Standing Up For Health

A brief overview of current research on the harmful effects of prolonged sitting and the influence of sit-stand workstations.

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Introduction:

Sitting too much, also known as sedentary behavior or prolonged sitting, has become one of the most discussed issues in the home and work office environments. With the emergence of globalization and the development of information technology in the last several decades, a lifestyle of physical inactivity which originated during the western industrial revolution and has gradually permeated throughout most of the world's work environments. It is the first time populations in the whole no longer perform damaging intensive human labor, while, paradoxically, now engage in lifestyles that result in new health risks and chronic diseases caused by a huge shift to physical inactivity. According to Kohl et al., (2012) "physical inactivity is the fourth leading cause of death worldwide" which requires global action for improvement. Thus, sitting in offices, as one of the most common physical inactivities worldwide, should be examined in order to improve global public health conditions. Actions have already been taken in the areas of research and development along with the identification of solutions to the problem of inactivity. The International Ergonomics Association has dedicated itself to the development of ergonomic programs and promotes ergonomic education worldwide (Caple, 2012), while making the concepts of ergonomics more popular at a global level. This brief overview will shed light on how replacing traditional work and office equipment with ergonomic sit-stand workstations can positively impact a workers' health condition based on recent scientific evidence, and share the knowledge of ergonomic health in workplaces with a specific focus on ergonomic office furniture.

Part One: Prolonged Sitting--Invisible Harm To Health

It is widely recognized in medical and public health spheres that sitting may cause various chronic diseases including obesity, metabolic syndrome, diabetes, cardiovascular disease, (Ryan et al., 2011 Thorp et al., 2012, & Hamilton et al., 2007) and musculoskeletal problems, which are "not only specific disorders, but also the continuum of normal and abnormal age-related physiological changes in muscle, bone, and joint function, as well as fitness-related performance capacity involving strength, mobility, and lean muscle mass", (Punnett, 2009: p17). Also, there is possible relativity between sedentary behavior and cancers of the proximal colon, distal colon and rectum. A research examining 918 cases and 1021 controls draws a conclusion that "compared with participants who did not spent any time in sedentary work, participants who spent 10 or more years in sedentary work had almost twice the risk of distal colon cancer and a 44% increased risk of rectal cancer". (Boyle, 2010: p1183)

Moreover, research of large scale samples has suggested fatality of prolonged sitting, a chronological research based on a large sample group of 17,013 Canadians, 18-90 years of age (Katzmarz et al., 2009: p1002), has shown that "the greater daily time spent sitting in major activities is associated with elevated risks of mortality from all-cause and from cardiovascular disease", regardless of "adjustment for potential confounder, including age, sex, smoking status, alcohol consumption, leisure time physical activity levels, and the PAR-Q". Another study evaluating 240,819 adults (from 50-71 years old) with no diagnosis of any cancer, cardiovascular disease, or respiratory disease shows similar results that spending more than 7hours per day watching Television has a direct relation to an increased risk of all-cause and cardiovascular mortality. (Matthews, et, al. 2012) In addition, a meta-analysis of data from 595,086 participants has found that "each additional hour of daily sitting is associated with an overall 2% increased risk of all-cause mortality". (Chau et al., 2013) Finally, all the studies listed above suggest that leisure time exercise does not reduce the relativity between sedentary behaviors and chronic diseases. In other words, the damage of physical inactivity cannot be compensated by physical activity.

Part Two: The Benefits of Sit-Stand Workstations

The reason why sedentary behavior causes all of these chronic diseases is that "prolonged time spent sitting, independent of physical activity, has important metabolic consequences that may influence specific biomarkers (such as triglycerides, high density lipoprotein cholesterol, fasting plasma glucose, resting blood pressure) of obesity and cardiovascular and other chronic diseases". (Patel et al., 2010: p427) Sitting too much disrupts the functionality of body, and indirectly increases the risks of many diseases. Although there are many other factors that also result in chronic diseases together with sedentary behaviors, it is obviously effective to improve health conditions by reducing sitting time. Thus, the most convenient solution to tackle this severe occupational hazard is by simply standing up.

Chronic diseases including cardiovascular disease, type 2 diabetes, metabolic syndrome risk factors, and obesity have strong association with low energy expenditure. (Hamilton, 2007) The prevalent lifestyle of low energy expenditure is not equivalent with the deficiency of physical exercise in modern society. The low energy expenditure primarily results from a lack of non-activity exercise which takes up large portions of energy expenditure of our ancestor in agrarian society. (Schmitz, 2011) That is to say, the primary reason why the energy expenditure in contemporary society rapidly decreases is that our technology-based everyday life does not require much energy consumption. Therefore, reducing the time of "freezing" mobility of the body can efficiently improve health conditions. Shaw et al. (2008: p662) suggest that "overall, independent of total sedentary time, the total number of breaks in sedentary time was associated with significantly lower waist circumference, Body Mass Index (BMI), triglycerides, and 2-h plasma glucose". The associations with triglycerides and 2-h plasma glucose were attenuated when waist circumference was included in the model. As what Neuhaus et al. (2014: p38) suggest that "considering the benefits of even short breaks in prolonged sitting time on biomarkers of cardiovascular health, stronger emphasis on the importance of regularly breaking up prolonged sitting may be needed". Using a sit-stand workstation or sit-stand desk is a

feasible and easy intervention to indirectly avoid dangers of obesity, cardiovascular disease, diabetes and metabolic syndrome by reducing sitting time.

