Made to Move

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LINAK®

WE IMPROVE YOUR LIFE

MADE TO MOVE.

Office environments may differ greatly, but the demands placed on the human body have striking similarities. We were not made to sit in one position all day. Like many other animals, our bodies were designed to move.

In today's automated world, it is not always easy to get the movement our bodies need to work properly. Many of us sit nearly motionless for upwards of 15 hours a day (car, work, home, etc...). Thankfully, a number of tools have been developed to help us feel good and keep moving throughout the day.

Propelled by LINAK® electric actuators, height adjustable desks allow you to pick a position that is right for you, anytime of the day, whatever the task. Push a button and make a move.

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This booklet is meant to be a useful reference and selling tool for individuals interested in the wellness benefits of height adjustable desks. It is not our intention to interpret the findings, but rather to report and summarize information that is available in a concise format.

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MADE TO MOVE:

FOLLOW YOUR NATURE: SIT AND STAND

A typical American spends up to 95% of a working day sitting. This accounts for our time in commute, work, meals and watching TV.[31]

Basically, our new automated society has essentially engineered movement out of our lives.[30] Even the small movements of standing up to file, fax or talk with a co-worker have been streamlined into extinction.

In theory it should leave the 70% of the American workforce who sit on the job with energy to burn. In all actuality, it leaves most of them fatigued and drained by the end of a working day.

The root of the problem lies in a fact that seems counter-intuitive: the human body is not made to sit for extended periods of time. We are designed to be on the move.[1]

Movement is important to keep the spine healthy, improve circulation and reduce muscle fatigue.[1]

Sitting and standing still for extended periods is detrimental to our health.[1]

Doing so induces static muscle exertion, which inhibits blood flow. Consequently, the muscles become fatigued, which causes an antsy, anxious feeling that induces the need to exercise the muscles.[6]

The natural response to the antsy feeling is to subconsciously fidget, which when sitting usually entails automatically shifting postures within the chair. However, these minor postural changes typically do not provide adequate increases in blood flow to relieve the fatigued muscles.[6]

Static muscle fatigue is relieved only through muscle movement. Standing and walking increases the blood flow to fatigued muscles and re-energizes them.

Research shows that people need to get out of their chairs and move at least five minutes per hour.[1]

SITTING

By getting up out of your chair throughout the day, you engage postural muscles that "switch on" genes that are essential to good health. When you sit all day, your health goes into decline.[30]

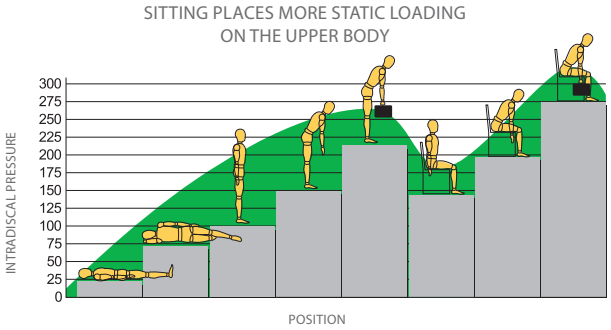
According to scientists, when we sit the "enzymes that are responsible for burning fat just shut down." This can lead to retention of fat, lower good cholesterol, and the overall reduction in the metabolic rate.[12]

In the standing position the natural curvature of the spine permits the body to achieve a loading balance.[2] Prolonged sitting causes a steady compression on the spinal discs that can contribute to their premature degeneration.

Prolonged sitting reduces body movement making muscles more likely to pull, cramp or strain. It has been associated with a high incidence of back complaints, discomfort in the lower extremities and increased muscle loading of the neck and shoulder muscles.[3]

Additionally, lower demands on the circulatory system while sitting results in a slow down of heart activity and blood flow which accelerates fatigue.[5]

A study of more than seventy-three thousand women reported that the risk of dying from heart disease was nearly three times higher among people who sit the most compared to those who sit the least.[30]



"Towards a better understanding of low-back pain," Alf Nachemson. Rheumatology and Rehabilitation (1975)[15]

"Sitting still in an upright unsupported position places 70% more static loading on the upper body than standing does."

MADE TO MOVE:

FOLLOW YOUR NATURE: SIT AND STAND

STANDING

When we are standing, the pressure on the intervertebral discs of the lower back is fairly low, much lower than when we sit unsupported. However, standing uses about 20% more energy than sitting, so we get tired more quickly and look to sit down.[1]

Prolonged standing, without some relief by walking, causes blood to pool in the legs and feet. When this continually occurs, it can result in inflammation of the veins.

Prolonged standing also causes the joints in the spine, hips, knees and feet to become temporarily immobilized or locked. This can later lead to rheumatic diseases due to degenerative damage to the tendons and ligaments.[5]

The discomfort many people incur with standing is a fatigue issue due to weak leg muscles, not a mechanical issue.[4]

