cut outs) to examine

the impact of stairwell use, but also included other environmental changes (e.g., changes to ventilation system, doors, wall color, and carpeting) in their intervention. Results of 21,786 observations revealed an increase of stair use from 51.8% to 60.0% after the 4-week intervention (8.2%, χ^2=41.365, p<.001). While this study highlights the impact point-of-choice prompts for increasing stair use, it is difficult to parse out exactly what component of the intervention drove the increase in stair use due to the multi-facet nature of the intervention. A benefit of completing a smaller-scale intervention is being able to parse out individual intervention components (e.g., prompts) to better understand their specific feasibility future intervention enhancement.

An additional point-of-choice prompt study by Eckhardt, Kerr, and Taylor (2013) collected 2,997 observations in which the impact of two different signs on stair use in a University setting were examined. The first prompt incorporated a general message (i.e., “Burn calories - Get healthy”) while the second employed a specific message (i.e., “Walking up-stairs burns almost 5 times more calories than riding an elevator”). Results of the study revealed that the odds of stair use were significantly higher when the specific sign was used relative to baseline measurement (OR = 2.04, 95% CI = 1.46-2.84, p <.001) and when compared to the general sign (OR = 1.57, 95% CI = 1.13-2.20, p <.008). Authors Eckhardt et al. (2013) concluded that a specific message may be more motivating than a general message and called for future research to be conducted regarding the content used in prompt signs to inform health promotion practices in the workplace. While all four of these real-world observational studies indicate that prompts are a low-cost and effective way to alter sedentary behavior, they were unable to discern specific feasibility components of the interventions. Even though these studies demonstrate that sign-based prompts may be an effective intervention strategy for deterring sedentary behavior, they do not allow us to explore and understand what may be contributing to the interventions success, and barriers. Feasibility assessments regarding the content of prompt messaging specific to the workplace is needed to enhance intervention efficacy.

Computer software POC prompts

An additional method for using point-of-choice prompts in the workplace includes the installation of computer software. Distributing point-of-choice prompts by installing software on personal computers allows for messages to be received at a more individual level and enables researchers control over the frequency of sending and the dose administered compared to using signs, for example. Evans et al. (2012) used prompting software on personal computers in office workers to examine whether the addition of the prompting software compared to education alone could reduce long uninterrupted sedentary bouts and total sedentary time. The computer-based prompt message appeared on the participants work computer screen for one minute, every thirty minutes, from the time the computer was started that morning. The prompt message reminded participants to take a break and could not be minimalized or moved, though participants were able to work around the prompt. Sedentary behavior was measured objectively using the activPAL micro. A significant difference between-groups was found for the total number of sitting events (0.54 events/hours [0.07, 1.02], p=0.027) as well as for the number of prolonged sitting events (-0.14 events/hour [-0.25, -0.03], p=0.012) and the duration of prolonged sitting events (-15.4% [-26.2%, -4.5%], p=0.007). This study highlights the impact that a single daily prompt can have on reducing both the longevity of sitting bouts in addition to total sitting time, even in a short-term intervention lasting 5-days. However, an important limitation is the inability to determine if participants were responding specifically to the point-of-choice prompt, or as general reinforcement to education.

Conversely, several other studies used computer software that deactivated the participant's computer screens, rendering them unable to ignore the prompts, or work around them (Pedersen et al., 2013, Cooley et al., 2013 Mainsbridge et al., 2016). For example, Cooley and Pedersen tested whether a 'coercive' prompt would increase the chances of employees completing non-purposeful movement during the workday. They tested this by installing the computer software (i.e., Exertime), which deactivated the participants screens, and offered them a selection of activities to complete, with the frequency and duration of the activity being up to the participant. This 'coercive' prompt was administered every 45 minutes during the work day for 13-

weeks. Following the 13-week 'coercive' prompt period, a second 13-week 'active' prompt period began, in which participants only engaged with the software on their own volition. Results displayed that the passive 'coercive' prompt group was five times more likely to engage in nonpurposeful movement, seven times a day, compared to when in the 'active' phase of the study (OR = 4.78, 95%CI = 3.78-5.93 and p <0.05).

A similar study by Pedersen et al. (2013) also examined the effect of the computer software Exertime, with the hopes of increasing work-day energy expenditure. However, this study compared the same 13-week 'coercive' prompt intervention as previously used by Cooley et al. (2013) to a control group. Results indicated that compared to the control, the intervention group stood 7.99 ± 4.44 minutes more by engaging in 6.28 ± 3.59 more prompt-based activities per workday, taking 1.34 ± 0.74 minutes of work time for each activity, comparable to the results found by Cooley et al. (2013). Lastly, Mainsbridge, Cooley, Fraser, and Pedersen (2016) also used the same 13-week passive 'coercive' and 'active' interventions used by Cooley et al. (2013) but examined the outcome of prolonged occupational sitting time through interruptions from the Exertime software. Results displayed that at the end of the passive 'coercive' prompt intervention participants stood 7.51 ± 4.06 minutes more per day by engaging in 4.95 ± 1.35 more prompt-based activities per workday, taking 2.53 ± 2.71 minutes of work time per activity. These three studies using a 'coercive' approach to change people's sedentary behavior in the workplace may indicate that people need to be frequently reminded to take brief breaks to stand or perform activities at work, as a return to habitual sitting was seen in the portions of the study relying on participants volition to engage with the program (Cooley et al., 2013; Mainsbridge et al., 2016). Demonstrating that when the participants are relied on to engage with the software on the own volition, they quickly regressed back toward the habitual behavior of sitting for prolonged periods without reminders.

It is important to note that while the 'coercive' take-over of the participants screen was effective at reducing sedentary time, many individuals may forgo from participating in an intervention using this method simply due to the invasive nature of the appearance of the prompt

message. Moreover, the coercive nature of the prompt diminishes any chance for individuals to establish the habitual behavior of choosing to take a sedentary break on their own volition, rendering them dependent on the software to remind them every 45 minutes. Indeed, the social cognitive theory largely encompassed by self-efficacy is essentially unable to be fostered using this method of prompt delivery with the removal of mastery experiences and confidence building. Similar to the study by Evans et al. (2012), a limiting factor amongst these Extertime software-based studies may be inclusion of sedentary behavior education before administering prompt messages. By doing this, one cannot discern whether participants are responding specifically to the prompts or as a general reinforcement to education (Evans et al., 2012). In a systematic review, Nocon et al., have called for future research to focus on examining what type of point-of-choice prompt is most appropriate for different settings given different environments

Combined POC methods

Researchers Swartz et al. (2014) assessed the effect of a point-of-choice prompt on the disruption of 60 minutes of continuous sedentary behavior using a parallel group randomized trial including two interventions: Stand (N=29; asked to get out of chair) and Step (N=31; asked to get up and walk at least 100 steps). The prompt messages were sent using computer software every 60 minutes. In conjunction with the computer software, participants also wore a wrist-worn device which was set to prompt the participants (i.e., beep or vibrate) once every 60 minutes. Both the intervention and baselines period lasted 3-days. Sedentary and more active behaviors were measured objectively using the activPAL micro. While no significant difference was observed over time between the two groups, results indicated that Stand participants reduced their sitting time by 6.6% (380.2 min to 355.2 min) while the Step group had no significant change in sitting time. However, for the Stand group and Step group, the mean duration of sitting decreased by 16% (14.3 min 10 11.9 min) and 19% (15.2 min to 12.2 min), respectively. Sitting bouts 60 minutes or greater decreased by 54% (1.1. bout to 0.4 bouts) and by 36% (1.1 bout to 0.6 bout) for the Stand and Step group, respectively. The Stand group significantly reduced the longest sitting bout duration by 29% (101.2 min to 72.0 min) and sitting bouts of 30 minutes or more by 13% (3.8

bouts to 3.2 bouts), thereby increasing the number of sit-to-stand transitions by 15% (28.3 events to 32.4 events). The results may highlight the difficulty office workers have with acquiring steps while at work, compared to simply transitioning from a seated to standing position.

A novel and more recent combined approach implemented by Donath et al. (2015) included both the environmental change (installing sit-stand workstations) and point-of-choice prompts. This study conducted a computer software-based prompt intervention for 12-weeks and compared the prompt group to an education only group, who only received benefits of using a sit-stand workstation at the start of the study. The prompt appeared daily at 10:00 am, 1:00 pm, and 3:00 pm daily during the 12-week intervention and participants were free to close the message once it appeared, unlike in the studies using the Exertime software with a 'coercive' method, or the study by Evans et al. (2012). For the intervention group, within group effects revealed a 9% increase in standing time (hours) per week and a group by time interaction for standing trended toward significance (p = .09). While results of this study are not significant, they postulate indication that that education regarding the benefits of using a sit-stand workstation are not sufficient for changing behavior. In addition, the three daily prompt messages may not have been sufficient for reducing standing time to a level to detect significant effects.

Social Cognitive Theory

The social cognitive theory developed by Albert Bandura in 1986 stems from his original work on the social learning theory in the 1960s (Bandura, 1977). The social cognitive theory functions on the premise that a personal sense of control can lead to behavior change, through processes of mastery, expectations, and intentions that are attainable in the short-term. Key determinants of the social cognitive theory include self-efficacy, outcome expectations and goal-setting. The central concept of the social cognitive theory is reciprocal determinism, which claims that psychological functioning includes a continuous interaction between behavioral, cognitive, and environmental influences (Bandura, 1978). Unlike unidirectional or partially bidirectional models, reciprocal determinism of the social cognitive theory postulates that behavior is more triadic, operating in a reciprocal fashion with consideration of the interaction between the

environment, individual, and behavior (Bandura, 1986). This is relevant to the workplace environment due to the nature of the physical and social environment, organizational structure, and individual demands of office workers.

Banduras work "Health Promotion by Social Cognitive Means," (2004) meticulously covers the core construct of self-efficacy, and its impact on outcome expectations and goal setting. Therefore, self-efficacy is a core element due to its ability to both directly and indirectly impact the other key elements of the social cognitive theory. Self-efficacy refers to the level of confidence a person has in their ability to successfully exercise control over a behavior. If an individual perceives the demands of a situation to exceed their coping abilities, they are likely to avoid the behavior. However, if an individual perceives themselves of being capable of completing the activity, they may engage in the behavior. An individual's self-efficacy for accomplishing a behavior can affect performance by modifying the amount of effort and persistence a person uses to overcome possible barriers (Bandura, 2004).

Self-efficacy is also able to directly impact outcome expectations, goals, and environmental factors and can act through each of these constructs to impact the health behavior. Outcome expectations refer to a person's perception that a given behavior will result in an outcome. The construct is two-fold and includes both the costs and benefits for the behavior. Outcome expectations can function through several different aspects including physical outcomes (pleasurable vs aversive), social reactions (approval vs. disapproval), and positive or negative self-evaluative reactions to engaging in the behavior. This construct can be heavily modified by self-efficacy, given that a person can have an understanding of a certain outcome, but if they do no deem themselves capable of executing the behavior they may disengage from execution (Bandura, 2004). As such, outcome expectations are thought to be highly dependent on self-efficacy due to self-efficacy's indirect effect on outcome expectations. Moreover, physical activity research has shown that outcome expectations is related to self-efficacy, but not directly to the outcome, physical activity (Sweet, Fortier, Stratchan, & Blanchard, 2012). Further research is needed on the relation between these variables and sedentary behavior as perceived control and

self-efficacy in regard to sitting time are important workplace intervention components (Hadgraft et al., 2017). As such, office workers may have an understanding of the physical benefits of reducing their standing time, but, low self-efficacy can hinder their ability to engage with the behavior successfully.

