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Factors Associated with Standing Desk Use in the Workplace: Implications for Workplace Health Promotion Programs and Interventions

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Abstract

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Keywords

adults, workplace, sedentary behavior, standing desk

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Abstract

The purpose of this study was to explore what sociodemographic, psychosocial, and behavioral factors were associated with standing desk use in the workplace among full-time non-instructional staff at a large, public university in the south-central United States. Data were collected using an online survey in Spring 2019 that contained items to assess sociodemographic variables, psychosocial factors, physical activity, and standing desk use. Participants (n = 381) were predominantly female (79.1%), white (91.7%), and 23.9% used a standing desk. In the binary logistic regression model, sedentary behavior awareness (OR = 1.11; 95% CI:1.04,1.18), self-efficacy (OR = 1.06; 95%CI:1.03,1.10), and salaried staff classification (OR = 1.99; 95%CI:1.19,3.34) were significantly associated with standing desk use (R^2 = 0.16; p < .001). Findings from this study not only identify important psychosocial factors that may be targeted in future standing desk-based interventions but also highlight specific subgroups of employees that should be targeted in intervention recruitment.

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Introduction

Increased time spent in sedentary behavior (SB) is a significant health concern for working adults. SB is defined as any activity involving sitting, reclining, or lying, and resulting in low energy expenditure (≤ 1.5 metabolic equivalents [METs]; Owen et al., 2011; Pronk, 2021). SB is associated with increased risk for cardiovascular disease, diabetes, hypertension, and all-cause mortality (Patterson et al., 2018; Stamatakis et al., 2019). Previous research has identified factors associated with increased workplace SB, including social norms related to sitting, positive attitudes towards SB, and SB habits; whereas factors associated with decreased SB include self-efficacy to reduce SB during the workday and perceived advantages of reducing SB (Prapavessis et al., 2015; Rhodes & Dean, 2009; Umstattd Meyer et al., 2016; Walsh et al., 2018; Wilkerson et al., 2018). Standing desks are a common intervention modality used to reduce SB in workplace interventions and have successfully decreased sitting duration between 15 and 89 minutes per workday (Chu et al., 2016; Shrestha et al., 2018).

Although successful at changing behavior, most workplace SB interventions lack a theoretical underpinning, and there have been calls for increased use of health behavior theory to inform workplace SB intervention development (Hutcheson et al., 2018). The most common theoretical framework used in previous standing desk-based interventions is

social cognitive theory (SCT; Bandura, 2004). SCT posits that an individual's cognitive perceptions, environment, and health behaviors influence one another in a reciprocal manner, which ultimately influences the regulation of health behavior (Bandura, 2004). SCT aligns with the multi-component approach to SB intervention development, where environmental strategies (i.e., providing standing desks) are combined with educational/behavioral strategies (i.e., awareness, motivation) to change SB (Chu et al., 2016). In intervention development, health behavior theoretical constructs are aligned with educational/behavioral strategies to encourage and support continued behavior change. The use of educational/behavioral strategies may increase the effectiveness of environmental changes, such as the introduction of standing desks leading to greater increases in SB change (Chu et al., 2016).

Due to the documented efficacy of standing desk-based interventions and use of these devices in the workplace setting, it is important to understand factors associated with standing desk use to help inform the development of and recruitment efforts for future workplace interventions (Chu et al., 2016; Shrestha et al., 2018). Compared to antecedents of SB, less is known about factors associated with standing desk use in the workplace setting. Additional research assessing characteristics of individuals who are already using standing desks will help inform the development of future workplace health intervention programming and identify potential employee subgroups to target in recruitment (Wallmann-Sperlich et al., 2017). Additionally, the identification of specific psychosocial factors associated with standing desk use may inform the selection and identification of potential theoretical frameworks to inform future research. Therefore, the purpose of our study was to determine what sociodemographic, behavioral, and psychosocial factors were associated with standing desk use among a sample of university employees.