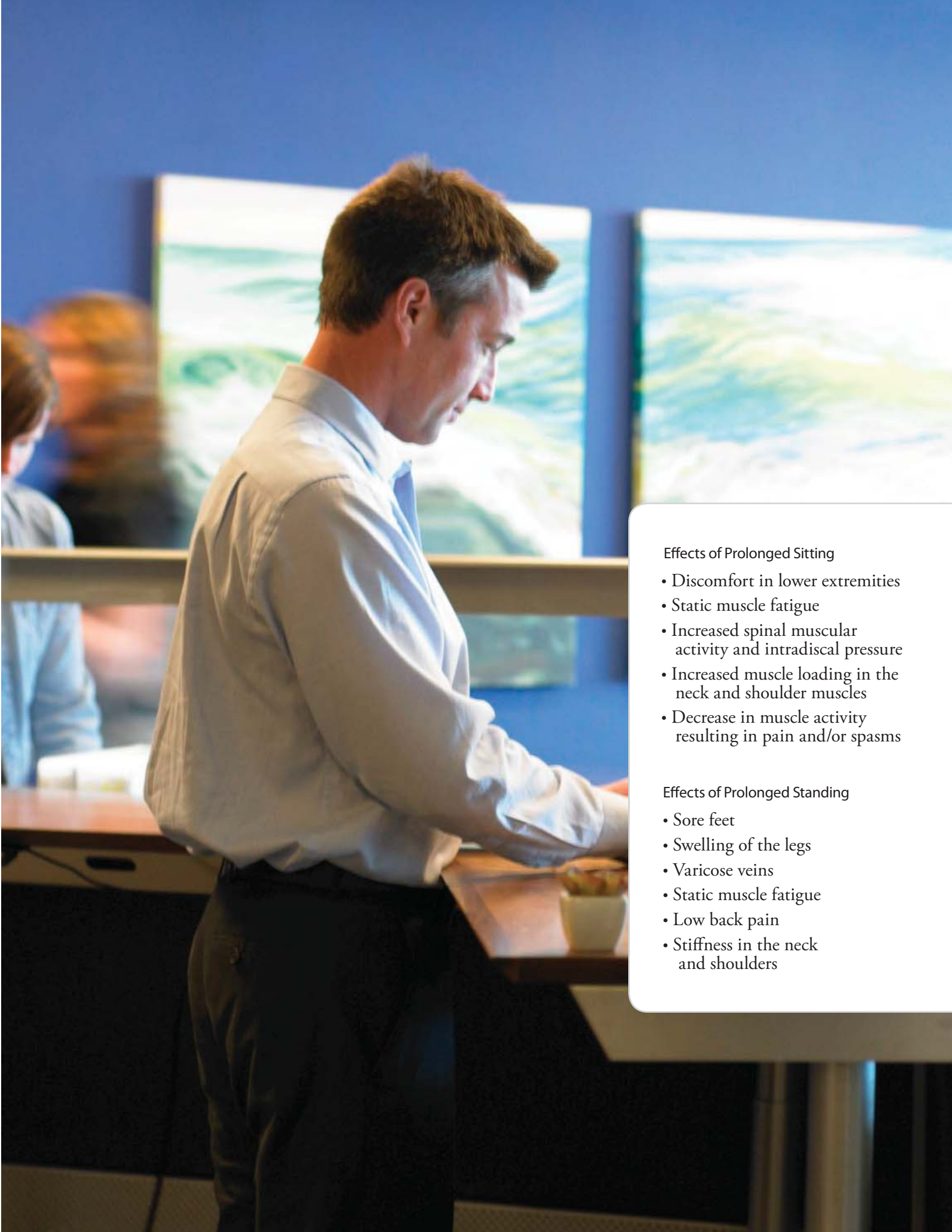
SITTING AND STANDING

Movement is critical for us to keep our bodies healthy and prevent illness. Mixing periods of sitting with periods of standing in addition to making time to move is key to our healthy existence in today's automated world.

Alternating between sit and stand positions adjusts the amount of load on the body allowing for increased rest intervals of specific body parts, thus reducing the adverse impact of risk factors.[3]

One study contended that there are more benefits to providing active breaks versus passive breaks in maintaining the health of muscles and spinal discs. Alternating between sitting and standing positions is the most effective way to maintain productive workflow while taking these types of breaks.[6]

Sit. Stand. Move.



Effects of Prolonged Sitting

- Discomfort in lower extremities
- Static muscle fatigue
- Increased spinal muscular activity and intradiscal pressure
- Increased muscle loading in the neck and shoulder muscles
- Decrease in muscle activity resulting in pain and/or spasms

Effects of Prolonged Standing

- Sore feet
- Swelling of the legs
- Varicose veins
- Static muscle fatigue
- Low back pain
- Stiffness in the neck and shoulders

MADE TO MOVE:

TRANSFORM YOUR BODY

Reports indicate America's weight problem is rapidly overtaking cigarette smoking as the leading cause of preventable death.[28]

"The health-care system is currently burdened with shelling out $177 billion a year for overweight-related health problems. The centers for Disease Control recently conducted a study that estimated that if the 88 million sedentary people in the U.S. increase their moderate activity level, we could reduce yearly medical costs by as much as $76.6 billion."[30]

As we battle this obesity crisis, companies are quickly shifting resources to target health and wellness. The question at hand is how can alternating between sitting and standing throughout the working day play a role in keeping our workforce healthy?

Too much sitting is making us unhealthy and fat.
There is a new realm of scientific study focusing on how inactivity such as prolonged sitting is affecting health and more specifically the human metabolism.

According to scientists, when we sit the "enzymes that are responsible for burning fat just shut down." This can lead to retention of fat, lower levels of good cholesterol (HDL), and the overall reduction in the metabolic rate.[25]

Results from a landmark study focusing on more than 73,000 women showed the risk of dying from heart disease to be nearly three times higher among people who sit the most compared to those who sit the least.[30]

When we sit the "enzymes that are responsible for burning fat just shut down."[25]

MADE TO MOVE:

TRANSFORM YOUR BODY

Supporting Research: Movement makes us healthy

The solution they say can be as simple as standing up and moving. The mere act of standing on your feet burns three times as many calories as sitting in your seat. So just by standing up, out of your chair, your body can break out of hibernation mode and switch enzymes on again.[30]

A Mayo Clinic study shows you can burn an additional 340 calories a day if you spend just two hours of your work day standing instead of sitting. If you were to maintain your current lifestyle, this could equate to a one pound weight loss every ten days (burn an additional 3,500 calories to lose one pound).

A new study out of Australia measuring activity in 168 subjects further supports these claims.

Their study found those who took more breaks from sitting had lower waist circumferences, lower body mass indexes and lower levels of triglycerides and glucose in blood, regardless of how much moderate to vigorous exercise they did or did not do.[29]

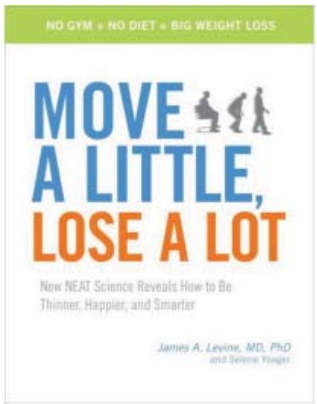
Also supporting this research is a study by British scientists investigating heart disease rates in thirty-one thousand male transit workers.

They compared conductors who walked and climbed the aisles to train operators who sat for more than 90 percent of their shift. The results showed that physically active work protects against heart disease. The sitting drivers suffered three times the rate of the coronary artery blockage that can lead to heart attack and more than twice the rate of death after a cardiovascular event than the conductors who spent their working hours on their feet.[30]

"The mere act of standing on your feet burns three times as many calories as sitting in your seat."[30]

MADE TO MOVE:

TRANSFORM YOUR BODY



This section is based on and contains excerpts from the book:
MOVE A LITTLE, LOSE A LOT
by James A. Levine, MD, PhD
MAYO CLINIC
and Selene Yeager
January 2009

Dr. Levine from the Mayo Clinic has spent more than twenty years studying human movement, obesity, and metabolism.

As he explains it, "the human body is like your computer. Turn it on and it whirrs and buzzes with energy, launching applications, running scans, and basically getting ready for action.

So long as you're actively tapping its keys and clicking the mouse, the machine keeps humming along. But what happens if you let it sit idle for an extended amount of time? It goes to sleep, right? The monitor dims and the machine powers down to conserve precious energy.

Your body does the exact same thing. This human conservation mode was a good thing when we spent the majority of our time on our feet and food was scarce. Now that we live in a near hibernation state, it's killing us."[30]

Dr. Levine's book, *Move A Little, Lose A Lot,* focuses on getting movement back into your life.

Specifically, he points to the "electronic age as increasingly leeching nonexercise activity thermogenesis (NEAT) from our existence to the tune of up to 1,500 to 2,000 calories a day."

What exactly is NEAT? It is the constant daily activity that our body gets by performing simple everyday tasks such as getting ready for work and doing laundry. NEAT is an essential part of our burning metabolism that is responsible along with exercise for 30 percent of our daily calorie burn.

