Impact of Standing Desk Intervention on Sedentary Behavior of 4th Grade Students

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Abstract

The object of this study was to investigate sedentary behavior of students with standing desks vs students with traditional desks. The null hypothesis stated that no statistical difference would be found in sedentary behaviors between students with traditional desks and those with standing desks. Thirteen students were recruited for the study. Research took place at a small private elementary school in the Midwest. During the assessment, students wore accelerometers for a school week at the beginning of intervention and for another school week at the end of the semester. Data was collected through ActivPAL software through the accelerometers. Analyses were completed using two-tailed independent *t*-tests. The accelerometer data, collected showed very few statistically significant data points. The total number of sedentary bouts per week and day, as well as the total and average sedentary breaks were the few data points that were significant.

Introduction

Past research has linked sedentary behavior with health outcomes due to the resulting lack of physical activity in sedentary individuals. The negative effects from sedentary behavior include metabolic dysfunction, which is characterized by increased plasma triglyceride levels, decreased levels of high-density lipoprotein (HDL) cholesterol and decreased insulin sensitivity. Another deleterious effect resulting from extensive sedentary behavior include decreased bone mass, hyperemia, and increased blood pressure.[1] Coupled with sedentary behavior, adolescents increase their individual health risk of cardiovascular disease, obesity, diabetes, and more by not participating in the recommended time of moderate to vigorous physical activity (MVPA).[2] Other studies have implemented standing desks in a study and the results showed that time spent sitting was decreased and standing time increases both inside and outside of school.[4] Low levels of physical activity relate to greater body mass, higher proportions of overweight/obesity than those with higher levels of physical activity. [5] Implementing standing desks affects physical activity

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Methods

Setting

- Small Midwestern Private Elementary School
- Academic School Year (2019-2020)

Participants

- 13 4th Grade Students (Male=5; Female =8)

Procedures

- Gaining permission from principals, teachers, and parents
- Obtaining informed consent for participants
- Measuring baseline biometric data on participants and performing a PACER test
- Splitting the students into four groups, two groups participating each quarter of the school year at either standing or traditional desks and obtaining accelerometer data at the beginning and end of each session
- Remeasuring biometric data on participants and performing a PACER test.
- This procedure was repeated each quarter to obtain data on each group at each desk.
- A *t*-test, means and standard deviations were used to report results

Figure 1
Students participating at standing desk interventions

References

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Results

Table 1.	Student Demographics									
	# of participants	# of males	# of females	Average age in years	Mean height prior to intervention	Mean height after the intervention	Mean weight prior to intervention	Mean weight after the intervention	Mean BMI prior to intervention	Mean BMI after the intervention
Subjects	13	5	8	9.08	140.429	139.843	36.71	37.564	18.339	18.968

Table 1 includes student demographics including the pre- and post- height, weight and BMI of the participants. The accelerometer data collected showed very few statistically significant data points. The total number of sedentary bouts per week and day, as well as the total and average sedentary breaks were the few data points that were significant. This data is represented in Table 2.

TABLE 2. Results of t-test, mean, and standard deviation					
	t-test	mean sit	SD sit	mean stand	SD stand
total time in sed bouts/week (wk)	0.489	380.667	147.412	251.467	254.821
total # sed bouts/wk	0.037	35.333	8.145	17.686	5.686
total # sed bouts/day (d)	0.037	7.067	1.629	3.533	1.137
total sed breaks for 5 days	0.028	47	2	39	3.606
avg sed breaks/day	0.028	9.4	0.4	7.8	0.7211
total sed (5 days)	0.433	1364.667	193.095	1463.72	40.12
avg daily sed	0.433	272.933	38.619	292.747	8.024
total light min/wk	0.258	648.333	170.653	102.11	60.175
avg light/d	0.258	129.667	34.131	102.11	12.031
total mod wk	0.494	61.833	26.269	74.387	12.111
avg mod/d	0.956	12.367	5.254	12.613	5.089
total vig/wk	0.277	25.167	8.251	51.333	35.098
avg vig/d	0.277	5.033	1.651	10.267	7.023
total MVPA/wk	0.275	87	24.295	125.723	47.153
avg MVPA/d	0.275	17.4	4.859	25.145	9.431

Discussion & Conclusions

This study provides data on sedentary behavior from accelerometers worn by the students at standing desks and traditional desks. The data from this study provided results showing that some sedentary behavior would be affected, such as total number of sedentary bouts per week and per day, as well as total sedentary breaks and average sedentary breaks. However, no significant difference occurred in total time in sedentary behavior weekly, and time in physical activity (light, moderate and vigorous). This leads current researchers to conclude that recommendations can be given to address the lack of change that occurs in sedentary behavior between students at standing desks and students at traditional desks.