Methods

Design and Sample

Findings presented in this report are part of a larger study exploring sedentary behavior in the workplace setting. Data were collected in Spring 2019 through the administration of a 57-item online survey using Qualtrics^{TM}. Participants were full-time staff (i.e., non-instructional employees) working desk-based jobs (i.e., $\geq$ 4 hours of sitting/day) at a large, public university in the south-central United States. The university where data were collected had previously implemented a wellness program initiative to provide height-adjustable standing desks at no cost to all interested employees who completed an online application through the wellness program. The program was ongoing at the time of data collection.

Participants were recruited to participate via an email sent to all full-time staff (i.e., 3,664 staff were employed in Fall 2018; University of Oklahoma, 2019) and online postings on the university's wellness portal. Employees were offered 300 "wellness points" as an incentive for participation. The first page of the survey contained important study information and details about the informed consent process. Participants were informed that clicking "next" and completing the survey documented their informed consent for participation. All study procedures were approved by the University of Oklahoma Institutional Review Board (Protocol #9220).

Measures

A subset of items from the larger 57-item survey were selected for the present analysis.

Demographic factors included age, race/ethnicity, gender identity, education level, and job category (i.e., hourly staff, salaried staff). Participants self-reported standing desk use (i.e., "Do you currently use a standing desk at work?"), length of standing desk ownership (i.e., months and years of ownership), and typical use of the standing desk (i.e., minutes used on a typical workday). Physical activity (PA) was assessed using the International Physical Activity Questionnaire (IPAQ; Craig et al., 2003). Participants self-reported the number of days and average time spent each day in vigorous/moderate PA and walking in the last week. Total MET-minutes/week for each activity were calculated using IPAQ scoring guidelines (Craig et al., 2003) to categorize participants into PA groups: low (i.e., did not meet moderate or high criteria), moderate (i.e., ≥ 3 days of vigorous PA for ≥ 20 minutes OR ≥ 5 days of moderate PA or walking for ≥ 30 minutes OR ≥ 600 total MET-minutes/week), and high (i.e., ≥ 3 days of vigorous PA AND accumulating ≥ 1,500 MET-minutes OR 7 days of any PA AND accumulating 3,000 total MET-minutes/week).

Psychosocial factors were assessed using previously validated scales in the SB and PA literature. Self-efficacy to reduce SB was assessed using a modified version of the 8-item Self-efficacy for Exercise Scale used in a previous workplace SB study (De Cocker et al., 2017), where items were rated on a 5-point Likert scale (1 = "not at all confident"; 5 = "very confident"). An example item from the scale states, "How confident are you that you could reduce your sitting time each workday if you felt tired?" SB awareness (i.e., the awareness of risks associated with SB and the importance to reduce SB during the workday) was measured using an 8-item scale adapted from a previous workplace SB study (Hadgraft et al., 2016). Items were measured using a 5-point Likert scale (1 = "strongly disagree"; 5 = "strongly agree"), and an example item from the scale states, "Sitting for most of the time at work is bad for my health." Workplace social norms concerning reducing SB and standing at work were assessed with an 8-item scale used in a previous study (Hadgraft et al., 2016). Items were measured using a 5-point Likert scale (1 = "strongly disagree"; 5 = "strongly agree"). An example item from the scale states, "My workplace is committed to supporting staff choices to stand or move more at work." Total scores for the self-efficacy, SB awareness, and workplace social norms scales were calculated by summing responses to all items in the scale. Total scores for each scale ranged from 5 to 40, where higher scores indicated higher self-efficacy, higher SB awareness, and positive workplace social norms around standing at work. All scales demonstrated sufficient internal consistency reliability (Cronbach's alpha ≥ .70) in the present study.

