

# SIT-STAND STUDY

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## BIOMETRIC & ERGONOMIC STUDY CONFIRMS BENEFITS OF ADJUSTABLE SIT-STAND WORKCENTERS



Workrite Ergonomics, in partnership with Fujitsu Laboratories of America, Inc. (FLA) and Sony Picture Entertainment (SPE), finds positive benefits from a workplace ergonomics and office equipment study designed to measure the health benefits and workplace effects when introducing adjustable height sit stand work surfaces into a typical corporate office environment.

Joy Boese, President of E3 Consulting, conceptualized the study and brought the three companies together to collaborate on the initiative. Joy recognized the potential of using FLA's monitoring capabilities as a way to measure stress and fatigue in the workplace with the ultimate goal of using the data collected to educate employees, reduce injury and improve performance.

Conducted in one of SPE Los Angeles facilities, volunteer participants consisted of members of the SPE finance and information services groups. Managing the monitoring and biometric measures was Fujitsu Laboratories of America, responsible for the independent capture, aggregation, and analysis of all collected data and the reporting of results. E3 Consulting took on the role of project management and also had staff members on site to provide support for the study participants. Workrite Ergonomics provided the height adjustable work centers and flat panel monitor supports and coordinated the installation and set-up of the ergonomic equipment used in the study.

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## NEW TECHNOLOGY = BIG DATA + BIG RESULTS

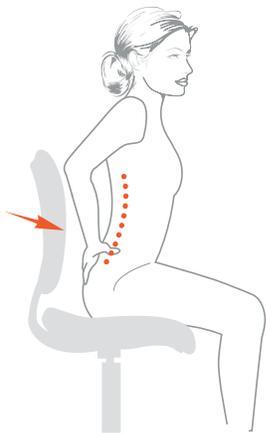
During the study, volunteers were outfitted with a real-time wearable cardiac monitoring device designed to continuously capture various human biometrics, including ECG, heart rate and skin temperature. The adjustable height sit stand work surfaces were outfitted with Android devices, which served two purposes. First, they acted as sensors for surface height, movement and engagement, by continuously collecting accelerometer data and images of a specially placed sticker on the feet of the desk. Second, they hosted Fujitsu's mobile real-time data aggregation and analysis platform — the Sprout™ (<http://www.fujitsu.com/us/about/other/fla/research/data-driven-healthcare/index.html>). The Sprout provided real-time data storage, analysis, and visualization of all the biometric and desk-related data streams. In all, over 287 GB of electronic data was captured over the test period. Participants were also manually assessed by a medical team at the beginning and end of the study, including capturing key metabolic biomarkers.

### KEY METABOLIC BIOMARKER TRACKING CONFIRMS HEALTH BENEFITS

During the 4-week test period, over 40 biomarker changes were analyzed and tracked. The per participant average changes included:

- An increase in good cholesterol (HDL) of 3.65
- An increase in fasting glucose of 2.28
- A reduction in fat as measured by Body Mass Index (BMI) of .86 lb.
- A reduction in weight of .81 lb.
- An decrease in average blood pressure of 2.28/1.20
- Age and BMI were not distinguishing factors in the amount of standing desk usage

### AVERAGE TWICE DAILY HEIGHT ADJUSTMENT HELPS WORKER SATISFACTION



The work surface tracking involved monitoring time spent sitting /standing and when participants were absent from their desks. On average, the mean standing percentage was 36%, with a high of 91% and low of less than 5%. Data revealed workers adjusted the height of their work surface on average two times per day, most often once in the morning and once in the afternoon. Workers stated they most enjoyed the freedom to make adjustments when they wanted to or needed to help relieve fatigue or better meet the work task at hand. On average, the heaviest standing occurred between the hours of 9-10 am, coinciding with the early part of most participants' workdays, and the next heaviest standing period peaked around 3-4 pm. The data also revealed age was not a factor in desk usage - everybody in the study used the desks to stand: men and

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*Having the ability to change work state during the day is broadly empowering*

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women, those with low and high body mass index, young and old. Women stood for a lower percentage of time compared to men, perhaps due to the footwear they used during the study.