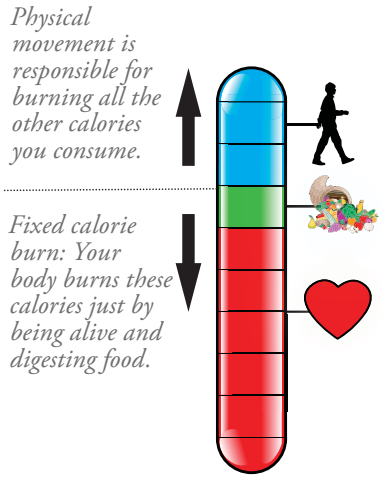
When you are sitting for the majority of your day it can be hard to burn the minimum number of calories required just to maintain weight.

"NEAT is the calories you burn living your life. It's the calories you burn washing the car, walking to lunch, running errands and even chewing gum."[30]

MADE TO MOVE:

TRANSFORM YOUR BODY

The way the human body burns calories:



To help clients relate to and see the magnitude of NEAT, Dr. Levine uses a simple financial analysis.

Your paycheck is $3,000 a month. About 60% goes to basic home-ownership expenses such as mortgages (BMR) and about 10% goes to food (TEF). The rest is your disposable income (NEAT) to spend how you choose. What you don't spend goes straight into savings. A good thing with money, but not with calories.

To really understand this NEAT science, it helps to understand the way the human body burns calories. Our basal metabolic rate (BMR) is responsible for about 60 percent of our daily calorie burn. Those are the calories your body uses even when you are perfectly still to keep your heart pumping, your brain thinking and all your organs doing their jobs.

Thermic Effect of Food (TEF) accounts for the calories that are burned when you are digesting food (about 10 percent). This leaves us with about 30 percent of our calories that need to be burned through movement. This includes NEAT as well as planned exercise.

If you do little planned exercise (like three-quarters of the population) all your additional calorie burn depends soley upon NEAT.[30]

"Dr. Levine sees patients time and time again who have reduced their food intake to pauper's portions and who go to the gym religiously, yet they still struggle with weight, hypertension, and high blood sugar."[30]

"Humans evolved to hunt and gather, sow and reap, and to spend the day burning thousands of calories through constant motion, not to run like mad on a treadmill for 20 to 30 minutes, burning maybe 200 calories, and then sit nearly motionless for the other 15.5 hours of our day burning next to nil."[30]

Exercise is good for us, but to battle obesity we need to make sure we get enough NEAT in our day as well. "Your ultimate goal is to reengineer NEAT back into your life."

"This includes setting NEAT behavioral goals that will eventually overwrite your chair addiction and become second nature.

Research suggests that a NEAT behavior that is repeated twenty-one days in a row will stick."[30]

Integrate more standing into your working day as a way to get more NEAT.

Standing and light NEAT activity allow you to charge your enzymes and raise metabolism in a way vigorous exercise cannot. "By getting up out of your chair throughout the day, you use a tremendous amount of energy over time. You engage postural muscles that "switch on" genes that are essential for good health."[30]

NEAT Activities[32]

Activity	Calories/Hr*
Sitting, watching tv	66
Standing, quietly	79
General Office Work (filing, copying, etc...)	99
Laundry	141
Walking, 2 mph	164
Playing with kids, moderate effort	348

**based on 145 lb person*

MADE TO MOVE:

HEIGHT ADJUSTABLE DESKS

ACCOMMODATE DIVERSITY

Adjustable desks allow companies to easily fit the desk to a variety of people (aging, people with disability or obesity, 5th and 95th percentile), rather than trying to fit a diverse workforce into one or two fixed desks.

This allows users to work in their bodies' ideal neutral posture – the work posture where your body is the strongest and most efficient.

PERFECT FIT FOR ALL

Since no one person is average on more than two dimensions,[4] it is difficult to accommodate a diverse workforce with a standard "one size fits all" desk.

Adjustable desks give users the capability to choose a working position that is ideal for their body. This helps to eliminate discomfort caused by a "desk that doesn't fit" such as insufficient leg space and too high keyboard/monitor heights.

SIT OR STAND

Over 60% of the workforce describe themselves as sitting for hours immersed in the monitor.[14]

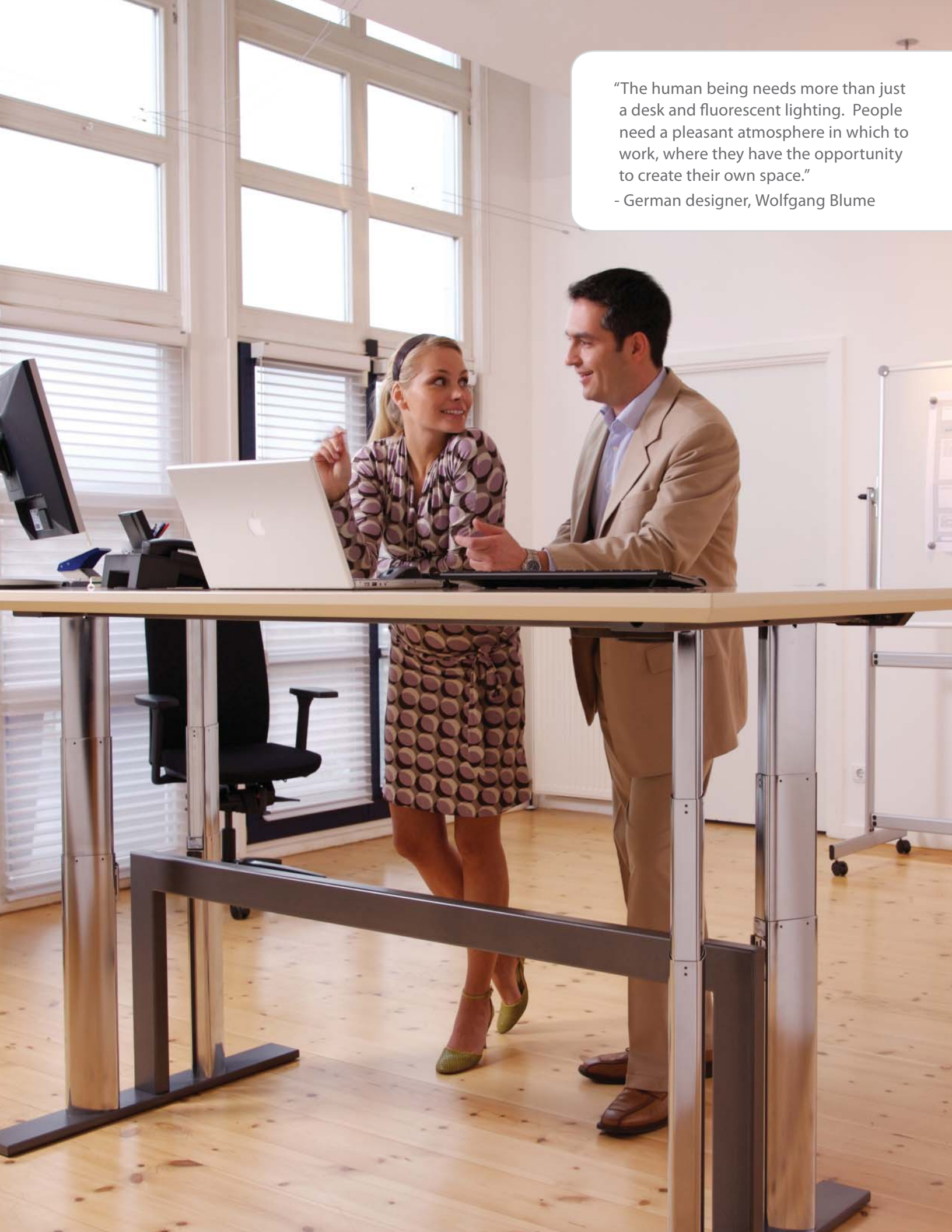
Alternating between a sit and stand position will give employees more energy, reduce fatigue, and further reduce the risks of injury caused by staying in one position too long.