Apart from the indirect effects, sit-stand workstations/desks feature prominent direct improvement of musculoskeletal problems by providing more space for mobility. According to Lin et al. (2014: p1454), "the sitting workstation with elevated desk induced more non-neutral postures and increased muscle load, particularly on the shoulders...The greater dynamic range in standing workstations implies a greater variability in the range of muscle use for each muscle". Compared with traditional sitting workstations, standing workstations significantly increase flexibility of both angles and muscles, and release strain and fatigue caused by increasing muscle load while sitting.

Similar results have been found in other research, Hedge (2013: p537) demonstrates that on the basis of employees' responses "the ergonomic design improves the discomfort on neck, shoulder, upper back, lower back, upper arm, elbow, forearm, wrist and hand". Lin et al. (2014: p1453) also suggest that "the standing workstation at elbow height associated with the lowest shoulder abduction and elbow flexion". Furthermore, Hedge (2013: p537) points out that ergonomic workstations help improve health issues related to the inappropriate viewing angles which includes "dry eyes, irritated/red eyes, difficulty focusing, watery/runny eyes, eyestrain, headache". In conclusion, current studies show sit-stand workstations/desks have clear advantages on improving health conditions and typically solving musculoskeletal problems for white-collar workers, researchers, architects, designers and many other office workers

Part Three: Motivating People to Change

Implementing ergonomic projects is mutually beneficial for both employers and employees. The investment of ergonomic improvement in a workplace can offer great heath benefits to employees while optimizing physical wellness, increased satisfaction and happiness of employees stimulates the productivity of organizations, and, therefore, organizations perform better, attract and retain employees (Hedge, 2013: p538). However, the barrier of implementing ergonomic modification of a workplace is that both employers and employees do not pay enough attention to the negative consequences of sedentary behaviors in office. In addition, employers usually do not trust or accept that simple modifications of work environments can bring big changes to employees' health. Conversely, employees often react negatively to the programs of behavioral adjustment because of the intervention of their personal preferences of work and the time they spend doing what they have no interest in.

Nevertheless, new studies show the benefits of ergonomic changes in workplace for both employers and employees. Recent research proves that the simplest training of correcting working posture without even creating employees' awareness of right working postures can still help them build healthy postures, and "the results indicate that training in the correct interaction with one's workstation may have significant benefits to workers in terms of their musculoskeletal well-being (Mahmud, 2015: p1664)". In terms of applying sit-stand workstations to home and office work areas, a study has shown that by using sit-stand workstations "sitting time at work

decreased in the intervention condition compared to the control condition (73min/day and 74-91min/day when measured objectively and by self-report, respectively)". (Chau, et al., 2014: p5) Furthermore, additional research has discovered that the application of training with ergonomic chairs brings a greater positive outcome of productivity due to additional health gain. By evaluating the outcome of ergonomic training with and without ergonomic chairs, “the productivity increase for those who received the chair and training was $353 (2006 dollars) per worker per day compared to the control group. Those who only received the training did not significantly improve compared to the control group. Productivity increase attributable to health gains was $119 per worker per day; about 6% of the total production gains”. (Benjamin, 2006:p 812)

With regards to the improvement of employees’ willingness to accept ergonomic working equipment, organizations should pay attention to attitudes regarding the concept of ergonomics found in the management’s mindset. In other words, employers should think more about human factors when they advocate any change to an employee’s working habits and patterns. "Organizations have a responsibility to ensure employees are offered a meaningful and rewarding work experience". (Barlow and Getty, 2000: p622) It is important to internalize the awareness of ergonomics among employees in order to create a self-motivated adjustment for physical well-being. Only relying on the professional ergonomists cannot provide sustainable improvement of working experience. The ultimate goal is to achieve health benefit from self-help approaches. (Smith, 2003) Thus, applying sit-stand workstations to workplaces can be effective to let employees experience the benefits of healthy working habits.

An additional study found that sit-stand workstations are particularly suitable for different demographic segments to experience health benefits. Research has determined that most people reach the same or similar preferred postures when they use sit-stand workstations. In the study users are interrupted by adjusting the sit-stand workstations in extreme positions several times, however they all eventually readjust the workstations to a similar setting. They all notice "the setting the table height lower compared to their elbow height more comfortable to work with. Additionally, they preferred lower monitor height compared to their eye level with a slightly up-tilt display angle while performing standing computer work". (Lin & Dennerlein, 2015: p1290) Results imply that sit-stand workstations have the potential to have positive universal work applications. Moreover, another research indicates that non-sedentary workplaces strengthen interactions among group members as information sharing and information collaboration improves without the separation of seating or walls. They spontaneously become more active and engaged by removing chairs (Knight & Baer, 2014). Hence, by simply standing up, employees can directly experience a more positive physical health and a satisfying work atmosphere with improved communication and creativity.

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