# FINDINGS



## SELF-REPORTING ERGONOMIC DATA REINFORCES BIOMETRIC FINDINGS

In addition to objective sensor data findings, subjective self-reported findings were collected via questionnaires distributed at the beginning and at the end of the study. These revealed even stronger judgments:

- Participants were uniformly delighted with their new desks
- Self-reported back pain decreased on average 1.3 points on a 1-10 scale
- 88% respond feeling healthier throughout the day
- 98% “loved” the new sit/stand work surface
- Home sleep quality improved +0.7 on a 1-10 scale
- All participants asked to keep height adjustable work surface after study

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*During the study, some participants reported becoming more cognizant of their diet, sleep, and exercise*

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Halo effects: Some participants reported becoming more cognizant of diet, sleep and exercise during the study and reported that having the ability to change work state during the day was broadly empowering.

## UNEXPECTED POSITIVE RESULTS DELIGHT RESEARCH TEAM

Hourly data tracking suggests heart rate can be affected by several factors throughout the workday including basic activities such as talking or standing. Several individual participants' heart rate measures settled into narrower bands (the average highs post-adjustable work surface introduction are not as high as before), possibly suggesting improved cardiovascular fitness upon the introduction of the adjustable height work surface.

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*At the end of the study, all participants were given a choice to keep their height adjustable work center or have their fixed height desks reinstalled. All participants chose to keep their height adjustable workcenters.*

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# METHODOLOGY

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## STUDY OVERVIEW

In late 2013, Workrite Ergonomics was invited to partner with SPE and Fujitsu Laboratories of America, Inc. in the design, development and implementation of a research study intended to measure the effects of and use of traditional office furniture work surfaces and the introduction of an adjustable height work surface in a typical corporate office environment. E3 Ergonomic Consultants conceptualized the study, brought the three companies together to collaborate and acted as project manager and on-site ergonomics consultants throughout the course of the study. Conducted in one of SPE's Los Angeles facilities, volunteer participants were comprised of the SPE finance and information services groups. Fujitsu Laboratories was responsible for the monitoring of the participants and the adjustable height work surfaces, the aggregation and analysis of the collected data, and for reporting on the results of the study. Workrite Ergonomics provided height adjustable work centers and flat panel monitor supports and coordinated the installation and set-up of the ergonomic equipment to be used in the study.

## RESEARCH FRAMEWORK

The study was conducted over a five week period. During Week One of the study, all participants worked in their usual workcenters which consisted of traditional fixed height desks in both cubicle and private office environments. During that week, the volunteers were outfitted with VitalConnect's HealthPatch wearable cardiac patch sensor devices, which continuously monitor a variety of key biomarkers including ECG and heart rate. These sensor devices were integrated by Fujitsu Laboratories into the Sprout platform, thereby providing continuous storage of these biomarker data streams for establishing a baseline for each participant. The Sprout also enabled storage of participant stress values, based on real-time analysis of the ECG data stream. All participants also underwent basic health screenings for weight and body mass index (BMI) and took blood tests to establish starting levels for HDL & LDL cholesterol, fasting glucose levels and other key biomarkers.

Leading into Week Two, fixed height work surfaces were replaced with the Workrite Sierra Electric Workcenters and the Workrite Willow or Willow Dual adjustable monitor arms. These workcenters were instrumented with tablets running the Fujitsu Sprout; the accelerometer and camera sensors in the tablets were used to algorithmically assess the height and state of the workcenter. Beginning on Monday of Week Two, participants returned to work and began using their new workcenter equipment after receiving basic operating instructions and an overview of proper ergonomic equipment positioning.

During the next four weeks, each individual desk was monitored using periodic photographic data and real-time tablet accelerometry data to determine when participants were present and how much time was spent in the sitting or standing position. This real-time data collection and analysis was made possible through the use of Fujitsu's Sprout mobile real-time data aggregation and analysis platform, running on Android tablets affixed to the work surfaces. In addition, all data streams (including those made available through the cardiac patches) were synchronized with the cloud in real-time for visualization and real-time on-site triage of any data collection issues.

During Week Five of the study, participants were patched and monitored again so physiological measurements could be taken and compared to the baseline data established during Week One of the study. Both biometric results and self-reporting results are included in this report. Participants completed a paper questionnaire at the beginning and end of the study.

At the end of the study, all participants were given a choice to keep their height adjustable work center or have their fixed height desks reinstalled. All participants chose to keep their height adjustable workcenters.