ADAPTABILITY

Most workers have furniture that offers only minimal adjustability despite the fact that 20.4% of workers report they share a desk with others.[14] Adjustable desks allow multiple users to quickly move the work surface to meet their individual needs.

Additionally, companies have begun to relocate workers every six months to a year within a facility. According to E3 Consulting, "Forty percent of employees change workstations one to three times per year."

When a modular system is used many times adjustability virtually disappears in the move. "First of all, most workers don't know that their office furniture is adjustable. Second, they think "this is my office and I must live with the layout." Even when a company takes great care in configuring the workstation correctly, when workers relocate the problem begins all over again."[9]



"The human being needs more than just a desk and fluorescent lighting. People need a pleasant atmosphere in which to work, where they have the opportunity to create their own space."

- German designer, Wolfgang Blume

MADE TO MOVE:

HEIGHT ADJUSTABLE DESKS

INCREASE PRODUCTIVITY

People need to get out of their chair and move at least five minutes per hour. Micro-breaks reduce fatigue.

Many employees don't have the flexibility to get away from their workstations every hour.[1] Using a sit-stand desk allows employees to take a break from their static posture without leaving their area.

In a University research study (page 22), participants who did not alter their positions took an average of 47% more work breaks. Plus, the average duration of their work break was 56% longer.

REDUCE LOST WORKDAYS

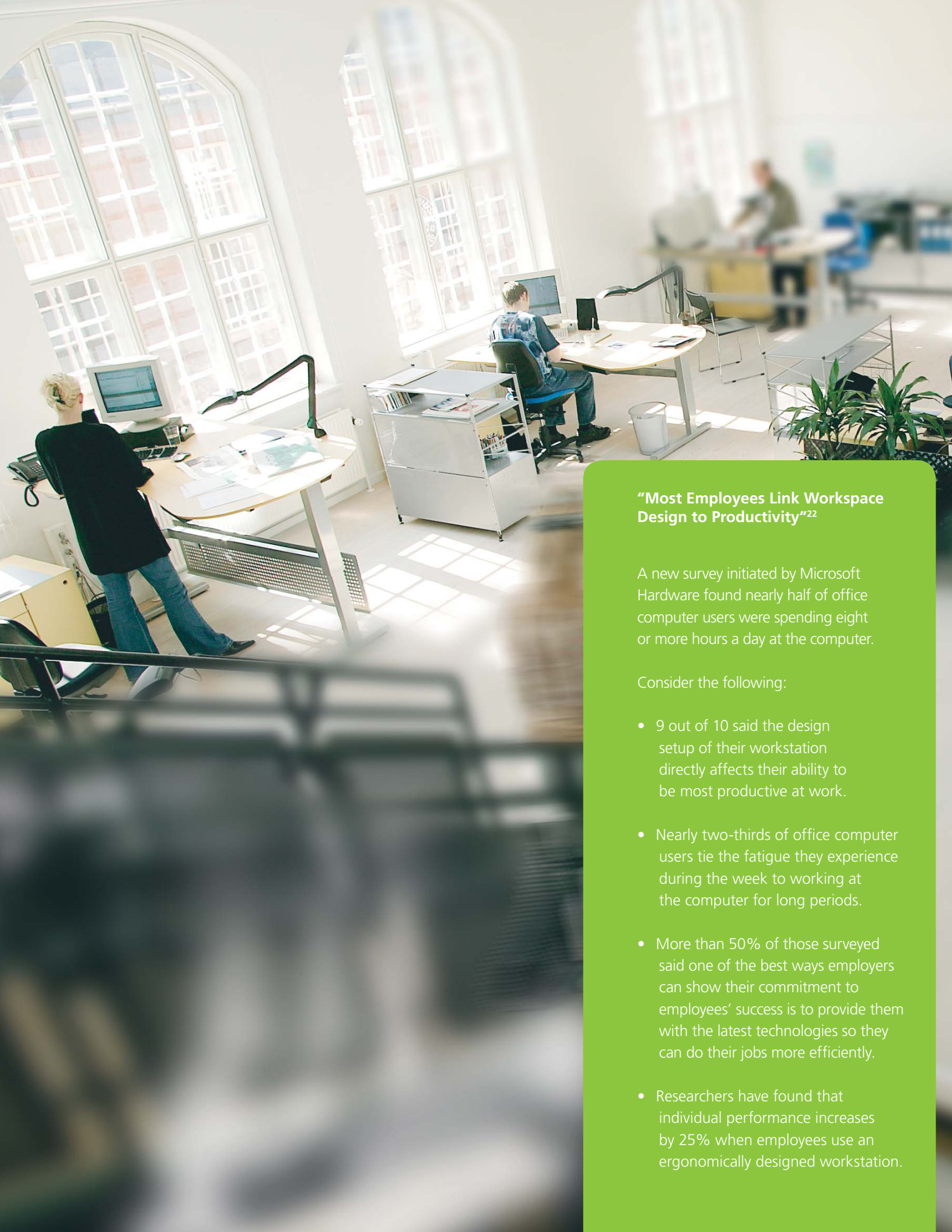
Investing in adjustable desks, is taking a preventative step towards reducing employee discomfort and injuries.

U.S. corporations face more than 16 million lost workdays each year as a result of CTDs (cumulative trauma disorders).[9] Fewer than half of those individuals, disabled for longer than six months, return to work.[8]

REDUCED COSTS

Many times, the combination of increased productivity, and the savings on workers' compensation expenses alone are enough to offset ergonomic investments.

Musculoskeletal disorders cost the nation up to $50 billion a year. Employers pay between $15-$18 billion in workers' compensation costs alone. That means $1 out of every $3 spent on workers' comp goes towards MSD-related claims.[10] What can an ergonomics program save you?



"Most Employees Link Workspace Design to Productivity"[22]

A new survey initiated by Microsoft Hardware found nearly half of office computer users were spending eight or more hours a day at the computer.

