

Ergonomics and the Mobile Environment

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Introduction

In today's society, working in a mobile environment has become almost as common as working in a traditional office environment. In 2010, 26.2 million people worked from home or remotely for an entire day at least once a month—a figure representing nearly 20 percent of the U.S. working adult population of 139 million.¹ Over the past several years, mobile work environments and interaction with mobile devices such as laptops, tablets, notebooks and smartphones have increased substantially. In 2010, experts estimated that 17.6 million tablets were sold—a number that was expected to increase more than three-fold in 2011.² Market projections predict that there could be more than 300 million tablets sold worldwide in 2015, with more than 80 million tablet users in the United States alone.^{2,3}

Not only do workers interact with increasing numbers of mobile devices, but they now use their car, van or home as a work area in which to routinely carry out tasks that would previously have been done at a desk in the office. Evidence shows that this trend is probably here to stay. According to a recent survey from Staples Advantage, the business-to-business division of Staples, Inc., employees who telecommute say they feel and work better from home. In fact, 86 percent of telecommuters say they are more productive in their home office.⁴

While working on mobile devices allows workers to be more productive, there are downsides to consider. Mobile and telecommuting computing environments have introduced new areas of ergonomic concern that may threaten workers' well-being and lead to increased health costs in the workplace. For example, there are a variety of injuries they may experience as a result of working with the technology in a mobile or home office environment.

Postural Demands

Though the use of mobile devices has increased dramatically, few employers have considered the postural demands on their workers who use laptops, tablets and other mobile devices. Instead, the user ergonomic focus has primarily been on stationary computer use. In theory, a mobile work environment and home office should meet the same health and safety standards as those available at the traditional office. For example, the work surface, chair and accessories should be of comparable quality to that found in the traditional office.

The desk should be the appropriate height and sturdy enough to handle the weight of any peripheral equipment placed on it (e.g., computers, printers, fax machines, scanners, etc.). Unfortunately, many home-based workers use the kitchen table, which is not an ideal work surface since it is too high and doesn't allow for proper positioning of the wrists in relation to the keyboard. In addition, workers have little control over ergonomic factors in their mobile work environment while conducting business at other locations outside the home such as the library, Starbucks or even the airport. To address this problem, businesses and managers should monitor the use of mobile devices from an ergonomic perspective to reduce potential injury.

Injuries

Laptop Burn

Laptops can generate a lot of heat since they tend to run fast microprocessors. When the laptop is placed on a solid surface or on a lap, ventilation is greatly reduced because the heat that mainly vents out of the bottom of the device isn't dispersed. As a result, a hot laptop can suffer from reliability problems, and a system that overheats can fail.⁵ In addition, a hot laptop can be uncomfortable to use since the heat it generates can be enough to cause superficial skin burns, even through clothing. *The Lancet* medical journal reports the case of a healthy 50-year-old scientist, fully dressed in trousers, who burned his genital area after using a laptop for an hour. Though he did occasionally feel the heat and a burning feeling on his lap and thigh while using the device, he was surprised to find two days later that he had blisters that burst and developed into infected wounds.⁶

Ways to prevent such burns include using a laptop stand that elevates the device for better cooling as well as decluttering the workplace to increase airflow around it. Users could also consider using laptops with built-in fans that generate airflow to keep them cool. Users should also refrain from placing a laptop on the lap for long periods. Those who must use a laptop for a long time should take it off their lap periodically and allow the laptop to cool down.

Mobile Device Neck

The posture adopted by many laptop users even more by tablet and smartphone users puts them at risk of chronic neck and shoulder pain. The tendency is to stand or sit overlooking the device while bending the neck and back to view the screen. Any activity where you hold your head/neck forward in a flexed or bent position for a prolonged period will cause neck injuries.⁷ Because of this injury trend, tablet and laptop users should receive the same ergonomic attention from their employers as desktop computer users did a decade ago. One solution is a laptop stand. Many laptop stands allow for multilevel positioning that improves the ergonomic sight line to the monitor, thus reducing strain on users' shoulders and necks when they view the laptop.