Analysis

Data were analyzed using SPSS Version 27. Descriptive statistics were calculated for each variable. Participants with large amounts of missing data were removed from the analytical sample. Listwise deletion was used for subsequent missing data. Chi-square analyses and independent samples *t*-tests were used to describe the bivariable relationship between demographic, psycho-social, and behavioral factors and standing desk use. A binary logistic regression model was created to explore the multivariable relationship between sociodemographic, behavioral, and psychosocial factors and standing desk use (1 = yes; 0 = no), while controlling for covariates (e.g., gender, age, race). The final regression model was assessed to determine all assumptions were met.

Results

A total of 381 employees (10.4% response rate) completed the survey. Participants (n = 381; Table 1) were predominantly white (n = 350; 91.9%), female (n = 307; 80.6%), and had a bachelor's degree or higher (n = 305; 80%). There was equal distribution between hourly (n = 195; 51.2%) and salaried staff (n = 186; 48.8%) in the sample. Mean age was 42.65 (SD = 11.29) years. Half (n = 194; 50.9%) of participants were classified as moderately physically active. About one-fourth (n = 89; 23%) of participants had a standing desk. Among those who reported using a standing desk, mean length of ownership was 1.70 (SD = 1.20) years, and mean time spent using the standing desk on a typical workday was 1.93 (SD = 1.65) hours.

Bivariable analyses (Table 2) showed that salaried staff (χ^2[1, n = 381) = 5.353, p = .021) and highly physically active individuals (χ^2[2, n = 381) = 8.609, p = .014) were significantly more likely to use a standing desk. Employees with a standing desk also demonstrated significantly higher awareness (M = 33.40 vs. M = 31.79) about SB (t[373] = 3.103, p = .002), self-efficacy (M = 25.88 vs. M = 20.93) for reducing SB (t[376] = 4.934, p < .001), and workplace social norms (M = 32.13 vs. M = 30.82) for standing at work (t[378] = 2.518, p = .013). There were no significant bivariable relationships between age, race, education level, or gender and standing desk use, p < .05. In the binary logistic regression model, (Nagelkerke R^2 = .165; p < .001), SB awareness (OR = 1.10; 95%CI:1.03,1.18), self-efficacy to reduce SB (OR = 1.06; 95%CI:1.03,1.10), and salaried staff job classification (OR = 2.03; 95%CI:1.21,3.42) were significantly associated with standing desk use.

Discussion

The purpose of this study was to determine the sociodemographic, behavioral, and psychosocial factors associated with standing desk use among a sample of university employees. Among the demographic factors analyzed in the present study, only salaried staff job classification was significantly associated with standing desk use in both bivariable and multivariable analyses. Salaried staff (i.e., administrative and professional employees) were more likely to report standing desk usage than hourly staff (i.e., administrative support employees). Differences in standing desk use between salaried and hourly staff may be related to autonomy in workplace decisions as well as barriers surrounding procurement of a standing desk. Qualitative research about standing desk use has shown that institutional barriers around access, cost, and workplace culture may be important barriers to standing desk procurement for university employees (Wilkerson et al., 2019). Future workplace health programs and interventions should consider which employee subgroups are benefitting from the provision of standing desks and include efforts to recruit employees from all ranks and positions.

We also found significant associations between several psychosocial variables (i.e., self-efficacy, SB awareness, and social norms) and standing desk use. From an intervention perspective, these psychosocial factors may emphasize important behavioral and psychosocial beliefs to understand and address when developing and testing standing desk-based interventions. Multicomponent interventions combining environmental change (i.e., standing desks) with behavioral approaches have been shown to successfully reduce SB (Chu et al., 2016;