Consider the following:

- 9 out of 10 said the design setup of their workstation directly affects their ability to be most productive at work.
- Nearly two-thirds of office computer users tie the fatigue they experience during the week to working at the computer for long periods.
- More than 50% of those surveyed said one of the best ways employers can show their commitment to employees' success is to provide them with the latest technologies so they can do their jobs more efficiently.
- Researchers have found that individual performance increases by 25% when employees use an ergonomically designed workstation.

MADE TO MOVE:

HEIGHT ADJUSTABLE DESKS

REDUCE RISK FACTORS

Ergonomically designing workstations for individuals can reduce or eliminate causes of work related stress. In addition, being able to alternate good sitting with periods of standing can provide the variety of movement needed to permit working muscles to eliminate lactic acid wastes that can cause pain.[2]

Office studies show over 30% of staff experience back pain and over 60% experience combinations of other pains in the neck, shoulders, arms and hands.

In call centers and control rooms, back pain can rise to 60% and 90% with pains in other parts of the body as well.

EMPLOYEE HEALTH AND WELLNESS

Workplace physical activity programs have been shown to reduce sick days by up to 32 percent, slash corporate health-care costs by up to 55 percent, and increase productivity by 52 percent.[30]

A recent workplace study pointed out that exercise during the workday has a perceived impact on an employee's frame of mind and ability to stay focused.[36]

- 85% - exercise gives them energy to stay awake
- 80% - exercise has or would have a positive impact on their overall well-being
- 78% - exercise has or would have a positive impact on their work productivity

IMPROVE EMPLOYEE SATISFACTION

A number of studies suggest associations between low levels of job satisfaction and upper extremity musculoskeletal symptoms and disorders.[12]

"Simply put, when people feel good, they can work as efficiently and productively as possible."[13]

"People with obesity have a natural tendency to be seated for two and a half hours per day [more than people who are not considered obese]."[33]

MADE TO MOVE:

HEIGHT ADJUSTABLE DESKS

FLEXIBILITY

A co-worker or customer drops in, no problem...adjust the desk to a group working level and meet in comfort. As an added bonus, when you stand you can keep meetings and "on the fly" interruptions shorter. One company managed to cut their meeting times in half by switching to standing meetings.[35]

Electric adjustable desks allow users to comfortably and quickly adjust to the task at hand by the touch of a button.

Sitting is particularly desirable for tasks involving fine manipulative hand movements or precise foot control actions. Standing is great when mobility or extended reaches are required.[34]

QUICK AND EFFORTLESS

The easier something is to use, the more likely it is to be used. An electric adjustable desk moves quickly and gives instantaneous results.

No cranking, no unloading: a desk powered by LINAK® lets users quietly adjust up to 1,000 pounds by the touch of a button.

According to a Vermont DMV case study, "The problem with modular furniture is that it is not user adjustable and most employees do not know it can be adjusted. Once a workstation is loaded with several hundred pounds of equipment it is virtually unmanageable by a single employee."[9]

HIRING AND RETENTION

A modern, clean and up-to-date working environment is integral in recruiting and keeping talent, especially as the pool of experienced workers shrinks (baby boomers moving into retirement).

EASIER ACCESS

I.T. or maintenance staff will appreciate the ease of which they can move the desk up to gain access to cabling or electronics. Not only will they be able to work on items under the desk more comfortably, they will seldom have to remove items from the work surface to do so.

Most electric adjustable desks can lift anywhere from 250 lbs to 1,000 lbs at the touch of a button. This can be especially helpful in an industrial environment where different equipment and hoses may require regular service.

Stand up to make meetings short and productive: some companies have reported cutting meeting time in half.

CASE STUDY:

SIT VERSUS STAND

Excerpts from "The Experience of Musculoskeletal Discomfort Amongst Bank Tellers Who Just Sit, Just Stand or Sit and Stand at Work" Dr. Leon Straker; School of Physiotherapy, Curtin University of Technology (Perth, Western Australia) http://physiotherapy.curtin.edu.au/staff/straker/?year=All

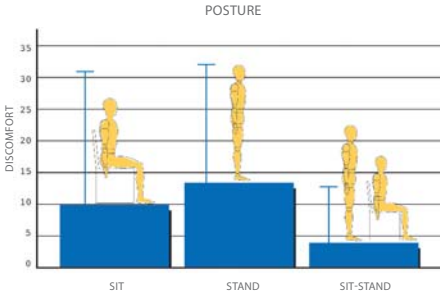
Bank telling provides limited opportunity for tellers to move away from their workstations. Consequently, tellers are required to maintain constrained postures for prolonged periods.

This study aimed to compare the experience of discomfort amongst bank tellers to determine whether greater postural variability in sit and stand environments impacted upon the experience of musculoskeletal discomfort.

Musculoskeletal discomfort was collected from subjects that assumed just sit, just stand and sit-stand work postures. The 'sit-stand' posture required subjects to alternate between a sit and a stand posture every thirty minutes.

Subjects were full-time bank tellers between 18 and 52 years of age. There were twenty-four females and six males [4'10"–6'1"].

RESULTS

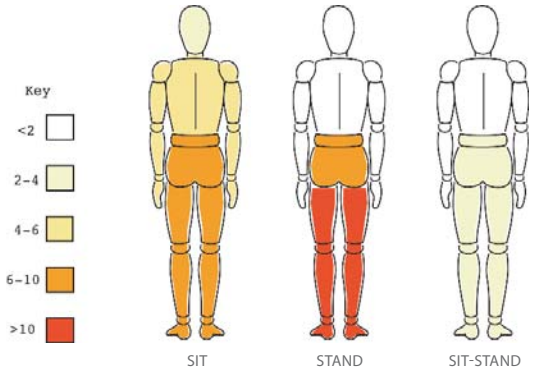


Study results provide evidence that postural variation is effective in reducing the experience of musculoskeletal discomfort for total body, back, lower limb and upper limb areas, and that the duration for which a posture is maintained affects the experience of musculoskeletal discomfort.

SUPPORTING STUDIES

- Studies by Visser and Straker (1994), Nehood and Thompson (1994), and Hagberg and Sundelin (1986) support postural variation and breaks from constrained postures can reduce or delay musculoskeletal discomfort.
- Graf et al. (1995) identified work tasks with less frequent and less marked opportunity for postural change as being associated with a higher prevalence of MSDs (Musculoskeletal Disorders).

MEAN MUSCULOSKELETAL DISCOMFORT FOR BODY REGION AND POSTURE



"Alternating between sitting and standing resulted in the least discomfort and was reported as the preferred posture by 70% of subjects."

The experience of musculoskeletal discomfort reported by subjects was found to increase across all three body regions over the course of the day.

The mean total body discomfort rating for subjects was highest in the 'just stand' posture, followed by 'just sit' and then 'sit-stand.' The greatest discomfort in the upper limb was noted in the just sitting posture and the greatest discomfort in the lower limb and back was reported for the just standing posture.

This finding offers support to the notion that a constrained sitting posture is more likely to impact upon the musculoskeletal health of the upper body whereas constrained standing is more likely to impact upon the musculoskeletal health of the lower body.