Repetitive Strain Injuries

Repetitive strain injuries are also occurring from overuse of handheld communication devices. These injuries range from "BlackBerry® thumb" and "iPod finger" to "Wiinjuries" and "Nintendinitis," which are more formally known as carpal tunnel syndrome, De Quervain's tenosynovitis and trigger thumb. Symptoms range from pain and weakness to disability, with the effects being greater in older users who may be more susceptible to inflammation and pain.⁸

When people use laptops, they usually focus on the laptop screen while using the supplied keyboard. As a result, individuals are more likely to tilt their head forward, hunch their backs and use the front portion of their chair. The reasons for this positioning may include reading small character sizes, performing difficult/complicated tasks, working with glare on the screen, or viewing the screen from far away.

To reduce the chance of developing injuries, ergonomic experts advise users to take breaks from electronic devices especially when they notice strain or pain. They can also try to use the auto-text feature or to write shorter/fewer messages. Those who have pre-existing joint problems should avoid overuse of electronic devices and seek medical assistance if swelling occurs or if symptoms don't go away.

Breaks

In an office environment, there may be many natural breaks, such as discussions with co-workers or a quick walk to the printer, that offer opportunities for a change in body position. But, for those who use mobile devices or work in a home office, there are few, if any, natural breaks that occur throughout the day to help reduce the potential for injury. Extended hours in the same body position or use of repeated motions can lead to various musculoskeletal injuries. Mobile workers should be conscious of taking occasional breaks throughout the day if no natural breaks occur. They can use mobile apps and computer programs that remind them to take breaks or to stretch throughout the day. These apps and programs help break up tasks and offer employees a chance to move about, infuse oxygen within the muscles, and lessen body fatigue.

Mobile Equipment Solutions

Laptops

Society's challenge is to start using laptops ergonomically; the good news is that the solutions are relatively simple. For those with a laptop at a desk area, experts recommend using a docking station or port replicator with a peripheral keyboard and mouse along with a separate monitor. A laptop stand or a separate monitor will allow the worker to raise the screen to avoid neck bending. Using a cordless keyboard and mouse will allow the user more flexibility to place the screen appropriately so it is comfortable for the eyes. Using a separate mouse gives the user the opportunity to work with the shoulders relaxed and elbows by the body, thus greatly reducing muscle fatigue.

iPads/Tablets

Currently, the iPad/tablet is not a true substitute for a laptop. Extended typing on-screen can be rather cumbersome, and fingertips may get sore or tender from repeatedly tapping against solid glass as opposed to energy-absorbing keys that allow an added tactile feel not matched by typing on glass. Ergonomic experts recommend that users writing for long periods on a tablet obtain and use a Bluetooth keyboard. Although adding a keyboard increases the bulk and clutter of using a tablet and may ruin the dynamic of working on a lightweight and portable system, it can help mitigate muscle fatigue.

In addition to concerns about typing on a tablet, it can be uncomfortable to hold an iPad for long periods. Tablet and smartphone users are similar to laptop users in that they are very likely to tilt their head forward and hunch their backs while using their devices, although they are usually standing rather than sitting. The many reasons tablet/smartphone users assume this awkward body position include trying to read small character sizes, performing complicated tasks, working with glare on the screen, or viewing the screen from far away. One solution is to use a tablet stand that props up the device so the user can view the screen at eye level. Another suggestion is to use an external keyboard to facilitate easier and more comfortable typing over long periods.

Mobile Computing

Advances in wireless communications and mobile computing have turned today's car into a fully functional office on wheels. While those using their vehicles to perform work may enjoy the benefits of mobility, it may be at the expense of comfort, performance and sometimes even health and safety. In general, vehicles are not ergonomically suitable for working on a laptop. For the mobile worker, ergonomic solutions primarily take the form of devices designed to properly position computers, peripherals and other equipment to avoid problems such as eyestrain, back strain and wrist strain.

The equipment necessary to create an ergonomic workplace in a vehicle includes a keyboard, monitor and storage area. Critical for data entry, keyboards must tilt to provide wrist relief during data entry. While using a laptop mount, the entire laptop will need to tilt, allowing the user to position it at an ideal angle. If a separate keyboard is used, it too should utilize a tilt mechanism. In addition, users should never allow an external keyboard to be loosely stowed in the cab, as it could become a projectile during an accident. Workers should position their monitor to reduce neck strain. Brighter screens are better, but users need to know how to dim the screen for nighttime use.