Table 1

Demographic Characteristics of the Sample and Results of the Bivariable Analyses

	Total Sample (*n* = 381)		**Standing Desk Users (*n* = 89)**		**Standing Desk Nonusers (*n* = 292)**		
Characteristic	***n* (%)**	**M (SD)**	***n* (%)**	**M (SD)**	***n* (%)**	**M (SD)**	***p*-value**
Age (years)	-	42.65 (11.29)	-	43.45 (11.15)	-	42.41 (11.34)	.982
SB Awareness	-	32.17 (4.29)	-	33.39 (3.86)	-	31.79 (4.35)	.002*
SB Self-efficacy	-	22.10 (8.53)	-	25.88 (8.50)	-	20.93 (8.20)	< .001*
SB Social Norms	-	31.13 (4.86)	-	32.13 (4.05)	-	30.82 (5.04)	.013*
Job Category							
Hourly Staff	194 (51.2)	-	36 (40.4)	-	159 (54.5)	-	.021*
Salaried Staff	186 (48.8)	-	53 (59.6)	-	133 (45.5)	-	
Gender Identity							
Female	307 (80.6)	-	73 (82.0)	-	234 (80.1)	-	.736
Male	73 (19.2)	-	16 (18.0)	-	57 (19.5)	-	
Racial Identity							
White	350 (91.9)	-	82 (92.1)	-	268 (91.8)	-	.915
Other	42 (11.0)	-	7 (7.9)	-	24 (8.2)	-	
Education Level							
Less than college	75 (19.7)	-	14 (15.7)	-	61 (20.9)	-	.232
Bachelor's Degree	150 (39.4)	-	32 (36)	-	118 (40.4)	-	
Graduate Degree	155 (40.0)	-	43 (48.3)	-	112 (38.4)	-	
Physical Activity Category							
Low	89 (23.4)	-	12 (13.5)	-	77 (26.4)	-	.014*
Moderate	194 (50.9)	-	46 (51.7)	-	148 (50.7)	-	
High	98 (25.7)	-	31 (34.8)	-	67 (22.9)	-	

Note. Frequencies represent the valid percent. Participants were not required to answer all survey items. Some participants selected to not report demographic characteristic(s). For physical activity category, low: did not meet moderate or high criteria, moderate: ≥ 3 days of vigorous PA for ≥ 20 minutes OR ≥ 5 days of moderate PA or walking for ≥ 30 minutes OR ≥ 600 total MET-minutes/week, and high: ≥ 3 days of vigorous PA AND accumulating ≥ 1,500 MET-minutes OR 7 days of any activity AND accumulating 3,000 total MET-minutes/week. *$p < .05$

Table 2

Results of the Binary Logistic Regression Model Predicting Standing Desk Ownership (n = 371)

Variable	B	SE	*p*-value	OR	95% CI
Age	.001	.012	.957	1.00	0.97, 1.02
SB Awareness	.097	.035	.005**	1.10	1.03, 1.18
Workplace Social Norms	.014	.029	.617	1.02	0.96, 1.07
Self-efficacy	.062	.017	< .001**	1.06	1.03, 1.10
Job Category*	-	-	-	-	-
Salaried Staff	.710	.266	.008**	2.03	1.21, 3.42
Physical Activity Level±	-	-	-	-	-
Moderate	.589	.372	.114	1.80	0.87, 3.74
High	.791	.407	.052	2.21	0.99, 4.90
Gender^	-	-	-	-	-
Female	.376	.346	.277	1.46	0.74. 2.87
Race§	-	-	-	-	-
White	.202	.481	.674	1.22	0.48, 3.14

Note. Of the 381 observations read, 371 were included in the logistic regression analysis; Outcome assessed was standing desk use (1 = yes, 0 = no); *Referent group = hourly staff; ±Referent group = low physical activity level; ^Referent group = male; §Referent group = other race. * *$p < .05$.

Gardner et al., 2016). The findings from our study further support the need to consider multi-component approaches, including educational/behavioral approaches aligned with health behavior theoretical constructs (i.e., self-efficacy, social norms, awareness), when developing workplace interventions. Theoretical constructs should be used to inform the development of educational/ behavioral intervention strategies to support standing desk use, including the provision of information about the consequences of SB in the workplace, goal setting, behavioral self-monitoring, use of prompts/cues for behavior change, and modifications to the workplace social environment (Chu et al., 2016).