Alternating between sitting and standing resulted in the least discomfort and was reported as the preferred posture by 70% of subjects, with 'just sit' being rated as most preferred by 20% and 'just stand' by 10%. These results support a move away from constrained work postures amongst bank tellers within the finance industry and toward the introduction of systematic postural variation.

- While MSDs have traditionally been associated with physically strenuous occupations, there is increasing evidence that sedentary office work and other constrained sitting or standing postures are associated with a high incidence of MSDs (Attwood, 1989; Westgaard and Winkel, 1996).

CASE STUDY:

INCREASED PRODUCTIVITY

Excerpts from: "The Effect of Ergonomic Work Tools on Productivity In Today's Automated Workstation Design" Dr. Marvin J. Dainoff; Center for Ergonomic Research, Miami University (Oxford, Ohio) http://www.units.muohio.edu/psychology/people/dainofmj.html.

Traditional routine breaks from prolonged sitting such as retrieving files, faxing and inter-office communicating are today routinely performed at the automated workstation. Consequently, the principle source of productivity in the modern office is the human in front of a PC, resulting in a large percentage of employees' workdays spent sitting in one basic posture in front of the computer.

By enhancing the efficiency (and sense of well being) of the employee sitting in front of the PC, we improve individual and organizational productivity.

The study assessed the effectiveness of periodically standing throughout the day as a means of providing the essential breaks from sitting in prolonged static postures. This would determine whether intermittent standing, while working, relieves fatigue without repetitively departing from the work area or from task accomplishment.

On day one, the subjects were asked to use the adjustable equipment to relieve fatigue while they worked.

On day two, the subjects worked with the same ergonomic work tools; however, they were directed to stand several times throughout the day while working.

On day three, the subjects were given no direction and told to work in whatever manner they choose.

RESULTS

Over one-third of the subjects (36%) stood on day one. Of those subjects who stood on day one, frequency of standing increased about 40% on day three, after the directed standing of day two. The subjects revealed that the benefits experienced by standing reinforced the action and resulted in an increased rate of standing.

Over half (57%) of the subjects who did not stand on day one stood on day three, after being directed to stand on day two. This further supports the premise that work routines can be modified through positive reinforcement in the experience. In fact, the subjects periodically stood almost 2.5 times more on day three than on day one (147% increase).

"The Non-Standers took an average of 47% more work breaks...and the average duration of each work break was 56% longer than that of the Standers."

Analysis of the duration of each stand-up also supports this conclusion. The average duration of each stand-up increased from day one to day two by 65% and remained essentially the same on day three.

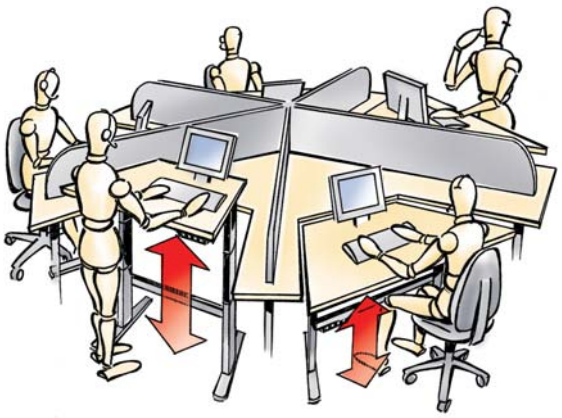
"There is strong evidence that intermittent standing increases productivity."

Eighty-two percent (82%) of the subjects had positive comments about standing in terms of providing relief and stated that they would stand in the future if their equipment adjusted to stand up height.

INCREASED PRODUCTIVITY

Analysis of this data provides strong evidence that intermittent standing increases productivity through a reduction in work break time; through fewer and shorter breaks throughout the day. These results demonstrated that standing while working at the automated workstation (stand-up working breaks from sitting) can substitute for the traditional work break (away from the work area).

The Non-standers took an average of 47% more work breaks, over the three days, than the Standers, and the average duration of each work break was 56% longer than that of the Standers. The effect on productivity is apparent as the Non-Standers took over twice as much total time on work breaks as the Standers did during the three days. On day three alone, which reflects a three-day cumulative effect of this data entry work effort, Non-Standers spent almost four times longer on breaks than Standers (288% increase in break time).



INCREASED USABILITY

Part One of the study identified specific characteristics in the actuation of ergonomic work tools that encourage regular adjusting. Analysis of the study provided the basis for an expanded definition of usability and the features required to promote regular adjustments (postural changes) throughout the workday. In this context, usability is defined as:

- **A minimum number of individual steps required for operation of controls**
- **The ability to make the adjustment with one hand**
- **The ability to make the adjustment rapidly**
- **Keeping the adjustment mechanisms in close proximity to the keying position**
- **Keeping the adjustment mechanisms visible from the keying position**

CASE STUDY:

DECREASED DISCOMFORT

Adapted from: "Effects of Electric Height Adjustable Work Surface on Self-Assessed Musculoskeletal Discomfort and Productivity in Computer Workers," Dr. Alan Hedge; Cornell University, Design & Environmental Analysis.24http://ergo.human.cornell.edu

There is good evidence to indicate sit-stand working is beneficial to the health and performance of workers. The present study was conducted to test the effects of using electric height adjustable work surfaces in offices.

Between two facilities, a group of 53 employees volunteered to participate. All participants were full-time employees and intensive computer users. On average participants reported spending about 60% of the day using a mouse and over 50% of the day using a keyboard. Initially, all participants worked at a fixed height work surface (FHW), 45 of the participants subsequently experienced working at an electric height adjustable work surface (EHAW).

FREQUENCY OF SIT VS. STAND

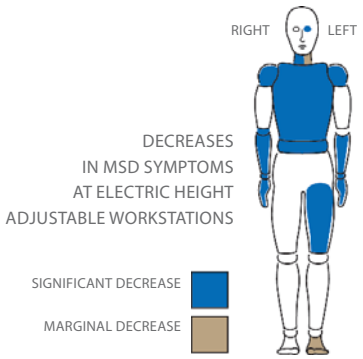
There was a significant increase in the daily time that subjects reported standing to do work with the electric height adjustable workstations.

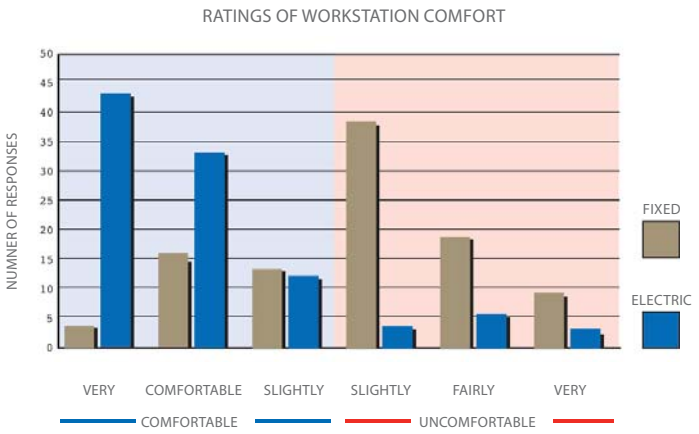
- 81% of participants reported standing one or more times a day
- 5% of participants reported standing three or more times a day
- 18% of participants reported standing five or more times a day

Results agree with previous research demonstrating beneficial effects of using height adjustable work surfaces. Overall, participants reported standing for 21% of the day, which is comparable to the 23% reported by Nerhood and Thompson (1994).