Similarly, according to Bandura (2004) self-efficacy may influence goal setting strategies. Goal setting within the social cognitive theory targets the establishment of short-term attainable goals that help to guide individuals to succeed. As such, low self-efficacy is reported to be associated with poorer goal attainment, and a higher likelihood of not following through with a goal. There is evidence to suggest that establishing proximal short-term goals or intentions are more beneficial than distal or long terms ones, as it helps to remove additional barriers that may arise over time, or the establishment of unrealistic goals (Bandura 1977; Bandura, 2004). As Bandura states, “A capability is only as good as its execution,” (Bandura, 1982). The workplace is conducive for setting short-term goals for decreasing sedentary behavior (e.g., stand for 15 minutes, stand for 5 minutes every hour) on a daily basis, compared to other more settings (e.g., home) where long-term goals may be established. Yet the feasibility of such goals has yet to be examined.

Interventions in the workplace are increasingly relying on theoretical frameworks such as the social-ecological model and applying social cognitive theory to combat sedentary behavior. The theoretical pathway through which the core constructs of the social cognitive theory impact behavior have been outlined by Bandura (1986) and can be applied to point-of-decision prompts. Self-efficacious prompts for standing may help to encourage sit-stand workstation utilization and thereby influence individual’s perceptions of their ability to stand and work through the development of mastery experiences in which individuals perceive their behavior as enhancing their capability to perform the behavior in the future. Moreover, the prompts have been designed to be verbally persuasive, in hopes of enhancing self-efficacy beliefs toward standing. In addition, reinforcement through outcome expectation statements may help to motivate individuals by changing their perception of engaging in the behavior into a positive view for the physical and

cognitive health. Furthermore, setting short-term goals can assist in the fostering of self-regulation processes by helping individuals to adjust their behavior by meeting more easily attainable proximal goals (Bandura, 1986). Interestingly, associations have been found for reductions in workplace sitting and perceived behavioral control (*B* = -0.17) and the advantages of sitting less (*B* = -.12), highlighting the need to assess putative mediators occurring in interventions.

Workplace sedentary behavior is a problem, and while sit-stand workstations pose a feasible intervention solution, point-of-choice prompts are needed to help intermittently break up habitual siting time in order to establish compliance with using the workstation in a standing position. As such, point-of-choice prompts represent a feasible and low-cost intervention tool to serve as a reminder to stand. The effects of combined point-of-choice methods (environmental i.e., sit-stand workstation and prompt) are less known and may be most effective. However, the workplace is a complex environment with individual, cultural, environmental, and organizational influences that interact across the socio ecological spectrum. Establishing intervention efficacy is important for warranting their use, but we need to understand the feasibility of using point-of-choice prompts in the workplace to enhance both efficacy and the effectiveness of future interventions. Interventions underpinned by social cognitive theory is warranted, with emphasis on self-efficacy, as it is a core component of health behaviors. Previous research is limited in its analysis of mediating variables once efficacy has been established. No research has investigated the effectiveness of a theoretical driven prompt encompassing the social cognitive theory in office workers with low compliance for using their sit-stand workstation in a standing position. Furthermore, no research has examined the feasibility through which behavioral changes are occurring by examining potential theoretical variables. This study aims to add both an assessment of the feasibility of a novel low-cost workplace intervention in addition to a thorough analysis of objective sedentary behavior changes to provide an overview of efficacy. This will help to inform and refine future intervention development by providing specific details regarding the feasibility of prompt-based interventions in office workers with sit-stand workstations.

CHAPTER 3

METHODS

STUDY DESIGN

The design of this study is a cross-over randomized trial including random allocation into one of the two following groups: 1) theory-driven Point of Choice (TD-PoC) prompts or 2) reminder Point of Choice (R-PoC) prompts. Eligible participants will be randomized using the fish-bowl method after being deemed eligible through completion of the eligibility survey and consenting to participate in the study. For the primary aim of this study, the following benchmarks were used for both the TD-PoC and R-PoC conditions in regards to the TEQ surveys: 1) Feasibility (i.e., acceptability, practicality and demand ≥ 70%), 2) Acceptability (i.e., items 1 - 3 ≥ 70%), 3) Demand (i.e., items 7 - 8 ≥ 70%), 4) Practicality (i.e., 4 - 6 ≥ 70%). In addition, participant responses for additional feasibility constructs (i.e., general, frequency, and specific prompt usefulness; time of day preference; frequency preference; and subjective and objective measures of amount received) will be presented. For the secondary aim of this study, the following dependent variables will be examined: objectively monitored sedentary behavior, including sitting time, standing time, long sit bouts during working hours, light intensity physical activity (LPA), moderate-vigorous physical activity (MVPA), ang total stepping time, standardized to an 8-hour workday. In addition, the number of sit-stand transitions per sedentary hour will be examined. The independent variable for the second aim includes study condition (i.e., TD-PoC vs. R-PoC) and covariates will include: age, race, ethnicity, gender, and job type.

PARTICIPANTS

The recruitment target goal for this study was a total of 20 participants. Recruitment was completed through an informational flyer (Appendix A), posted on the Downtown Phoenix and Tempe Arizona State University campuses to develop interest. Additional recruitment occurred outside of the university through established contacts at local worksites who asked to administer the informational flyer electronically via email. The informational flyer included a link to learn more information about the study and to complete the eligibility survey (i.e., Qualtrics). This survey

determined asked potential participants to voluntarily provide their first name, and email and determined individual level eligibility criteria (Appendix B).

Inclusionary criteria for the study included the following: age 18 years and older, full-time status (>30 hours/week), in office at least 4-days per week, in a seated position for majority of working day, has sit-stand workstation installed at primary desk, uses sit-stand workstation ≤ 4 hours of working day, and is able and willing to engage in study assessment and intervention for 4-weeks. Exclusionary criteria for this study includes the following: non-English speaking, advised by a health professional to avoid long periods of standing, and pregnant women entering or in the third trimester.

PROCEDURES

All interested participants, after reviewing the informational flyer of the project goals, were directed to the studies eligibility screening questionnaire using Qualtrics (Qualtrics, Utah). Research staff notified potential participants if they met study qualifications and emailed the Online Informed Consent (Appendix C) via Qualtrics. If the individual agreed to participate they then completed the no prompt control assessment (i.e. day 1-5), were randomized and completed the intervention assessments (i.e., days 8-12 and days 22-26). In addition, during days 15-20 no objective sedentary/physical activity behaviors were collected, and no study intervention prompts were sent, representing the participants “wash” week. Furthermore, no lab visits were required for participation in the study, and all in-person communication with the participant was conducted at a location of the participants choosing at their worksite (e.g., at their desk or conference room). Each participant was provided a PDF of their sitting and moving behaviors from the activPAL micro corresponding to their baseline (i.e. no prompt control condition) and the two intervention weeks at the end of the study

<u>No Prompt Control (baseline) assessment (days 1-5)</u>:

Participants were provided with a copy of their signed Informed Consent, instructions for affixing the activPAL device to their right thigh (Appendix D), and a daily work/sleep time log to record arrival and departure time from work and sleep wake and bedtime (Appendix E). Participants were also provided with an activPAL micro device to wear for 5-work days during a

typical work week. Participants were asked to keep the device on until the end of their workday of their last no prompt control assessment day (i.e. day-5). It was also explained verbally and via the activPAL instructions to participants that the activPAL device is waterproof and can therefore be worn while showering/bathing, swimming, and other water or exercise activities. The activPAL device was collected at the start of the 1st intervention week. Participants were sent the demographic survey (Appendix F) at the start of the no prompt control week and were asked to complete it by day-5.

Randomization:

After participants were visited in person to drop off the first activPAL device and were sent the demographic survey they were randomized to receive either intervention 1) Theory-driven Point of Choice Prompts (TD-PoC) or 2) Reminder Point of Choice Prompts (PoC) for their first intervention week. The intervention condition group they were not originally allocated to at this time was administered during the second intervention week (i.e., days 22-26).

Intervention weeks (days 8-12 and days 22-26): On the Friday prior to each upcoming intervention week participants were provided with a new activPAL device to wear for 5 working days. During the Monday following each intervention week (i.e., day 15 and day 30) participants were sent the TD-PoC TEQ or the R-PoC TEQ, dependent on their respective randomization. In addition, during each intervention week participants were sent eight messages per work day (Mon – Friday) during normal working hours (i.e., 9:00 – 6:00 pm), totaling 40 messages sent per study intervention (i.e., TD PoC, R-PoC). At the end of the participants second intervention period (i.e., day 26) the participants work/sleep time logs were collected upon they were then entered Qualtrics using the participant's de-identified ID number for future analyses. Lastly, as previously stated, in-between receiving the studies two interventions on days 15-20 no physical assessment via the activPAL device or study prompts were sent, providing a "wash" week in between the studies interventions.

Prompts

The TD-PoC prompts were designed using the Social Cognitive Theory and included the following three main domains: self-efficacy, outcome expectations, and proximal goals (Appendix J). A total of 40 prompts were sent during this 5-day intervention period (i.e., eight per day, for five days). Of the 40 prompts, 15 were developed to be self-efficacy based and outcome expectancy based, respectively. The final 10 prompts included proximal goal setting. For the TD-PoC group, each self-efficacy-based prompt was followed by with one of the outcome expectation prompts and one of the proximal goal setting prompts, resulting in three self-efficacy-based prompts, three outcome expectation prompts, and two goal setting prompts being sent per day. Each of these prompts were sent once during the 5-day period, such that the TD-PoC intervention encompassed 40 unique messages. For RemindeR-PoC group, prompts were not tailored to any specific theoretical format, and as such, the same reminder prompt, “Time to Stand!,” was sent eight times per day over the 5-day period, to equate the dosage (40 prompts) of the TD-PoC prompt intervention.

MailChimp

All prompt messages were sent to participant’s emails using MailChimp, an email marketing company, and were obtained voluntarily from each participant. Participant emails were stored temporarily on the MailChimp server for prompt distribution during the study’s intervention and were deleted thereafter. Delivery time for each individual prompt message per participant and time of opening of the prompt email was recorded by MailChimp. This data was downloaded through MailChimp as a CSV reports and was be stored securely on a local drive for analysis. Email was used to deliver the study prompts as it was anticipated to represent the most feasible and appropriate modality for distributing point-of-choice prompts within the workplace, given the nature of desk-based work and high reliance on technology. Sending point-of-choice prompts to office workers email is also appropriate due to the studies intention to reduce sedentary behavior at one’s desk.

For both the Td-PoC group and PoC group eighty ‘Campaigns’ in MailChimp were created for the forty prompts of each intervention, respectively. The prompt emails were sent every hour, with four being sent in the morning and four being in the afternoon, leaving time in-between for the lunch hour. Each individual prompt was randomized to be sent either on the hour, 15 minutes past, 30 minutes past, or 45 minutes past the hour. This was done to prevent anticipation of prompt arrival time. However, each participant received the same random schedule of prompt7s for ease of distribution. Participants were asked to open the prompt messages sent to their individual emails whenever at their desk to record acknowledgement of the prompt. The open time were recorded and downloaded in the same manner as delivery times and saved in a de-identified excel file for future analysis.