Notably, we found a significant bivariable association between high PA level and using a standing desk, where 31.7% of employees with high PA used a standing desk, compared to 23.7% and 13.5% with moderate and low PA, respectively. Recent epidemiological evidence suggests a dose-response relationship between sitting time and mortality, where adults who sit the most and are the least active have the highest mortality risk (Ekelund et al., 2019; Stamatakis et al., 2019). Thus, targeting adults with low PA and high SB should be a priority in workplace SB interventions. Future research should continue to explore the associations between standing desk use and PA level and design

interventions to enhance the use of standing desks in workplace settings. Additional research is also needed to explore the association between standing desk use and PA level to determine the direction of causality between the two variables to better inform future intervention development.

The present study is not without limitations. The study used a cross-sectional design, restricting any interpretations of causation or temporality among the variables. Data from this study were self-reported, leading to potential for social desirability and recall bias. The participants were employees from one large, public university in the south-central United States and were relatively homogenous with respect to racial and gender identity. However, the demographics of the eligible population for inclusion (i.e., non-instructional staff in sedentary occupations), mirror the sample attained for this study, where during the time data were collected the eligible population was predominantly female and white (61% and 77%, respectively; The University of Oklahoma, 2019). The sample characteristics and low response rate (10.4%) still limit the generalizability of the findings to other groups of employees, and warrant recruitment of representative and diverse samples in future studies. A further limitation may be imposed by the sampling strategy used for the present study. Participants were recruited from an email distribution by the wellness organization on campus, resulting in potential self-selection bias due to interest in the study topic. Future research should aim to recruit random, representative samples to overcome this potential source of sampling bias. Lastly, considering the university wellness program previously implemented an initiative to provide employees with standing desks, recently hired employees may not have had an opportunity to acquire a standing desk through this program. This may have impacted uptake of standing desk ownership among newly hired employees compared to those that were employed at the university when the program was implemented.

Implications for Health Behavior Theory

In addition to job category and physical activity level, the present study found associations between several psychosocial variables (i.e., self-efficacy, social norms, SB awareness) and standing desk use in the workplace. Most notably, a bivariable and multivariable relationship was found between self-efficacy and standing desk use. Self-efficacy is an important antecedent to health behavior change and is foundational in many health behavior theoretical frameworks, most notably, social cognitive theory (SCT). In addition to self-efficacy, the environment is another important determinant of health behavior change in SCT (Bandura, 2004). Environmental factors, including social factors (e.g., co-worker support, workplace culture, social norms) and physical factors (e.g., workplace environment, availability of resources), should also be considered when viewing standing desk use through a multi-component perspective, such as through the lens of SCT.

To date, most standing desk-based interventions lack the inclusion of a theoretical framework, but among the interventions that utilize health behavior theory, SCT is the most common framework (Hutcheson et al., 2018). The findings from this study suggest that theoretical constructs and frameworks may help explain factors associated with standing desk use. Future studies should utilize health behavior theoretical frameworks to further explore standing desk use among working adults, as there is a need for application of theory to better understand standing desk use to develop and test theory-based interventions in workplace SB research (Gardner et al., 2016; Hutcheson et al., 2018) and the field of

health behavior change (Willmott & Rundle-Thiele, 2021). To better determine additional factors associated with standing desk use, we suggest future studies aim to conduct similar analyses to explore factors associated with standing desk use in representative, diverse samples across a variety of workplaces. Additionally, researchers should consider the utility of theoretical frameworks to determine factors associated with standing desk use in the workplace setting and to better inform the development of future interventions.

Discussion Questions

1. How are psychosocial, work-related, and behavioral factors associated with standing desk use among employees in desk-based jobs?
2. How can psychosocial, work-related, and behavioral factors be addressed in future standing desk-based interventions implemented in the workplace?

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