RELATIONSHIP BETWEEN PATTERNS AND AMOUNT OF OCCUPATIONAL SITTING ON METABOLIC RISK FACTORS

INDEPENDENT OF LEISURE TIME PHYSICAL ACTIVITY

Erin Buck, Megan Dobbertin, Carrie Rosenthal & Eric Stadtmueller | Department of Kinesiology
Faculty Mentors: Saori I. Braun, PhD & Marquell J. Johnson, PhD

University of Wisconsin Eau Claire

ABSTRACT

Our research study aims to discover if there is a relationship between occupational sedentary behavior and metabolic risk factors despite varying amounts of leisure-time physical activity among low-intensity professions. Current research on sedentary behavior has focused on total sedentary time among US adults, which is beneficial in establishing relationships between metabolic syndrome and sedentary jobs. However, Kim et al. (2015) suggests further research is needed to describe the patterns and duration of sedentary bouts.

Data was collected in Fall 2017 and included 13 office workers between the ages of 35-58 years old. The office workers wore two different accelerometers, the ActivPal and Actical, to measure their physical activity levels over the course of 7 consecutive days. Participants underwent a biometric screening that measured height, weight, blood pressure, waist circumference, cholesterol levels, triglycerides, and fasting blood glucose following physical activity monitoring. Data will be analyzed to determine a relationship between physical activity levels and metabolic risk factors among office workers.

INTRODUCTION

The Sedentary Behaviour Research Network (SBRN) defines sedentary behavior as "any waking behavior characterized by an energy expenditure of ≤ 1.5 metabolic equivalents (METs), while in a sitting, reclining, or lying posture" (SBRN, 2017). Too much sitting has been shown to have negative health consequences, such as metabolic syndrome. As per Mayo Clinic, metabolic syndrome is diagnosed by measuring five different variables: waist circumference, triglyceride level, high-density lipoprotein cholesterol, blood pressure, and fasting blood glucose (2018). If an individual surpasses at least three out of five of the cutoffs that have been determined for these variables, they can be diagnosed with metabolic syndrome (Mayo Clinic, 2018). In the last 50 years, according to U.S. census data from the years 1950 to 2000, the number of individuals employed in low-intensity occupations has nearly doubled, from 23.3% to 42.6% (Kirk and Rhodes, 2011).

HYPOTHESIS

We anticipate seeing a positive relationship between occupational sedentary time and increased prevalence of metabolic risk factors. We believe that leisure-time physical activity will not compensate for high amounts of occupational sedentary activity enough to reduce metabolic risk factors.

METHODS

DATA COLLECTION

- 13 participants between the ages of 35-58 were recruited from Mayo Clinic health systems in Eau Claire via email.
- To be included in the study, participants had to have jobs that required them to be seated for at least 50% of their work hours per day.
- Participants were excluded if they were taking medications to control cholesterol or blood pressure.
- Accelerometers were used to provide objective measures of physical activity throughout the day. Participants wore three accelerometers: one ActivPal and two Actical devices.

INSTRUMENTATION

ActivPal

- ActivPals are small, flat devices that are worn at the top middle of the non-dominant thigh. ActivPals classify posture by measuring its angle of tilt to determine if one is sitting/laying down, standing, or walking (PAL Technologies, Glasgow, Scotland).

Actical

- Acticals are small, square, flat devices that can be attached to a variety of straps and worn at many different body locations. Acticals function by tracking human movement using an omnidirectional sensor in set 15 second time increments (epoch). The data points, called activity counts, are then classified into the intensity categories of sedentary, light, moderate, or vigorous (Mini Mitter, Sunriver, OR).

ActivPal

Actical (hip)

Actical (wrist)

Table 1: Participant Demographics and DXA Values

	Total (n = 13)		Female (n = 10)		Male (n = 3)	
	Mean	SD	Mean	SD	Mean	SD
Age	47.38	9.02	49.3	8.77	41	7.94
Height (cm)	170.31	170.31	167.1	5.65	181	11.27
Weight (kg)	80.23	27.79	80.9	31.83	78	8.19
BMI (kg/m²)	27.88	10.02	29.11	11.22	23.8	2.17
% Body Fat	34.93	10.48	38.08	9.63	24.47	3.61
Body BMD	1.17	0.11	1.15	0.12	1.26	0.09
Body T-Score	0.67	1.07	0.71	1.17	0.57	0.93
Body Z-Score	0.81	0.91	0.89	1.01	0.6	0.61

Note: SD = Standard Deviation, BMI = Body Mass Index, BMD = Bone Mineral Density

Table 2: Metabolic Risk Factors

	Total (n = 13)		Female (n = 10)		Male (n = 3)	
	Mean	SD	Mean	SD	Mean	SD
Waist (cm)	83.61	18.66	84.1	21.46	82	3.61
SBP (mmHg)	121.07	10.91	123	11.71	114.67	4.16
DBP (mmHg)	77.23	10.53	78.6	11.74	72.67	2.31
TGL (mg/dL)	107.53	73.05	119.1	79.85	69	20.78
LDL (mg/dL)	93.15	25.81	91.1	29.01	100	10.82
HDL (mg/dL)	67.76	15.13	66.9	15.15	70.67	18.01
FBG (mg/dL)	97.76	16.32	100.1	17.9	90	6.24

Note: SD = Standard Deviation, SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, TGL = Triglyceride, LDL = Low Density Lipoprotein, HDL = High Density Lipoprotein, FBG = Fasting Blood Glucose

DATA ANALYSIS

- At the end of the data collection period, participants were brought in for a metabolic risk factor screening session and a bone mineral assessment. Bone mineral density scores are presented in Table 1, and metabolic risk factor screening results are presented in Table 2.
- Multiple regression analyses will be performed to evaluate the relationship between activity intensity and metabolic risk factors as well as between postural changes and metabolic risk factors in both occupational and leisure-time settings.
- Paired sample *t*-tests will be conducted to determine the difference in means of physical activity intensities during occupational and leisure-time. If the results of the *t*-tests are deemed significant, Tukey post-hoc tests will be conducted as well.
- Significance will be set at $p < 0.05$
- Means and standard deviations will be provided for time spent in different activity categories, metabolic risk factors, and number of steps.

SIGNIFICANCE

This research may raise awareness of how prevalent sedentary behavior has become in the workplace and how this trend is associated with negative health risks. These results will hopefully lead to companies changing their values to promote a healthier office environment. In addition to creating a healthier lifestyle for their employees, workplaces would be able to reduce total spending on health costs. Hopefully, this will influence a societal shift involving the importance of physical activity.

FUTURE IMPLICATIONS

- Creating a standardized Log Sheet format and protocol for data collection would improve the quality of data being collected
- Further research is also needed to separate the effects of occupational physical activity levels and leisure-time physical activity levels
- This research will allow researchers to educate the general public about the health consequences of sedentary occupations

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