MEASUREMENT

Anthropometrics

Participant’s height and weight were obtained through self-report using the studies demographic survey sent administered through Qualtrics.

activPAL Micro

The activPAL micro (PAL Technologies Limited, Glasgow, UK) was used to obtain an objective measurement of sedentary behavior. The activPAL micro is an accelerometer worn on the midline of the thigh and therefore is able to collect with precision the start and end time of each bout of sitting lying, allowing it to capture sitting, standing, and moving (i.e., steps) by the detection of posture (Dunstan et al., 2013). Comparison of the activPAL to direct observation has revealed a 99.1% level of agreement for sitting, standing, and slow walking. Further validation has been indicated its validity of the measurement of physical activity in adolescent females (Dowd, Harrington, & Donnelly, 2012).

Participants wore the activPAL micro accelerometer on their right thigh during the no prompt control and intervention assessments. The device was initialized for 9:00 am for the first day of data collection and was then worn for 5 continuous days. The same protocol was utilized for the intervention periods. To gather an accurate representation of participants sedentary and

more active behaviors while at work, a minimum of one day with at least 4 hours of wear time at work was required. In addition, daily work/sleep time were collected using paper logs and were used to segment activPAL data during work hours. In addition, the outcome, total stepping time was derived by combing time spent in light-intensity physical activity and moderate-vigorous physical activity (i.e. total stepping time = LPA + MVPA).

Surveys

The study included a demographic survey consisting of demographic questions (i.e., age, gender, race, ethnic, and job type) and health-related questions (i.e., smoking status). Participants were asked to complete this demographic survey by day-5 of the no prompt control week.

Participants were asked to complete the corresponding Therapy Evaluation Questionnaire (TEQ) surveys (Appendix G, H) the Monday following each intervention, respectively. The TEQ is an 8-item (pre and post-intervention) measure that was developed based on a therapy credibility instrument (Sidani, Epstein, Bootzin, Moritz, & Miranda, 2009) and was modified to evaluate intervention feasibility for the studies two prompt interventions. TEQ items #1-3 (e.g., how logical, how easy, how appropriate) were inserted under the feasibility construct acceptability due to the nature of these questions assessing perceptions of satisfaction. Furthermore, TEQ items #4-6 (e.g., how helpful, how successful, how confident) were inserted into the feasibility construct practicality as these questions assess factors that may modify the ease at which the participant is able to respond to the intervention. Lastly, TEQ items #7-8 (likely to recommend, availability importance) were lumped into the feasibility construct Demand as they help to establish perceived interest and intention to continue use and demand of the prompts. For the purposes of this thesis, only the post-intervention items are reported.

In addition to the demographic and post TEQ surveys, participants were asked to rate the general usefulness and frequency usefulness of the prompts from each intervention in helping them to stand. In addition, after the respective intervention, they were asked to rate the usefulness of the reminder prompt, ‘Time to Stand’, the self-efficacy-based prompts (SE), the

outcome expectancy (OE) based prompts, and the proximal goal (PG) based prompts. These questions used the following scale: ‘Not at all useful,’ ‘slightly useful,’ ‘moderately useful,’ ‘very useful,’ and ‘extremely useful.’ To assess the practicality of the prompts, participants were asked to indicate if they preferred receiving the prompts in the morning, afternoon, or if they had no preference. In addition, to further evaluation the feasibility construct demand, participants were asked if they deemed the frequency of prompts sent to be appropriate, or if they should be sent more or less frequently. To evaluate the implementation of the studies interventions participants were asked to rate how often they received the prompts “Approximately a few times per day (i.e. 2 or 3),” “Approximately 5 to 7 times per day,” “Approximately 8 times per day,” “Greater than 8 times per day,” “Never,” and “I don’t recall.” In addition, they were asked to rate how frequently they noticed the prompt messages appear on their computer screen and how frequently they responded to the prompts by standing, from ‘none of the time’ to ‘all of the time’ on a 7-point scale. Lastly, implementation was also assessed objectively through delivery and open reports provided by MailChimp, which was used to send the prompts to participant email.

Table 1

Feasibility Framework

Construct	Measure	Outcome(s)
Acceptability	TEQ item's 1-3	• How logical, easy, appropriate
	Survey	• How useful in helping to stand more, • How useful the frequency was • Usefulness of specific types of prompts, (extremely useful to not at all useful);
Demand	TEQ item's 7-8	• How important, likely to recommend
	Survey	• Opinion regarding frequency (i.e., more or less freq, appropriate)
Practicality	TEQ item's 4-6	• How helpful, successful, confident
	Survey	• Time of day preference (i.e., morning, afternoon, no preference)
Integration	Survey	• Reasons for using or not using workstation
Implementation	Objective report Survey	• Objective- reports via mailchimp, • Subjective- rating of frequency of having received prompts (none to all of the time)

Note. TEQ: 5 point scale from 'Not at all' to 'Totally'

STATISTICAL ANALYSIS

Continuous variables were expressed in means and standard deviations and categorical variables were expressed as percentages. Variables were assessed for normality of distribution. All outcome variables and non-normally distributed variables were transformed to assume a normal distribution if appropriate. All analysis will be performed using SPSS software (IBM Analytics). An average of 3 valid days per participant and time point was determined after processing the activPAL data

Primary Aim: To assess the feasibility of a 1-week theory-driven point-of-choice prompt intervention and a 1-week atheoretical reminder point-of-choice prompt intervention on reducing sedentary behaviors in office workers with sit-stand workstations through the treatment evaluation questionnaire (TEQ) and participant feedback. Mean scores for each of the eight items and the overall mean score of the post TEQ surveys were examined for both interventions. All models were adjusted for ordering effects. In addition, participant feedback questions were analyzed quantitatively when possible (e.g., means, standard deviations, and percentages) and the open-ended questions were examined for themes within and between the study interventions. Lastly, McNemar tests were completed to detect significance in TEQ scores within and between the R-PoC and TD-PoC conditions.

Secondary Aim: To assess the preliminary efficacy of a 1-week theory-driven point-of-choice prompt intervention and a 1-week atheoretical reminder point-of-choice prompt intervention on reducing sedentary behaviors relative to a no-prompt control conditions measured objectively using activPAL micro device. The independent variable was condition (i.e., no-prompt control, TD-PoC prompt group, PoC prompt group). The dependent variables were focused on behaviors in the workplace and included the following: sitting time, standing time, number of sit-stand transitions, sit bouts > 30 minutes, light-intensity physical activity (LPA), moderate-vigorous physical activity (MVPA), and total stepping time (LPA + MVPA). Multilevel models for change were used to account for clustering of observations within participants and to determine if there

were significant differences in sedentary behaviors between the three conditions. All models were adjusted for age, race, ethnicity, gender, job type, and ordering effects.

CHAPTER 4

RESULTS

Figure 1 presents the flow of screened and enrolled participants. A total of 41 individuals were screened for eligibility and eighteen individuals were determined ineligible during the screening process due to not meeting study inclusion criteria, not responding, or lack of interest. Twenty-three participants consented to participate; however, only 19 completed the initial no prompt control assessment and all other aspects of the study protocol.

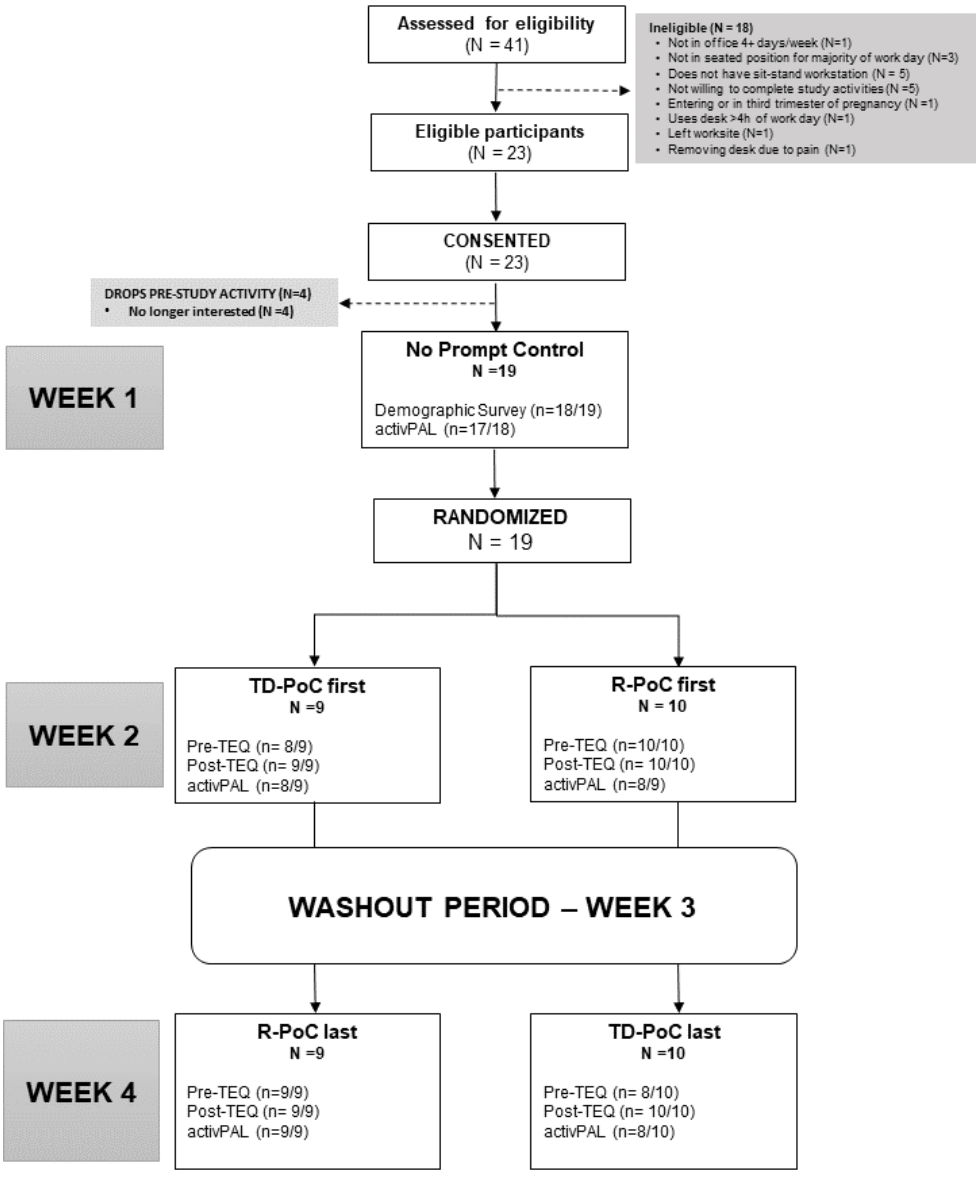

Figure 1. StandUp Prompt Study Consort Diagram

Demographics

Table 2. presents demographic characteristics on age, gender, race/ethnicity, and job type. This sample of office workers consisted of primarily middle-aged Caucasian women.