With Electric Height Adjustable Workstations:

- Daily discomfort ratings were lower
- Productivity ratings improved
- Severity of MSDs significantly decreased





MUSCULOSKELETAL DISCOMFORT (MSD)

Use of the EHAWs resulted in significant decreases in the severity of MSD symptoms for most upper body segments. The mean musculoskeletal discomfort index score was 43.1 for the FHW and 35.1 for the EHAW, which is almost a 20% decrease, and the difference was statistically significant.

Discomfort ratings were significantly lower for the EHAW condition for mid-morning and throughout the afternoon until the evening. Having lower discomfort ratings by the end of the workday agrees with previous research (Paul, 1995b).

COMFORT AND PRODUCTIVITY

There were significant improvements in comfort ratings for the Electric Height Adjustable Workstations (EHAW). Further, there were significant improvements in comfort ratings for the keyboard, mouse and chair when used with the EHAW.

Participants reported improvements in their personal work productivity.

Productivity ratings for "somewhat helped" and "definitely helped" were significantly higher for the EHAWs compared with the FHWs (57.5% vs. 20.0%).

CONCLUSION

In the EHAW condition, daily discomfort ratings were lower in the afternoon and productivity ratings improved. Results showed significant decreases in the severity of musculoskeletal discomfort for most upper body regions and there was a reported increase in the daily time spent standing versus sitting.

The results of this study suggest that there may be a number of benefits associated with using the EHAWs. These changes occurred over a relatively short time scale of four to six weeks, which suggests that the potential benefits may be even greater after longer time periods of use.

There was almost a unanimous preference for the EHAWs rather than the FHWs. Most written survey comments were positive about the EHAWs and three participants refused to relinquish their EHAW during the study. Overall, 82.4% preferred the EHAW and 64.7% indicated a definite preference for this arrangement.

CASE STUDY:

DECREASED DISCOMFORT

WHAT PARTICIPANTS HAD TO SAY…

"As soon as I started to get any pain I adjusted the table height and the pain either went away or got better. This is very necessary for working long hours. (I) need to have the ability and flexibility to adjust table height during the day."

"…It definitely changed the way I work."

"…It makes me (feel) so much better. My neck was suffering a severe pain, but after I got this table I am feeling much better..."

"…I wasn't in pain before, but with this table my sitting and working posture felt good. Before, I would start wriggling in the afternoon-I stopped squirming in my chair with this adjustable height workstation."

"I like the sit-stand configuration since it gives me the flexibility of standing up while typing. Also, it is easier for two people working and typing at the same time."

"The adjustable height work surface helps me to be more comfortable. I find that standing three to four times a day helps my neck and back (I usually stand for 20 to 30 minutes at a time). This allows me to stretch and move while continuing with my work..."

"I was able to adjust height the way I needed. It helped my elbow, forearm and wrist."

"The varying heights definitely helped avoid "repetitive stress" in a big way."

"Definitely better than fixed height work surface also helps me remember to take breaks and stretch and I adjust the height."

THE BASICS:

WORKPLACE ERGONOMICS

* ERGONOMIC TERMS

MSDs	*Musculoskeletal Disorders*
CTDs	*Cumulative Trauma Disorders*
WRI	*Work Related Injuries*
OOS	*Occupational Overuse Syndrome*
RSI	*Repetitive Stress Injury*
RMI	*Repetitive Motion Injury*
UEMSD	*Upper Extremity Musculoskeletal Disorder*
WRULD	*Work-Related Upper Limb Disorders*
WRMSD	*Work-Related Musculoskeletal Disorders*
NIOSH	*National Institute for Occupational Safety and Health*
OSHA	*Occupational Safety & Health Association*

WORKPLACE ERGONOMICS

Ergonomics refers to an approach which recognizes the capabilities and limitations of people.[9] The goal is to fit the environment to the worker.

Each employee is different so a single setup will not work for everyone. Nevertheless, if the basic concepts behind ergonomics are learned, the changes that are necessary even when faced with an unusual situation, will be known.[13]

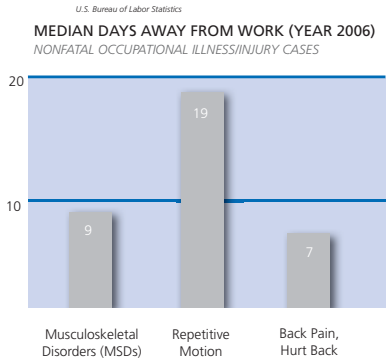
ANTHROPOMETRICS

Anthropometrics is the study of human physical dimensions such as height and forward arm reach.[9] No one person is average on more than two dimensions, therefore there is no such thing as an "average" person.[4]

Many times workplaces are created around a set of body dimensions that fit an "average" of the population. Although this accommodates a number of users, it often neglects the very smallest (5th percentile) and the very largest (95th percentile) of the population for each body dimension.

WORK-RELATED INJURIES (WRI)

Ergonomic work-related injuries often occur in the arm, neck, back and shoulder. Most commonly, they are referred to *MSDs, CTDs, or RSI** and are the result of repetitive motions and forces.



Other risk factors such as awkward postures, contact stress, and static loading compound the risk of injury. Many risk factors can be controlled by adjusting elements at the workstation such as the height of the work surface or screen, changing work positions, and reducing repetitious action.

"Simply put, when people feel good, they can work as efficiently and productively as possible."[13]

WRI COSTS

People are a valuable resource. Just as a machine malfunctioning adds to company costs, operator loss due to work-related illnesses will add to the cost through lost productivity, absenteeism, compensation and insurance costs.

Replacement operators are an additional cost and have a learning curve. If there is no change in the workplace to correct or reduce the stressors, the cost and loss will be repeated.[4]

Consider an employee as a million dollar asset with a 30 year life span. Companies spend hundreds of dollars on maintenance and spare parts for machinery, yet when it comes to employees, one of the most important production factors, they hesitate to invest.

Ergonomic programs can reduce injuries and costs while improving quality, efficiency, productivity, and morale. They also are a vital way to protect the aging workforce. As with most things, prevention is less costly than treatment.

LEGAL ACTION

Companies may incur ergonomically related legal costs in many ways including citations and employee lawsuits.

