Comparing the Physical, Cognitive and Work Performance Effects of Using an Active Sitting Desk versus a Standard Desk

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Background

- Prolonged muscular inactivity has been identified as a cause of sedentary induced health ramifications (Hamilton et al, 2007).
- LifeBalance Station is an active elliptical desk that allows for light-moderate ntensity activity while completing sedentary work tasks.
- No studies have tested the effect of LifeBalance Station on measures of physical, cognitive or work performance.

Purpose

To compare acute physical, cognitive and work performance effects of completing sedentary work tasks while: 1) pedaling on LifeBalance Station at a light intensity; vs. 2) sitting at a standard desk/chair.

Methods

- 18 adults (43.4±11.6 yrs; 94% female, BMI = 28.8±5.5 kg/m^2) working in full-time, sedentary jobs completed sedentary computer tasks (typing, mousing) while: 1) sitting at a desk/chair; and 2) pedaling on LifeBalance Station at a light intensity (40 rpm which equates to 1.7±0.4 METs).
- Energy expenditure (indirect calorimetry), muscle activity (electromyography), heart rate and blood pressure were collected after 8 minutes of each condition to ensure steady state had been achieved.
- Cognitive function and work productivity were collected during each condition using 3 cognitive tests of learning, memory and attention (CogState Research) and 2 work productivity simulation tests of mousing and typing ability (Compass Software).
- Paired t-tests and effect sizes (Cohen's *d*) were calculated to compare desk/chair and LifeBalance pedaling conditions.

Table 1. Participant characteristics.

	Mean+ SD
Age (years)	43.4 ± 11.6
Body Mass Index (kg/m^2)	28.8 ± 5.5
Resting Heart Rate (bpm)	75 ± 12
Resting SBP (mmHg)	109 ± 11
Resting DBP (mmHg)	75 ± 8
Female (%)	94.4
White (%)	83.3
Black (%)	11.1
Other (%)	5.5
Hours worked /week	43.1 ± 4.2
Hours sitting at work /week	36.2 ± 6.7

Results

- Completing work tasks during light intensity pedaling on LifeBalance Station resulted in significant increases in heart rate, systolic BP, energy expenditure and activation of the biceps femoris and vastus lateralis leg muscles compared to the desk/chair condition.
- No group differences were observed for activation of the multifidus back muscle.
- No differences were observed for cognitive measures of learning, memory or attention.
- No group differences were observed for simulated work performance task measures of typing speed, typing errors or mouse drag time.
- Mouse aim time performance was better while completing work tasks in the standard desk/chair compared to pedaling on LifeBalance Station.

Figure 1. LifeBalance Station.

Figure 2. Energy expenditure comparison.

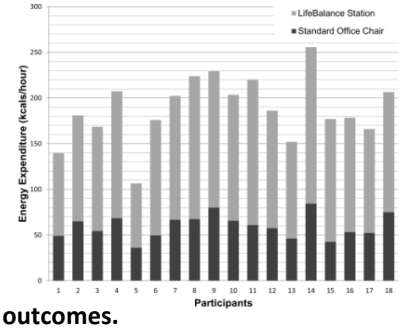

Table 2. Comparison of physiological outcomes.

	Desk/Chair	LifeBalance	Effect Size (d)
Heart Rate (bpm)	75±12	89±11	1.26*
Systolic BP (mmHg)	109±11	122±20	0.79*
Diastolic BP (mmHg)	75±8	74±11	0.11
Energy Expenditure (kcals/hr)	59.6±13.0	128.1±24.4	3.49*
VO_2 (ml/kg/min)	2.7±0.7	5.8±1.5	2.75*
METs	0.8±0.2	1.7±0.4	2.76*
Biceps Femoris (mV)	0. 44±0.12	0.76±0.31	1.36*
Vastus Lateralis (mV)	0.41±0.09	1.02±0.45	1.88*
Multifidus (mV)	1.13±1.25	1.13±1.16	0.01

Table 3. Comparison of cognitive and work performance outcomes.

	Desk/Chair	LifeBalance	Effect Size (d)
1 Card Learning (arcsine %)	0.97±0.07	0.98±0.08	0.10
2 Cards Back Memory (arcsine %)	1.20±0.13	1.24±0.10	0.34
ID Task Attention (log10 ms)	2.70±0.06	2.71±0.06	0.08
Mouse Aim Time (sec)	1.22±0.13	1.35±0.29	0.59*
Mouse Drag Time (sec)	2.20±0.40	2.33±0.8	0.34
Typing Speed (words/min)	45.41±12.43	44.85±12.22	-0.05
Typing Errors (%)	3.69±3.55	3.41±2.76	-0.09

Conclusions

- These findings suggest pedaling at a light intensity on active sitting devices like LifeBalance Station results in meaningful increases in physiological processes thought to short circuit sedentary-induced chronic disease mechanisms
- Minimal detriments to cognitive function and/or work performance were observed warranting intervention studies of active sitting desks in real world environments.

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