Table 2. Demographic Characterisitcs

	N (%)
N	19 (100.0)
Age, M ± SD	39.4 (10.7)
Female	15 (78.9)
Race/Ethnicity	
Non-Hispanic White	15 (78.9)
Hispanic	2 (10.5)
Black	0 (0.0)
Asian	1 (5.3)
Other	1 (5.3)
Job Type	
Executive	4 (21.1)
Professional	7 (36.8)
Clerical	8 (42.1)

Sedentary characteristics measured by activPAL micro

Table 3. presents time spent in sedentary and more active behaviors as measured by the activPAL micro device during the no-prompt control condition (this condition always was delivered first). Participants spent 267.90 ± 68.01 min/8hr workday sitting, 170.20 ± 69.34 min/8hr workday standing, completed on average 5.87 ± 2.12 sit-stand transitions per sedentary hour, spent 35.91 ± 15.55 min/8hr workday in LPA, 6.0 ± 2.8 min/8h workday in MVPA, 41.9 ± 16.6 min/8h workday stepping, and 128.69 ± 70.28 min/8hr workday in sitting bouts greater than 30 minutes.

Table 3. Baseline Sedentary and More Active Behaviors

	M (SD)
Sitting	267.9 (68.0)
Standing	170.2 (69.3)
Sit-stand transitions*	5.9 (2.1)
Sit bouts > 30 min	128.7 (70.3)
LPA	35.9 (15.5)
MVPA	6.0 (2.8)
Total stepping time	41.9 (16.6)

Note. LPA = light-intensity physical activity (<100 steps per minute); MVPA = moderate-vigorous physical activity (>100 steps per minute); Sitting, standing, sit bouts >30 min, LPA, MVPA, and total stepping time are standardized to an 8h workday. Total stepping time is a summary of LPA and MVPA variables. Sit-stand transitions include the average per sedentary hour.

TD-PoC and R-PoC Therapy Evaluation Questionnaires

Table 4. presents percentage ratings scores for each of the 8-components of the TEQ within respective feasibility constructs (i.e., acceptability, practicality, and demand) after each study condition. Bolded percentages indicate that the benchmark of ≥ 70% was met. In regard to an overall feasibility score, the TD-PoC prompt condition nearly met the benchmark for the post time point (68.9%), whereas the R-PoC prompt condition did not (63.2%).. Individual percentages meeting the ≥ 70% benchmark included the logical and recommend items for the R-PoC condition. For the TD-PoC prompt condition, the items logical, recommend, and availability items met the ≥ 70% benchmark. In addition, the lowest percentages were under the practicality construct, in regard to how helpful and how successful participants anticipated on being or felt that they were. In addition, no significant differences were found between the R-PoC and TD-PoC prompt conditions when comparing scores.

Table 4. Feasibility Outcomes by Study Condition

	R-PoC	TD-PoC
	Post	Post
Acceptability		
Logical	**84.2**	**73.7**
Easy	63.2	68.4
Appropriate	68.4	68.4
Practicality		
Helpful	47.4	63.2
Successful	47.4	47.4
Confident	63.2	68.4
Demand		
Recommend	**73.7**	**72.2**
Availablility	57.9	**73.7**
Average TEQ Score	63.2	68.9

Note. Bold values indicate that the benchmark of 70 percent or greater was met.

Additional Feasibility Measures

Table 5. presents additional feasibility outcomes (broken down by construct) collected following each intervention.

Acceptability:

Less than the majority of participants rated the prompts 'Very' or 'Extremely useful' in helping them to stand more with their sit-stand workstation for the R-PoC and TD-PoC and conditions, respectively. In addition, less than the majority of participants rated the frequency at which they received the prompts being helpful for standing more as 'Very' or 'Extremely useful,' for the R-PoC and TD PoC groups, respectively. Regarding the reminder prompt, 'Time to Stand,' the majority of the participants rated the prompt as 'Very Useful' or 'Extremely Useful'. Lastly, regarding the TD-PoC prompts, 26.3%, 42.1%, and 63.2% participants rated the self-efficacy based (SE), outcome expectancy based (OE), and proximal goal based (PG) prompts as 'Very Useful' or 'Extremely Useful.'

Practicality:

For both the R-PoC and TD-PoC conditions, 57.9 % of participants reported no preference in the time of day that they would prefer to receive the prompts. However, for the R-PoC condition, 36.8% reported that they would prefer to receive prompts in the afternoon, and only 5.3% reported wanting to receive the prompts in the morning. For the TD PoC condition, 42.10% reported that they would prefer to receive prompts in the afternoon, and 0% reported wanting to receive the prompts in the morning.

Demand:

Post the R-PoC condition, 26.3 % of participants reported that they would prefer to receive prompts more frequently, compared to 15.80% of the TD-PoC condition. Furthermore, for the R-PoC condition, 15.80% reported that they would prefer to receive prompts less frequently compared to 5.30% of the TD-PoC condition and 57.90 and 78.9% reported that the amount received was appropriate for the R-PoC and TD PoC conditions, respectively.

Implementation:

Post the R-PoC condition, 79.0% of participants reported receiving the study prompts 5-8x/day, while 94.7% of participants reported receiving the study prompts 5-8x/day during the TD PoC condition. In addition, 89.5% and 94.7% of participants reported seeing the prompts pop-up on their computer screen 50% of more of the time for the R-PoC and TD-PoC conditions, respectively. Data from MailChimp indicated that 79.5% and 79.3 % of participants received 8 prompts per/day for the R-PoC condition and TD-PoC conditions, respectively. However, after adjusting for participants who wished to not receive prompts after 4:00 pm (i.e. 6-7 prompts maximum/day depending on randomization), 90.8% and 90.7% of participants received 7 prompts per day.

Table 5. Additional Feasibility Ratings Post R-PoC and TD-PoC Prompt conditions

	Basic Reminder PoC Prompts (%)	Theory-Driven PoC Prompts (%)
Acceptability		
General Usefulness	42.1	47.4
Frequency Usefulness	47.4	42.1
Reminder Usefulness	52.6	--
SE Usefulness	--	26.3
OE Usefulness	--	42.1
PG Usefulness	--	63.2
Practicality		
Morning preference	0.0	5.3
Afternoon preference	42.1	36.8
No preference	57.9	57.9
Demand		
More frequenty	26.3	15.8
Less frequently	15.8	5.3
Amount appropriate	57.9	78.9
Implementation		
Received 5-8x/day	79.0	94.7
Saw pop-up	89.5	94.7
Delivery Mailchimp	79.5	79.3
Adjusted	90.8	90.7

Note. Acceptability constructs included a 5-point likert scale ranging from 'Not at all' to 'Totally'. The Saw pop-up percentage includes responses 50% or greater. The 'Adjusted' Delivery MailChimp score accounts for participants whom wished to not recieve prompts after 4:00 pm.

activPAL Outcomes

R-PoC Condition

Time spent in sedentary and more active behaviors as measured by the activPAL micro device while participants included 251.29 ± 86.77 min/8hr workday sitting, 193.22 ±85.80 min/8hr workday standing, 29.82 ± 13.40 min/8hr workday in LPA, and 106.04 ± 18.11 min/8hr workday and long sit bouts (>30 min).

TD-PoC Condition

Time spent in sedentary and more active behaviors as measured by the activPAL micro device while participants included 255.47 ± 77.72 min/8hr workday sitting, 185.56 ± 77.34 min/8hr workday standing, 31.66 ± 8.32 min/8hr workday in LPA, and 99.54 ± 59.59 min/8hr workday in long (>30 min) sitting bouts.

R-PoC and TD-PoC Relative to No Prompt Control

Mixed-effects regression models were used to cluster for observations within-persons and were adjusted for age, gender, race, job-type, and ordering effects. As displayed by Table X. relative to no prompt control, the R-PoC condition increased standing time (b[se] = 24.52 [11.09], p=0.034) whereas the TD-PoC condition did not (b[se] = 9.95 [11.44], p=0.39). The R-PoC condition did not display any significant changes in long sitting bouts i.e. sit bouts >30 minutes (b[se] = -24.20 [15.59], p=0.13), the TD-PoC condition displayed a significant reduction in long sitting bouts (b[se] = -34.86 [16.20], p=0.036) relative to no prompt control. The R-PoC group displayed a decrease in light-intensity physical activity (LPA) relative to no prompt control (b[se] = -5.73 [2.55], p=0.03), while no significant change was noted for the TD-PoC condition relative to no prompt control (b[se] = -1.79 [2.64], p=0.50). Also, the R-PoC condition significantly reduced total stepping time relative to no prompt control (b[se] = -5.98 [2.81], p=0.038), with no significant change for the TD-PoC condition relative to no prompt control (b[se] = -0.52 [2.92], p=0.86). Lastly, no significant changes were determined for sitting time, the number of sit-stand transitions per sedentary hour, and moderate-vigorous physical activity (MVPA) for either the R-PoC or TD-

PoC conditions relative to no prompt control. For comparisons between active study conditions (i.e., R-PoC vs. TD-PoC), no significant differences were observed.

Table 6. Mixed-effects Regression Outcomes per Study Condition.

	Basic Reminder PoC Prompts vs No Prompt Control			Theory-Driven Poc Prompts vs No Prompt Control			Basic Reminder PoC Prompts vs Theory-Driven Poc Prompts		
	beta	(SE)	*P*	beta	(SE)	*P*	beta	(SE)	*P*
Sitting	-19.0	(11.8)	0.12	-10.2	(12.2)	0.41	8.8	(12.2)	0.48
Standing	**24.5**	**(11.1)**	**0.03**	10.0	(11.4)	0.39	-14.6	(11.4)	0.21
Sit-stand transitions	0.7	(0.6)	0.22	0.5	(0.6)	0.40	0.2	(0.6)	0.73
Sit bouts >30 min	24.1	(15.6)	0.13	**34.9**	**(16.2)**	**0.04**	-10.8	(16.2)	0.51
LPA	**-5.7**	**(2.5)**	**0.03**	-1.8	(2.6)	0.50	3.9	(2.6)	0.15
MVPA	-0.2	(1.0)	0.84	1.4	(1.0)	0.17	1.6	(1.0)	0.12
Total stepping time	**-6.0**	**(2.8)**	**0.04**	-0.5	(2.9)	0.86	5.5	(2.9)	0.07

Note. Significant results are bolded. Data are standardized to an 8h workday
Abbreviations: LPA, light-intensity physical activity; MVPA, moderate-vigorous physical activity
All models were adjusted for age, gender, race/ethnicty, joby type, and order

Figure 2. presents condition effects on sedentary behavior outcomes in which the y-axis represents unstandardized beta coefficients and associated 95% confidence intervals.