If an organization experiences a high frequency of injuries, it could be cited by OSHA under the general duty clause. Citations can result in substantial fines depending on the factors involved such as the number of violations cited or the employer's willful disregard of employee safety. For example, a small company was fined $4,650 for alleged word processing related injuries, while another agreed to pay $420,000 in penalties to resolve ergonomic related citations [9]

"An effective safety an health program can save $4 to $6 for every $1 invested." [17]

THE BASICS:

ERGONOMICS PROGRAMS

Benefits of Ergonomic Programs Include:

Increased:
- *productivity*
- *quality*
- *job satisfaction and morale*

Improved:
- *employee retention*
- *health and safety*
- *lean processes*

Decreased:
- *lost time at work*
- *absenteeism*
- *employee turnover*
- *worker's compensation claims*

ERGONOMIC PROGRAMS

The practice of ergonomics varies from incorporating principles in the design process of new systems to evaluating existing facilities and making recommendations.[9]

The goal is to achieve those interactions between the work and the worker that will optimize productivity and preserve the safety and health of the workforce.[7]

The key to a successful ergonomic program is to be proactive by anticipating risk factors. Engineering controls such as workstation design are some of the best methods in reducing ergonomic disorders.[9]

ERGONOMIC PROGRAM ESSENTIALS:

- **Implement ergonomic standards into buying practices** to ensure purchases meet the requirements of the company's ergonomic initiative.

- **Educate decision-makers involved in the design of job tasks, processes, equipment and workplace layout in ergonomic principles.** This ensures design strategies emphasize fitting job demands to the capabilities and limitations of workers.[7]

- **Obtain the support of top management.** This support is critical in order to provide funding and gather support for employees at all levels.

- **Educate employees on methods of prevention, detection of symptoms and use of tools and equipment.** This helps to ensure employees get the most out of ergonomic equipment, report hazards before injuries occur and report injuries before they become irreversible.

RESULTS

One specialist pointed out that the combination of increased productivity with the reduction of worker compensation expenses reaped significant rewards when compared to the costs incurred during redesign.[9]

For example, after a three year evaluation period of the ergonomic program at the Tacoma Dome, there were 39 injury claim reductions, $399,825 savings in worker compensation funds, 458 fewer workdays lost, 50-60% improved worker performance, 50-65% improved productivity and $200,000 improvement in net profit.

CONSIDER THE FOLLOWING:

- Low back pain is second only to upper respiratory infections as a cause for absence from work.[11]

- Users who spend more than four hours a day on a PC lose one and a half lost work days due to MSDs.[19]

- U.S. corporations face more than 16 million lost workdays each year as a result of CTDS. [9]

- MSDs cost the nation up to $50 billion a year.[10]

- We have an aging workforce: The largest population is the 35-44 year old age group. In ten years the largest population will be in the 50-59 year old group.[4]

- 75% of back pain cases associated with lost workdays resulted in three or more lost workdays and 26% result in thirty-one or more lost workdays (BLS, 2000).[23]

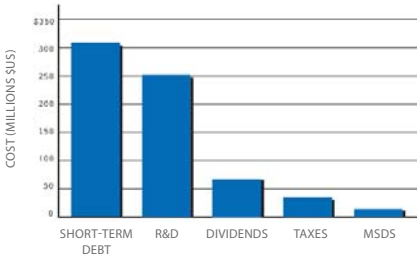
BE PREPARED:

SELLING ERGONOMICS TO TOP MANAGEMENT

Derived from Jack Kester's "Selling Ergonomics to your CFO" session at NECE 2004 (www.ergoexpo.com).

Jack Kester, CSP, CIE, Senior Vice President of Workforce Strategies of Marsh, Inc. has over 24 years of experience in the field of risk control which includes 16 years of experience in ergonomics. He is an expert in working with company management on identifying risk factors within a workplace and developing solutions which lead to a decrease in quality assurance issues while increasing productivity and efficiency.

CHART A



Even though MSDs could be costing your organization millions of dollars, to the CFO the amount may be small compared to other priorities such as short-term debt.

I think everyone will agree that getting support from top management is crucial to the success of an ergonomics program. This support not only provides the funding you need, but also the support you need on many different levels.

To capture their attention and support, you must begin by understanding each manager's perspective, priorities and working style and tailoring a precise and well thought out action plan to meet the needs of the entire group.

The key is to align your ergonomics process with their priorities.

For example:

- with a CFO concentrate on cost reduction and earnings consistency
- with the Operational Manager concentrate on productivity and quality

Instead of focusing on what MSDs are costing the company, focus on what your program can save the company. Capture all potential cost savings including claims, productivity, quality, absenteeism, overtime costs and the cost of temps. It is important to be conservative with your figures. The more grandiose the figures, the harder they are to believe.

When communicating with senior management it is extremely important to respect their time. This means you need to be well prepared to present your case in a clear, concise and compelling presentation. Use graphs and pictures to help your story.

Present the costs in the format used for your company's other operating cost comparisons (i.e. cost per man hour). Be prepared to explain the sources of your data and any assumptions you have made.

Integrate ergonomics into existing processes such as lean manufacturing, kaizen and six sigma. These are processes top management are embracing, learn to connect ergonomics into the process.

"Instead of focusing on what MSDs are costing the company, focus on what your program can save the company."

R.O.I.

If the sit stand desk is for a new facility, subtract the cost of a standard desk from the cost of a sit stand desk to see how much the extra investment is going to cost. In this case the payback period is usually very quick. Since you have no past data to work from, however, it is harder to calculate a tangible answer.

Sauer & Sauer, ergonomic experts out of Germany, use days of absenteeism due to illness to calculate the amortization of a sit-stand workplace with the average payback being three days.

A calculation we are currently working with is based on productivity gain. If you know that you are gaining extra minutes a day from a decrease in work breaks or two extra claims are being processed, you can take this information and calculate a payback. Variables include daily pay rate (salary + benefits/ days worked in a year), productivity gain (minutes gained/minutes worked in a day), cost savings per day (daily pay rate x productivity gain).

$$\frac{\textbf{cost of equipment}}{\textbf{cost savings per day} \times \textbf{days worked in a year}}$$

If a person whose salary + benefits equals $46,000 and works 240 days (2 weeks of vacation + 2 weeks of holidays) can be 15 minutes more productive a day. The payback on a $1500 workstation is 1.04 years.

CHECK OUT:

RESOURCES

RESOURCES

www.movingdesks.com

This is a LINAK® sponsored site focusing on electric height adjustable desks. Highlights include:

- Find a Sit to Stand desk
- Calculate the sitting or standing height that works best for your height
- View exercises you can do at your desk
- Printable template for tracking standing time
- Q&A on workers' compensation and ergonomics programs
- Q&A on reducing health insurance premiums through wellness programs
- Download this booklet as a pdf

www.startwalkingnow.org

Check out the "In the Workplace" tab for some great links including a Start Guide for employers that offers a menu of tools and programs to help companies get their employees fit and heart healthy.

www.fitkidsact.org

This site is aimed at getting our kids moving again.

www.american heart.org or www.sparkpeople.com

Here are two great sites for starting a healthier lifestyle and tracking results.

www.eatsmartmovemorenc.com/worksites.html

They offer a very comprehensive worksite wellness tool kit.

www.thesafetylibrary.com

Choose ergonomics located on the sidebar to access an extensive amount of ergonomics information including sample programs and case stories.

http://welcoa.org/freeresources/

Here you can find health and wellness resources from Wellness Council of America.

THANK YOU TO:

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