Many times, employees forget creature comforts in the mobile world. A good storage console for a laptop and peripherals will also offer cup holders and a place to store tissues, pencils and paper. Employers should not underestimate the impacts these items can have on worker comfort and job satisfaction.

Telecommuting

With advances in technology (e-mail, Wi-Fi, tablets, smartphones, etc.), more and more employees are opting to work from their private residences on a regular basis (once a week, twice a week or more).

The Benefits

The benefits of telecommuting include savings of over \$100 billion in commercial real estate, electricity, employee turnover and absentee costs.⁹ In addition, companies increase productivity since employees are allowed to work at their own pace and in an environment with fewer interruptions. There are also several environmental benefits resulting from fewer vehicles on the road: less fuel consumed, less pollution and shorter commute times for those who still go to offices. Telecommuting also allows for “flexing” time for family commitments which results in increased employee satisfaction. However, it is important that organizations committed to providing employees with telecommuting options also provide work-at-home employees with the same safe environment given to office employees.

The Drawbacks

Because employees are working in the “course and duty” of their employer while working at home or another location, the costs of an injury would be covered under their employer’s workers’ compensation coverage. Thus, when a home office is set up, it should be done with safety in mind, making sure the work area has ergonomically suitable equipment and furniture to help mitigate the risk of a workers compensation claim. Documentation of employers’ efforts to provide a safe and ergonomically designed work area will help prove they did their part to ensure their workers’ safety.

Summary

Generally, ergonomic risk factors are identified in the office workplace. However, as mobile electronic devices help many workers cut the cords with the traditional workplace, ergonomics are now an important factor for those who telecommute or work in a mobile environment such as their car. These risk factors, left uncontrolled, will result in an increase in ergonomic injuries over time. Uncontrolled ergonomic risks can mean potential liability for those corporations that support telecommuting and a mobile workforce. In fact, many companies may find that the cost of workplace injuries can mean the difference between being competitive or not.

To maintain the health of employees and reduce potential corporate liability, risk and safety professionals must address ergonomic risk factors faced by the telecommuters and a mobile workforce. One approach to mitigating this risk is to develop telecommuting processes, standards and program elements using employee input from a number of corporate disciplines (facilities, HR and other departments). This collective planning process ensures that employees have the proper equipment, workstation setup and other tools to work more productively and safely in their home, a coffee shop or the airport.

Endnotes

- ¹ Ozias, Andrea. 2011. Telework 2011: A WorldatWork Special Report. *WorldatWork*, June.
- ² Gartner, Inc. 2011. "Gartner says Apple will have a free run in tablet market holiday season as competitors continue to lag." <http://www.gartner.com/it/page.jsp?id=1800514>.
- ³ Pepitone, Julianne. 2011. "Tablet sales may hit \$75 billion by 2015." *CNN Money*. http://money.cnn.com/2011/04/19/technology/tablet_forecasts/index.htm.
- ⁴ TelecommuteNews Staff, 2011. "There's No Place Like a Home Office: Staples Survey Shows Telecommuters are Happier and Healthier, With 25% Less Stress When Working from Home." *TelecommuteNews*, July 21, 2011. http://www.telecommutenews.com/telecommute_friendly_companies/there%E2%80%99.
- ⁵ "Portable Power (Laptop Computers) (Product Service Evaluation)," *Consumer Reports*, March 2003, 44-47.
- ⁶ Ostenson, Claes-Goran, 2002. "Lap Burn Due to Laptop Computer," *The Lancet*, 360 (9346), 1704.
- ⁷ "iPad Neck—Ergonomics Experts Warn of Tablet Injury," *Herald Sun*, April 11, 2011.
- ⁸ Avitzur, Orly. 2009. "Rx for Blackberry Thumb." *Consumer Reports*. <http://www.consumerreports.org/health/conditions-and-treatments/rx-for-blackberry-thumb/overview/blackberry-thumb-ov.htm>
- ⁹ Bram, Thursday, 2012. "Telecommuting Means Billions in Savings." GigaOM, March 12. <http://gigaom.com/collaboration/telecommuting-means-billions-in-savings>