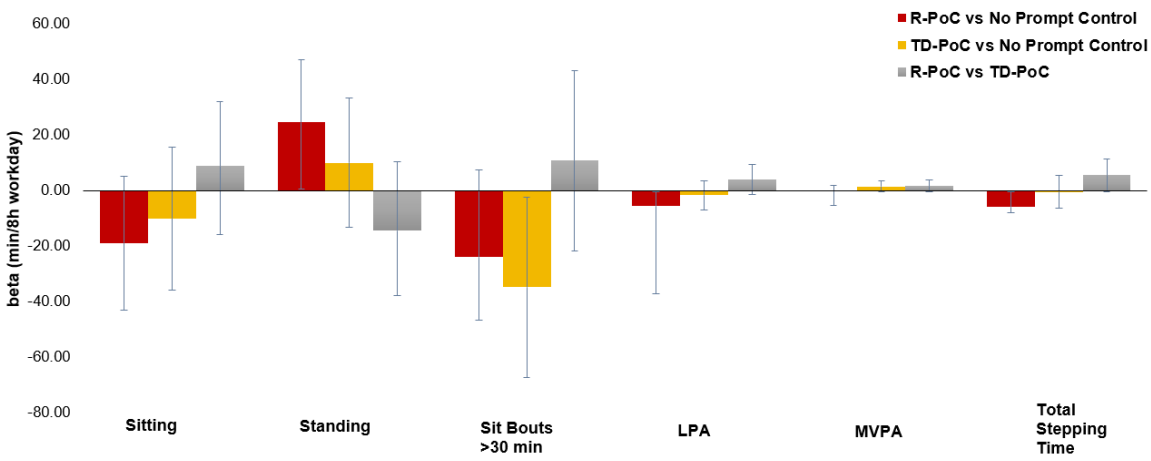

Figure 2. Sedentary Behavior Condition Effects

CHAPTER 5

DISCUSSION

The purpose of this study was to examine the feasibility of two different low-cost, easily disseminable prompt interventions on reducing sedentary behaviors in office workers with low utilization for their sit-stand workstations. In addition, objective levels of sedentary and more active behaviors were assessed to determine the preliminary efficacy of these interventions. This study is unique in that it assessed both a point-of-choice prompt intervention developed from a theoretical perspective (i.e., 40 unique prompts tailored to the social cognitive theory) and a basic reminder prompt (i.e., 'Time to Stand!') to enhance intervention implementation knowledge regarding the most effective prompt types to use in the workplace to reduce sedentary behaviors. Furthermore, this study is unique in that it utilizes a feasibility framework (i.e., Bowen et al., 2010). In addition to objective measures of sedentary and more active behaviors to further enhance knowledge surrounding preliminary efficacy of using prompts in the workplace.

Summary of Findings

Overall, feasibility findings indicated that both interventions were perceived similarly, with the TD-PoC condition being slightly closer to the 70% of greater benchmark than the R-PoC condition. Despite this, no significant differences were revealed through dependent t-test analysis within or between conditions for total TEQ scores for all 8-items.

Overall the R-PoC prompt condition utilizing the same basic prompt, "Time to Stand!" resulted in a statistically significant increase in standing time as well as a reduction in light-intensity physical activity and total stepping time relative to no prompt control. Alternatively, the TD-PoC prompt condition did not produce a reduction in standing, LPA, or total stepping time relative to no prompt control, but did produce a reduction in time spent in prolonged sitting bouts (>30 minutes of continuous sitting). In addition, no significant differences between the TD-PoC or R-PoC prompt conditions were detected.

Feasibility

The primary aim of this study was to assess the feasibility of a theory-driven and atheoretical intervention using self-report responses from participants by administering pre-and-post therapy evaluation questionnaire surveys for both interventions. Other studies (Cooley et al., 2013; Evans et al., 2012; Mainsbridge et al., 2016; Pedersen et al., 2013; Swartz et al., 2014) have generally examined the effectiveness of interventions without assessing feasibility constructs in-depth, potentially limiting the ability to achieve important knowledge that can further enhance, develop, and establish an intervention as evidence-based for future implementation and dissemination. Assessing feasibility in this study and of other studies is of critical importance for the development of evidence-based interventions and helps researchers to understand the probability of an intervention being efficacious (Bowen et al., 2010). By examining feasibility constructs such as acceptability, demand, implementation, practicality, and integration we can enhance knowledge surrounding the perceived appropriateness of an intervention, its actual use, degree and success of execution, resources needed, efficiency, and perceived sustainability. As such, it has been suggested that research focusing on different types of messaging (i.e., specific vs general) to better inform workplace health promotion practices (Eckhardt et al., 2013), and this study aimed to help resolve this missing body of knowledge. Furthermore, feasibility and acceptability examination had been called for in non-health work places (Chau et al., 2014), and as such, this study largely consisted of non-health related academic office workers to help bridge this gap. More specifically this study sought to provide knowledge regarding how a theory-driven and a basic reminder point-of-choice prompt intervention would be rated by office workers with sit-stand workstations in terms of their feasibility. When examining previous literature stating that interventions are more effective when based off of theory (Straker et al., 2013), and that more tailored messages may be more conducive for behavior change (Noar, Benac, & Harris, 2007), it would be expected that a prompt intervention developed to incorporate social cognitive theory constructs would be perceived as more feasible than that of a simple reminder and show greater

efficacy in behavior change. While this was showcased descriptively, no significant differences were detected in mean TEQ scores for the 8-items assessing feasibility.

While no other point-of-choice prompt-based studies have attempted to encompass measured constructs (i.e. TEQ) into a feasibility framework, this was done in attempt to enhance feasibility knowledge and help others develop similar methods for assessing feasibility of using prompts in the workplace. Further assessment of feasibility questions beyond the Therapy Evaluation Questionnaire (TEQ) revealed that both the R-PoC and TD-PoC interventions were rated similarly in regard to the general usefulness and frequency usefulness of the prompts in helping participants to stand. This highlights the lack of clarity between the efficacy of a theory-driven or basic reminder prompt Interestingly, for individual rating of specific prompt types, the self-efficacy based prompts (e.g., SAY IT: I have the ability to STAND while I work) were rated almost of that of the outcome expectancy based prompts, and less than half as the proximal goal prompts and the R-PoC prompt in terms of usefulness. This may highlight the nature of self-efficacy and how it must be built within an individual and may not be properly constructed in a prompt message. In addition, in terms of assessing the practicality of the time the prompts were delivered, very few participants during the TD-PoC condition and no participants during the R-PoC intervention indicated having a morning preference for prompt receival. This highlights anecdotal reports of participants indicating that they are more motivated to stand in the morning, but fatigue as the day goes on. In addition, other studies have documented similar trends (Chau et al., 2014). Almost half of the R-PoC sample and about a third of the TD-PoC sample indicated a preference for receiving prompts during the afternoon. However, slightly over half of the sample for both the R-PoC and TD-PoC conditions indicated no preference. More information about workplace sedentary time trajectories may help to establish the most appropriate time to send prompts in the workplace. Moreover, this also points towards the growing need to tailor interventions at the individual level and use of real-time feedback whenever possible. Regarding demand, just over half of the participants during the R-PoC condition thought the amount was appropriate while 26.3% asked for prompts to be delivered more frequently and 15.8% indicated

they wanted prompts to be delivered less frequently. Alternatively, just over three-fourths of participants during the TD-PoC prompt condition thought the amount was appropriate, only approximately 5.3% requested to receive prompts less and 15.8% requested to receive prompts more frequently. One possible reason for the differences in demand between the R-PoC and TD-PoC prompt interventions could be that the same reminder was perceived as less interesting as the TD-PoC prompts, who were all unique and were typically longer than that of the R-PoC, possible making participants feel more engaged during the TD-PoC time. This may highlight that overtime it is important to consider how engage participants are and that they might be less likely to lose interest in an PoC prompt-based intervention that displays unique messages over time.

Sedentary behavior

Other studies utilizing point-of-choice prompts to reduce sedentary behaviors in the workplace have either recruited office-workers with no sit-stand workstation (Evans et al., 2012), or have intervened at the time of sit-stand workstation installation (Chau et al., 2014). This study is unique in that all participants had been using their sit-stand workstation for at least one month, with the average time of having a workstation being 14.82 ± 11.54 months. The lack of research on sedentary behavior interventions in office workers with sit-stand workstations provides little room for direct comparison specific to prompt interventions. With typical sitting time of office workers being seated for 70-80% of an 8 hour a day, this population of sit-stand workstation owner's is less sedentary compared to those typically intervened upon. However, multi-facet studies have reported an average of 125-min (Healy et al., 2013) and 66-min (Pronk et al., 2012) of decreased of sitting time in result of their multi-facet interventions, largely transferred to standing behavior. While this study did not display any significant reduction in sitting time relevant to baseline or between-conditions in this study, descriptive showcase a 16.60 and 23.01 minute reduction in sitting time for the R-PoC and TD-PoC conditions, respectively. In addition, a 12.42 and 15.36-minute increase in standing time for all participants for the R-PoC and TD-PoC conditions relative to no prompt control was noted.

Moreover, the positive effects of reducing sitting time on the glucose response cannot be ignored despite lack of statistical significance in the reduction of sitting time. As such, more interruptions are thought to be beneficial for metabolic risk (Healy et al., 2008). Furthermore, we must consider the benefit of accumulating small amounts of standing over time that can transfer to a longer-term meaningful impact on health outcomes (Chau et al., 2014). While Evans et al. (2012) found significant between group differences for sitting events, prolonged sitting events, and duration of sitting time, the comparison groups in this study included a prompt group every 30-minutes relative to the education group who received no prompt. However, as previously indicated, Evans et al. (2012) utilized a higher prompt-dose through computer software by prompting participants for 1-minute, every 30-minutes from the time the computer was started. Over a typical 8-hour workday, participants may have been prompted up to 16 times, twice the dose of this present study. Furthermore, sedentary values during the no prompt control for this study were approximately 5.7 ± 1.0 hours per day. Conversely, this study displayed approximately 4.5 ±1.1 hours (267.90 ± 68.01 minutes) sitting during the no prompt control condition and were therefore already slightly more active than that of the 20 participants examined in Evans et al. (2012). Therefore, the combined higher prompt dosage with a slightly more sedentary population may point to displayed differences between this study and the study by Evans et al. (2012).

In addition, it is difficult to parse out whether duration of the intervention may have impacted the results. Descriptively it appeared that the greatest reduction in sitting time and increases in standing time were seen toward the beginning of the first intervention condition (i.e., regardless of which was first). While ordering effects were adjusted for in all analyses, it does suggest that we must consider novelty effects and the overall duration of the R-PoC and TD-PoC conditions, though others have shown decreases in sitting time during a 5-day intervention, the baseline sedentary behavior was higher, thus providing participants with more room to change. Interestingly, despite having a higher feasibility score provided by the TEQ, the R-PoC prompt condition had a significant increase in standing and higher, though non-statistically significant,

reduction in sitting time than that of the TD-PoC prompt condition. Furthermore, it is likely that the increase in standing time resulted from a combined reduction in time spent sitting and light-intensity physical activity. As such, during the R-PoC prompt condition, participants may have been more focused on reducing standing time, due to this basic reminder prompt specifically stating 'Time to Stand!,' reinforcing standing behavior. The TD-PoC prompts included a broader range of messages (i.e. 40 unique prompts) that encompassed behavior change tactics from the social cognitive theory (i.e., self-efficacy, outcome expectations, proximal goal setting) and largely focused on not only standing less but the importance of reducing sedentary behaviors (i.e. sitting time) while at work. Therefore, this may partially account for the lack of significance seen in increasing standing time and notably, the statistically significant decrease in sitting bouts greater than thirty minutes.

The original hypothesis of the secondary aim of this study was that relative to baseline, the R-PoC and TD-PoC prompt conditions would display greater reductions in sitting time, sit-bouts >30 min and increases in standing time. Furthermore, while both interventions had separate effects on sedentary behaviors these findings may indicate that a basic reminder to stand may be sufficient for increasing standing time, but to target long sit-bouts (i.e. sit bouts >30 min) that have been established with poor health outcomes, more elaborate reminders, possibly especially those displaying outcome expectancies may be needed to reduce prolonged sitting.

Strengths

The study's strengths are the inclusion of a randomized design and 1-week wash-out period, providing balancing between the R-PoC and TD-PoC conditions and reducing potential carry-over effects between the two interventions. In addition, no participants were influenced by others at the same worksite as participants were spread out across different worksites across the Phoenix metropolitan area. Of those in the same worksite, no influence from others standing behavior was indicated. Participants also had their sit-stand workstation for at least one month, possibly minimizing novelty effects from when the workstations are first installed. This study also utilized objective measures of prompt engagement (i.e. delivery and open rates), allowing for

implementation measurement and not sole reliance on self-report for the number of prompts received. In addition, sedentary behavior was also assessed objectively using the validated and reliable activPAL micro device, which has frequently been used in workplace settings. In addition, this study included individuals of different job types, including rages from clerical to executive positions.

Limitations

Limitations of this study are reflected in the size of the sample recruited and ultimately enrolled. An additional limitation includes time spent using the MailChimp website to deliver the prompt emails. This would likely not be a feasible method of prompt delivery for dissemination or for a longer-term study or a study with a larger sample size. In addition, while participants all had their desk for a minimum of one-month, potentially minimizing the novelty effect of having a new workstation, participants also had sit-stand workstations for various lengths in time, from 1 month to 3-years; therefore, participates may respond differently based off how long they have a had a sit-stand workstation. Furthermore, participants typically responded positively to the TEQ surveys, displaying a non-normal distribution. Lastly, participants in this study were mostly ASU employees who volunteered to participate and therefore may not be representative of other non-volunteer office workers.

Future Directions

Future studies further examining the feasibility and/or efficacy of using prompts to increase sit-stand workstation utilization must consider several adaptations to enhance study design. Recruiting a larger sample size and recruiting across different sectors (i.e., academia, government, and industry) will enhance the generalizability of results. Furthermore, the incorporation of real-time feedback using wearable devices or sensors may enhance the practicality and receptiveness to responding to prompts. For example, real-time feedback could enable prompts to appear during periods of prolonged sitting and be used to provide individual progress, such as how much more they are standing with their workstation. It would also be beneficial to know how much time office workers are spending specifically at their desk, and if

they are standing specifically in response to study prompts. This could be accomplished through the use of proximity sensors, for example. In addition, consideration must be given to different modalities for sending prompts, such as through text messaging or computer software. This intervention relied on email due to logistical cost; however other methods may also be beneficial or preferred by participants. Future studies should also consider the possibility of timing a prompt intervention with a sit-stand workstation install to help establish new behaviors from the start, though consideration must be given to when the novelty effect of having a sit-stand workstation wears off.

In addition, while this study utilized feedback from worksite wellness advocates in the development of the forty unique prompt messages encompassed, more in-depth development may enhance the efficacy of the unique social cognitive theory-driven messages. Moreover, longer-term interventions utilizing a unique approach will need to create a larger pool of prompt messages to pull from. In addition, a component of the social cognitive theory not encompassed in this study includes social relationships. Integrating prompt responsiveness within a computer program or smart-phone app could enable sit-stand workstation competitions within worksites. In addition, it may be of important consideration to educate office workers on the benefits of decreasing long sitting bouts on glucose responses (Thorp et al., 2014) and increasing sit-stand transitions, due to muscle contractions in the large quadriceps muscles of the legs, compared to prolonged standing. This was only highlighted minimally in the outcome expectation prompts, but further education in this area might prove beneficial for reducing prolonged sitting and total sedentary time.

Lastly, if a cross-over design is utilized a longer wash out period may be beneficial if comparing to different prompt interventions or a different design (e.g., text vs email). Assessing objective levels of sedentary behavior post interventions will also help to further establish efficacy by determining if office workers revert to habitual sitting behaviors once the prompts are removed.

Conclusion

This study highlights the importance of assessing feasibility through self-report participant experience in addition to collecting objective data to for full efficacy assessment and to enhance future intervention effectiveness. This study demonstrates the ability of point-of-choice prompts to reduce sedentary behaviors in the workplace, though it is still unclear as to whether an intervention based on theory (i.e. social cognitive theory) or an intervention including basic reinforcing reminders is sufficient for behaviors change

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APPENDIX A

RECRUITMENT FLYER

School of Nutrition & Health Promotion

ARIZONA STATE UNIVERSITY

RESEARCH STUDY SEEKING:

Full-time office workers with *sit-stand workstations*

are wanted for a study on the feasibility of prompts on reducing sedentary behavior

Eligibility

- 18 years or older
- Full- time office employees (30+ hours/week)
- In office at least 4 days per week
- Desk work for majority of day
- Have a sit-stand workstation
- NOT advised by a health professional to avoid long periods of standing
- NOT currently in or entering the third trimester of pregnancy

Study Description

- Physical activity monitor – small thigh worn device (wear for four weeks)
- If fully eligible, receive 2 different 1-week prompt interventions (work hours/days only)
- Demographic and behavioral surveys (one per week [~15 min] for four weeks)
- Total Time commitment (~ 3 hours over span of one month)
    - Time includes all surveys, study interventions, and brief study visits at your worksite (we come to you!) to give you the physical activity tracker (~10 min, 4x each).

Participation is voluntary

To learn more or participate please contact Miranda Larouche: Mlarouche@asu.edu

APPENDIX B

PARTICIPANT ELIGIBILITY SCREENER

This study is designed to help you increase your standing time with your sit-stand workstation.

If you wish to participate, please complete the survey below to determine if you are eligible to move through the first part of the studies eligibility screening process.

If you are eligible based on these questions, a member of the research team will contact you to have you start the second phase of the eligibility screening process.

Please provide your first and last name:

_____

Please provide your full work email:

_____

Please provide your work location:

_____

Am I eligible?

To move on to the second screening phase **YOU MUST BE**:
(Please check the box next to each criteria you meet)

- o 18 years or older
- o A full-time employee (30+ hours per week)
- o In the office at least 4 days per week
- o In a seated position for a majority of your working day (computer, desk-based tasks)
- o Currently have a sit-stand workstation installed at primary desk
- o Ability and willingness to engage in study assessment and intervention for approximately 30-days
- o NOT advised by a health professional to avoid long periods of standing
- o NOT currently in or entering the third trimester of pregnancy
- o

How often do you use your sit-stand workstation?

- o Never
- o < 1 hour per day
- o 1 to < 2 hours per day
- o 2 to < 3 hours per day
- o 3 to < 4 hours per day
- o 4 to < 5 hours per day
- o 5 to < 6 hours per day
- o 6 to < 7 hours per day
- o 7 to < 8 hours per day

Display This Question:

If How often do you use your sit-stand workstation? = Never

Or How often do you use your sit-stand workstation? = < 1 hour per day

Or How often do you use your sit-stand workstation? = 1 to < 2 hours per day

And How often do you use your sit-stand workstation? = 2 to < 3 hours per day

And To move on to the second screening phase YOU MUST BE: (Please check the box next to each criteria... q://QID2/SelectedChoicesCount Is Equal to 8

Thank you for completing this survey. Based on your responses, you are eligible to continue onto the second screening phase of the study. Will you be interested in consenting to participate and continuing the screening process?

- o Yes
- o I would like to speak to the research staff about the study
- o No

Display This Question:

If Thank you for completing this survey. Based on your responses, you are eligible to continue onto... = Yes

Or Thank you for completing this survey. Based on your responses, you are eligible to continue onto... = I would like to speak to the research staff about the study

We will be in touch with you regarding participation. Please feel free to contact the study coordinator, Miranda Larouche at Mlarouche@asu.edu if you have any questions or concerns.

Display This Question:

If Thank you for completing this survey. Based on your responses, you are eligible to continue onto... = No

Thank you for your time. Please feel free to contact the study coordinator, Miranda Larouche at Mlarouche@asu.edu if you have any questions or concerns.

If you would like to know more about specific eligibility items above, please contact us at:

Email: Mlarouch@asu.edu
Phone:

APPENDIX C

ONLINE INFORMED CONSENT

STAND UP PROMPT STUDY CONSENT

Investigators: Miranda Larouche, Meynard Toledo, Kristina Hasanaj, Robin Faulkner, Sarah Mullane, Matthew Buman

Why am I being invited to take part in a research study?

We are inviting you to take part in this research study because you meet our pre-screening criteria to participate in "Phase 1" of the study. You indicated in our online questionnaire that you are at least 18 years of age, work full-time, have a sit-stand workstation and are willing to engage in the study for approximately 30 days. In addition, you reported that you do not have any medical problems that preclude you from standing and are not in the third trimester of pregnancy.
If you wish to proceed after your baseline assessment (1-week), it will be determined if you can participate in "Phase 2" of the study (approx 3-weeks).

Why is this research being done?

Sedentary behavior (SB) has been strongly linked with cardiometabolic health risk and several studies have explored the various personal and environmental factors that are associated with SB. In addition, there is a current trend in workplaces to purchase sit-stand workstations for employees, but these desks are often given without a behavioral intervention. Therefore, behavioral support to transition from habitual sitting to breaking up long sitting bouts by standing more frequently is warranted.
In addition, the technology industry is embracing the need to prompt employees to stand or move more and represent a low-cost method for reducing sedentary behavior. Yet, the acceptability and need for prompt messages to increase sit-stand workstation usage have yet to be examined.
The purpose of this study is to determine the feasibility of sending point-of-choice prompt messages to employees with sit-stand workstations to identify behavioral strategies that are most likely to produce reductions in SB.

How long will the research last?

This study will take approximately 30 days to complete and we expect that participants will spend an average of less than 5 mins per day participating in the study, except during assessment visits (4x) which will require about 10 mins per visit. No study activities will occur outside of typical work hours, nor will the participant be required to visit the research laboratory. In addition, the study surveys will take approximately 15 minutes each and will be administered 4 times throughout the course of the study.

How many people will be studied?

We expect approximately 20 people to participate in this research study.

Q5 **What happens if I say yes, I want to be in this research?**

If you agree to be part of this research study, you will be asked to do the following:

PHASE 1

Week 1: Baseline measurement

- To wear a physical activity monitor on your right thigh continuously for 5 workdays.
- To complete a demographic and behavioral/evaluation survey (approximates 15 minutes).
- To complete a daily log (1 minute in length) every morning to assess your sleep and wake times and your work arrival and departure times.

After your baseline measurement, your eligibility will be determined to see if you can participate in "Phase 2" of study. If you are eligible, you will move on to "Phase 2" of the study. If you are ineligible at this time, we will notify you via email and send you a PD

print-out of your sitting, standing and moving behaviors measured during your baseline assessment.

PHASE 2

You will be randomized to receive either intervention A or Intervention B during week 2. The intervention that you are not initially randomized to is what you will receive during week 4.

Week 2: Intervention A or B

- To wear a physical activity monitor on your right thigh continuously for 7 days (5 workdays).
- To complete a behavioral/evaluation survey (approximates 15 minutes).
- To complete a daily log (1 minute in length) every morning to assess your sleep and wake times and your work arrival and departure times.
- Be willing to receive 8 prompts per day Monday through Friday sent randomly during typical work hours (9:00 - 6:00 pm) to your primary work email.
- Be willing to open each prompt email when at your desk as they appear as an acknowledgment of having received the prompt while at your desk.

Week 3: Follow-up Survey 1

- To complete a behavioral and evaluation survey (approximates 15 minutes).
- To wear a physical activity monitor on your right thigh continuously for 7 days (5 workdays).
- To complete a daily log (1 minute in length) every morning to assess your sleep and wake times and your work arrival and departure times.
- During this period **you will not** be sent any prompt messages.

Week 4: Intervention A or B

- To wear a physical activity monitor on your right thigh continuously for 5 workdays.
- To complete a behavioral/evaluation survey (approximates 15 minutes). To complete a daily log (1 minute in length) every morning to assess your sleep and wake times and work arrival and departure times.
- Be willing to receive 8 prompts per day for Monday through Friday sent randomly during typical work hours (9:00 - 6:00 pm) to your primary work email.
- Be willing to open each prompt email when at your desk as they appear as an acknowledgment of having received the prompt while at your desk.

Day 30: Final Survey and Study Completion

- To complete a behavioral/evaluation survey (approximates 15 minutes)
- During this period, **you will not** be sent any prompt messages or asked to wear a physical activity monitor (ActivPAL).

The completion of the behavioral/evaluation survey sent shortly after week 4 (~Day 30) will mark the end of your participation in the study.

The ActivPAL devices will be distributed every Monday morning (Week 1, Week 2, Week 3, and Week 4). ActivPAL's will be collected on the following Monday.

At the end of the study you will be given four PDF files with information including your sitting, standing, and moving behaviors recorded from the activPAL micro device.

You are free to decide whether you wish to participate in this study.

Page Break

Q6 **What happens if I say yes, but I change my mind later?**
Participation in this study is voluntary. Your decision whether or not to participate in any or all aspects of this study will not affect your current or future relations with Arizona State University or your employer. If you decide to participate, you are free to not answer any study questions or to not engage in any component of the study and can withdraw at any time without affecting those relationships.

Q7 **Is there any way being in this study could be bad for me?**
Potential risks include possible physical discomfort that may occur due to participation in a program focused specifically on increasing standing/reducing sitting time at the workplace. However, standing/walking behaviors are totally voluntary.
Participation in the study may also cause some burden from the assessment questionnaires and the prompts that you will receive eight times per day. As these prompt emails will be sent randomly each day during work hours (M-F) during week 2 and 4, they can cause disruption in the normal daily activities while at work. However, the prompts are designed to be short (<49 characters) and take less than 30 seconds to view and open as a record of receival.
A second risk includes possible breaches of privacy and confidentiality based on some of the personal data being collected within this study. This risk would be minimized by encrypting all data, storing all data in password-protected files, utilizing secure data protection strategies when transferring data, and keeping all personal identifying information as a separate file. Further, all research data will only be identifiable using a randomized research number.

Q8 **Will being in this study help me in any way?**
We cannot promise any benefits to you or others from your taking part in this research. However, participating in the study will help the you be aware of your physical activity behavior and develop strategies to decrease sedentary behavior at the workplace.

Q9 **What happens to the information collected for the research?**
Efforts will be made to limit the use and disclosure of your personal information, including research study records, to people who have a need to review this information. We cannot promise complete secrecy. The results of this study may be used in reports, presentations or publications but your name will not be used.

Data will be retained for up to five years after the final publication of any work based on this research and any paper files will be shredded prior to disposal. All electronic files will be deleted from all storage sites including back-up drives. Only research personnel will be allowed to access to research data to conduct the research. This type of data will improve our ability to determine when, where, and how best to help individuals to walk more. You have the right to refuse the collection of these types of data while still participating in this study.

Q11 **Who can I talk to?**

If you have questions, concerns, or complaints, talk to the research team by contacting:

Miranda Larouche
mlarouch@asu.edu
Phone:
OR
Matthew Buman
matthew.buman@asu.edu
Phone:

his research has been reviewed and approved by the Social Behavioral IRB. You may talk to them at (480) 965-6788 or by email at research.integrity@asu.edu if:
Your questions, concerns, or complaints are not being answered by the research team.
You cannot reach the research team.
You want to talk to someone besides the research team.
You have questions about your rights as a research participant.

Start of Block: VOLUNTARY CONSENT

VOLUNTARY CONSENT

O First Name _____

O Last Name _____

Any questions you have concerning the research study or your participation in the study, before or after your consent, will be answered by Dr. Buman, 500 N 3rd ST, Phoenix, AZ 85004; (602) 827-2315. If you have questions about your rights as a subject/participant in this research, or you feel you have been placed at risk, you can contact the Chair of the Humans Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788. This form explains the nature, demands, benefits and any risks of the project. By signing this form, you agree knowingly to assume any risks involved. Remember, your participation is voluntary. You may choose not to participate or withdraw your consent and discontinue participation at any time without penalty or loss of benefit. In signing this consent form, you are not waiving any legal claims, rights, or remedies. A copy of this consent form will be emailed to you. Clicking on "Yes" below this indicates that you consent to participate in the above study.

O Yes, I agree to participate in the StandUp Prompt Study

Page Break

Display This Question:

If Any questions you have concerning the research study or your participation in the study, before o... = Yes, I agree to participate in the Stand Up Prompt Study

Q20 We thank you for agreeing to participate in our study. You will receive a copy of your consent via email shortly after completing this online consent. If you do not get one or if you have any other questions about the study, please contact us at mltoledo@asu.edu or call us at 706-363-2866.

End of Block: VOLUNTARY CONSENT

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APPENDIX D

PARTICIPANT INSTRUCTIONS

ActivPAL FAQs

What is an activPAL device?

- An activPAL is a small, thigh-worn device that measures posture and physical activity.

Does this device track my location?

- NO, the device does not track your location and your data will be stored on our secure server.

When and for how long do I have to wear it?

- You will wear this device for four weeks, each week you will be given a new device.
- Please put the device on as soon as you receive it.
- The device should be worn continuously (during wake and sleep periods) for 7-days.

How do I wear it?

- Wear the device on the midline of your right thigh. The arrow on the device should be facing outward and up.

Is it waterproof?

- Yes, the device is waterproof so please DO NOT take it off when showering or engaging in any water-related activities.

What if it falls off?

- If the device falls off please record the time when it fell off and when you reaffixed the device on your sleep and work time log and use the extra hypafix tape provided in your activPAL pack.

Will someone pick-up my device?

- Yes, every Monday a member of the research team will stop by your worksite to pick-up your old device and provide you with a fresh device to wear for the following week.

I have a study-related problem/question. What do I contact?

- If you have any problems, please contact the study coordinator Miranda Larouche at (480) 271-9099 or **mlarouch@asu.edu**

Placing the activPAL on your right thigh:

If your activPAL is loose, or falls off, use the extra hypoallergenic hypafix tape provided in your activPAL pack to reaffix the device to your **right thigh.**

Remember that when affixing your activPAL, the arrow needs to be facing outwards and be pointing up.

If you need additional tape please email Mlarouch@asu.edu

APPENDIX E

PARTICIPANT WORK/SLEEP LOG

Log _ "Week _"– Baseline (T_)

Please fill out the below log within one hour of arriving at work every day.

If the day is a non-work day (e.g., day-off or weekend day) please enter N/A into the box
*Sleep Time refers to the respective date's bed-time

	Wake Time	Work Start Time	Work Departure Time	Sleep Time	Notes
Example:	6:40 am	8:15 am	4:35 pm	10:30 pm	*AP fell off at 10:30 am, placed back on at 11:00 am.*
Day 1 M	N/A	N/A	N/A	N/A	N/A
Day 2 T					
Day 3 W					
Day 4 Th					
Day 5 F					

APPENDIX F

DEMOGRAPHIC QUESTIONNAIRE

Welcome to the STANDUp Prompt Demographic Survey!

Thank you for your willingness to complete this questionnaire, which should take about **15 minutes**. As you will see, some questions are personal in nature, and others assess work-related activities. We very much appreciate your time and honesty.

Please remember that your answers are strictly confidential. If you have any questions while taking this study, please call or email your study coordinator:

Miranda Larouche
Mlarouche@asu.edu

What is your date of birth? (MM/DD/YYYY)

_____

Are you Hispanic or Latino/a?

- o Yes
- o No

Which of the following best describes you? (Check all that apply)

- o Asian
- o Black or African-American
- o Hawaiian or Pacific Islander
- o Native American or Alaskan Native
- o White
- o Other (please specify)

What is your sex?

- o Female
- o Male
- o I prefer not to answer

Please choose the category that best describes your main job. If none of the categories fits you exactly, please respond with the closest category to your experience. (Select only one.)

- o Executive, administrator, or senior manager (e.g., CEO, sales, VP, plant manager)
- o Professional (e.g., engineer, accountant, systems analyst)
- o Technical support (e.g., lab technician, legal assistant, computer programmer)
- o Sales (e.g., sales representative, stockbroker, retail sales)
- o Clerical and administrative support (e.g., secretary, billing clerk, office supervisor)
- o Service occupation (e.g., security officer, carpenter, machinist)
- o Chemical/Production Operator (e.g., shift supervisors and hourly employees)
- o Laborer (e.g., truck driver, construction worker)
- o I prefer not to answer

INCOME What was your **total household income before taxes** last year?
(By "household," we mean that you should report the combined income of everyone in your home).

- o $14,999 or less
- o $15,000 - $24,999
- o $25,000 - $34,999
- o $35,000 - $49,999
- o $50,000 - $74,999
- o $75,000 - $99,999
- o $100,000 - $124,999
- o $125,000 - $149,999
- o $150,000 - $174,999
- o $175,000 - $199,999
- o $200,000 - $249,999
- o $250,000 - $299,999
- o $300,000 or more
- o I prefer not to answer
- o I don't know

Nicotine How would you categorize your use of the following tobacco/nicotine products?

	Current user	Former user	Never used
Cigarettes	O	O	O
E-cigarettes	O	O	O
Pipes full of tobacco	O	O	O
Cigars or cigarillos	O	O	O
Smokeless tobacco (e.g. snuff, chewing tobacco, dip)	O	O	O

How long have you had a sit-stand workstation? (e.g., 6-months)

_____

Thank you for taking the time to complete your baseline questionnaire!
- The StandUp Prompt Study Team

APPENDIX G

POST THEORY-DRIVEN TEQ

Thank you for your participation in this study. This short survey will be used to get your feedback regarding the intervention you just received and to assess your sitting and standing behaviors. Please be honest so that we can improve our intervention for future research.

We want to get your opinion about the **unique** email prompts that you have received last week now that you've had experience engaging with them.

	Not at all	A little	Moderately	Very	Totally
How logical did the prompts seem to you?	○	○	○	○	○
How easy was it for you to respond to the prompts? (i.e. by standing)	○	○	○	○	○
How appropriate were the prompts for your sitting and standing?	○	○	○	○	○
How helpful was the prompts for managing your sitting and standing?	○	○	○	○	○
How successful were the prompts for managing your sitting and standing?	○	○	○	○	○
How confident are you that you can continue to stand once the research project ends?	○	○	○	○	○
How likely is it that you would recommend the prompts to others with a sit-stand workstation?	○	○	○	○	○
How important is it to make the treatment available to others with a sit-stand workstation?	○	○	○	○	○

APPENDIX H

POST REMINDER TEQ

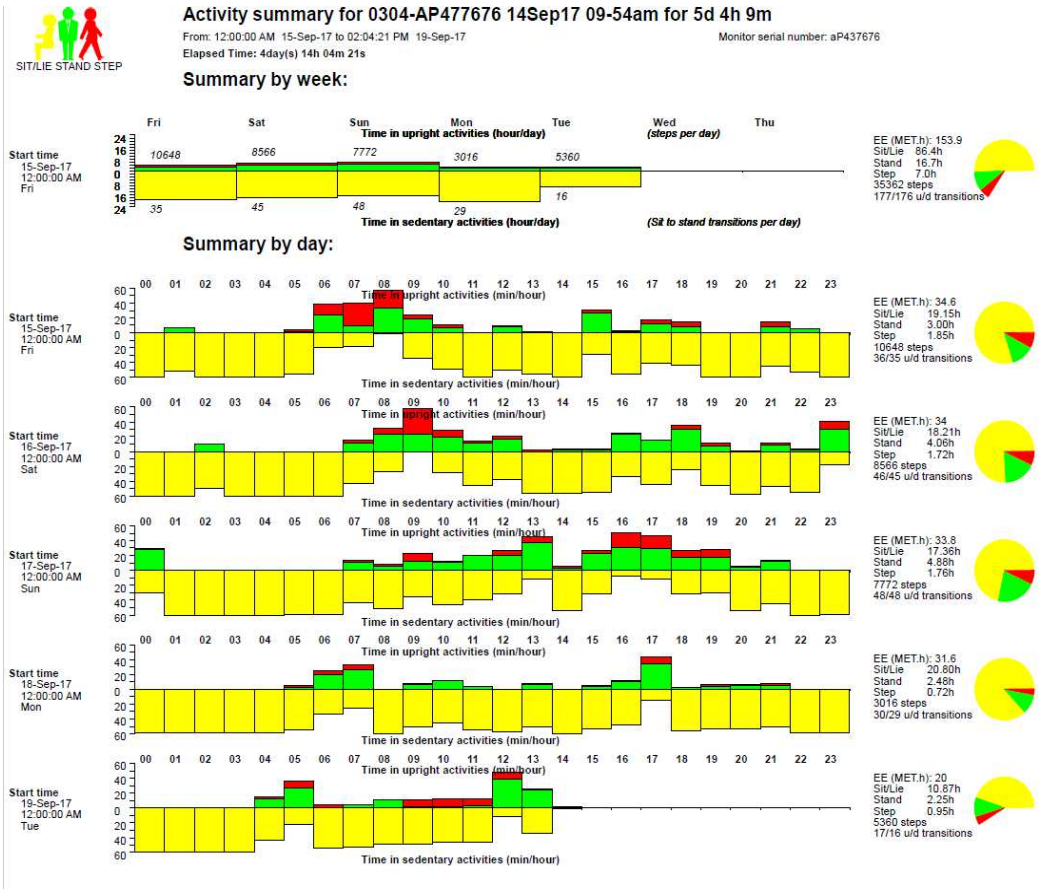
Thank you for your participation in this study. This short survey will be used to get your feedback regarding the intervention you just received and to assess your sitting and standing behaviors. Please be honest so that we can improve our intervention for future research.

We want to get your opinion about the **email prompt reminders** that you have been receiving now that you've had experience with them

	Not at all	A little	Moderately	Very	Totally
How logical did the prompts seem to you?	○	○	○	○	○
How easy was it for you to respond to the prompt?	○	○	○	○	○
How appropriate was the prompts for your sitting and standing?	○	○	○	○	○
How helpful was the prompts for managing your sitting and standing?	○	○	○	○	○
How successful was the prompt for managing your sitting and standing?	○	○	○	○	○
How confident are you that you can continue to stand once the research project ends?	○	○	○	○	○
How likely is it that you would recommend the prompt to others with a sit-stand workstation?	○	○	○	○	○
How important is it to make the treatment available to others with a sit-stand workstation?	○	○	○	○	○

APPENDIX I

ACTIVPAL EXEMPLAR FEEDBACK PDF


SIT/LIE STAND STEP
Activity summary for 0304-AP477676 14Sep17 09-54am for 5d 4h 9m
From: 12:00:00 AM 15-Sep-17 to 02:04:21 PM 19-Sep-17
Monitor serial number: aP437676
Elapsed Time: 4day(s) 14h 04m 21s
Summary by week:
Fri Sat Sun Mon Tue Wed Thu
Time in upright activities (hour/day)
(steps per day)
10648 8566 7772 3016 5360
35 45 48 29 16
Time in sedentary activities (hour/day)
(Sit to stand transitions per day)
Start time 15-Sep-17 12:00:00 AM Fri
EE (MET.h): 153.9
Sit/Lie 86.4h
Stand 16.7h
Step 7.0h
35362 steps
177/176 u/d transitions
Summary by day:
Start time 15-Sep-17 12:00:00 AM Fri
EE (MET.h): 34.6
Sit/Lie 19.15h
Stand 3.00h
Step 1.85h
10648 steps
36/35 u/d transitions
Start time 16-Sep-17 12:00:00 AM Sat
EE (MET.h): 34
Sit/Lie 18.21h
Stand 4.06h
Step 1.72h
8566 steps
46/45 u/d transitions
Start time 17-Sep-17 12:00:00 AM Sun
EE (MET.h): 33.8
Sit/Lie 17.36h
Stand 4.88h
Step 1.76h
7772 steps
48/48 u/d transitions
Start time 18-Sep-17 12:00:00 AM Mon
EE (MET.h): 31.6
Sit/Lie 20.80h
Stand 2.48h
Step 0.72h
3016 steps
30/29 u/d transitions
Start time 19-Sep-17 12:00:00 AM Tue
EE (MET.h): 20
Sit/Lie 10.87h
Stand 2.25h
Step 0.95h
5360 steps
17/16 u/d transitions
Time in upright activities (min/hour)
Time in sedentary activities (min/hour)

APPENDIX J

PROMPT LIST

DAY	AM OR PM	TYPE	NUM.	PROMPT	Time	Conversion
DAY 1	AM	SE	1	SAY IT: I have the ability to STAND while I work	0	9:00 AM
		OE	2	Did you know? STANDing can re-energize and maintain focus	45	10:45 AM
		SE	3	SAY IT: I CAN use my sit-stand workstation to STAND and work	30	11:30 AM
	PM	PG	4	GOAL: STAND while you email today	15	1:15 PM
		SE	5	SAY IT: I can STAND while I work!	0	2:00 PM
		OE	6	Can't concentrate? STAND to clear your mind!	45	3:45 PM
		SE	7	SAY IT: I know I will Stand at work	30	4:30 PM
		PG	8	GOAL: STAND when someone visits your desk	15	5:15 PM
DAY 2	AM	SE	9	SAY IT: It is MY choice to STAND and work	30	9:30 AM
		OE	10	Break away from sitting to clear your head – STAND	15	10:15 AM
		SE	11	SAY IT: I am STANDing more at work	0	11:00 AM
	PM	PG	12	GOAL: STAND when your phone rings	45	1:45 PM
		SE	13	SAY IT: I will STAND and work	45	2:45 PM
		OE	14	Engaged muscles = improved blood flow – STAND	15	3:15 PM
		SE	15	SAY IT: I WILL use my sit-stand workstation today	0	4:00 PM
		PG	16	GOAL: STAND when you transition between tasks	30	5:30 PM
DAY 3	AM	SE	17	SAY IT: I WILL balance my sitting time by STANDing	15	9:15 AM
		OE	18	Need energy - Take a STAND	45	10:45 AM
		SE	19	SAY IT: I WILL accomplish my goal to STAND and work	0	11:30 AM
	PM	PG	20	GOAL: STAND while reading	30	1:00 PM
		SE	21	Keep STANDing, look at how far you've come!	15	2:15 PM
		OE	22	STAND up - be good to yourself	0	3:00 PM
		SE	23	You've made it this far, don't stop now! STAND!	45	4:45 PM
		PG	24	GOAL: STAND while you problem solve	30	5:30 PM
DAY 4	AM	SE	25	Keep it up! Beat your sitting habit, STAND!	45	9:45 AM
		OE	26	Stop stressing about a deadline – STAND!	30	10:30 AM
		SE	27	You're making progress, keep STANDing while you work!	0	11:00 AM
	PM	PG	28	GOAL: STAND for the next 5-minutes	15	1:15 PM
		SE	29	Fight back against sitting, take a STAND now!	0	2:15 PM
		OE	30	Help yourself get a good night rest – STAND	15	3:00 PM
		SE	31	The choice is yours, sit or STAND!	30	4:30 PM
		PG	32	GOAL: STAND for the next 10-minutes	45	5:45 PM
DAY 5	AM	SE	33	Keep it going you're still STANDing	30	9:30 AM
		OE	34	Too much sitting = poor health outcomes, STAND!	15	10:15 AM
		SE	35	Don't let setbacks halt your progress, STAND!	45	11:45 AM
	PM	PG	36	GOAL: STAND for the next 15-minutes	0	1:00 PM
		SE	37	Continue your successes now by STANDing	15	2:15 PM
		OE	38	Reduce your risk for diabetes - STAND!	45	3:45 PM
		SE	39	You have CAN STAND and work	30	4:30 PM
		PG	40	GOAL: STAND for the next 30-minutes	0	5:00 PM

APPENDIX K:

IRB APPROVAL

ASU Knowledge Enterprise Development

APPROVAL: EXPEDITED REVIEW

Matthew Buman
SNHP: Exercise Science and Health Promotion
602/827-2289
Matthew.Buman@asu.edu

Dear Matthew Buman:

On 10/28/2017 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Feasibility of a theory-driven point-of-choice prompt intervention and a reminder prompt to reduce sedentary time if office workers with Sit-Stand workstations: A randomized crossover trial
Investigator:	Matthew Buman
IRB ID:	STUDY00007207
Category of review:	(4) Noninvasive procedures, (7)(a) Behavioral research
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Appendix A_Consent Form_Revised_10_26_17.pdf, Category: Consent Form; • Appendix C_Baseline Survey.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Appendix J_Sleep_Work Logs.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Appendix K_ActivPAL FAQs and Materials.pdf, Category: Participant materials (specific directions for them); • Appendix G_Sample Prompt List.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Appendix L_Exemplar ActivPAL Feedback.pdf,

	Category: Participant materials (specific directions for them); • Appendix I_Recruitment flyer.pdf, Category: Recruitment Materials; • Appendix E_Post_WASH_Survey.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Appendix B_Screening Form.pdf, Category: Recruitment Materials; • Appendix F_Post Intervention B (atheroetical) Survey.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Appendix D_Post Intervention A (Theory Driven) Survey.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Prompt Feasibility Study REVISED 10_26_2017_IRB_503a.docx, Category: IRB Protocol; • Appendix H_General Study Timeline and Prompt Instructions.pdf, Category: Participant materials (specific directions for them);

The IRB approved the protocol from 10/28/2017 to 10/27/2018 inclusive. Three weeks before 10/27/2018 you are to submit a completed Continuing Review application and required attachments to request continuing approval or closure.

If continuing review approval is not granted before the expiration date of 10/27/2018 approval of this protocol expires on that date. When consent is appropriate, you must use final, watermarked versions available under the "Documents" tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Miranda Larouche
Sarah MULLANE
Robin Faulkner
Kristina Hasanaj
Matthew Buman

Meynard John Toledo
Miranda Larouche