Term Paper:

What's happening in Instructional Technology: Surprising Trends and their Consequences- with Respect to the Dangers of and Interventions for Sedentary Work

Mark C. Angel

Instructional Science and Technology, California State University, Monterey Bay

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Dr. Sarah Evanick

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Sedentary behavior at work(especially when one is working at home) has become a significant topic of interest for public health and occupational health. This development over the past few decades seems to have accompanied the growth and development of internet-based work, which keeps people at their desks and watching screens more than ever. More research will likely show that the COVID -19 pandemic has highlighted and greatly exacerbated this trend. A now popular catchphrase “sitting is the new smoking” is emblematic of this and the dangers it presents.

Instructional technology (IT) is devoted to bringing about change in people. This is accomplished by providing them with access to evidence, motivation, demonstration, and other effective forms of interventions in order to affect changes in behavior. IT targets gaps in behavior that, once addressed, are intended to help people become more efficient, effective, healthy, happy, and productive among other things. The role of IT, with respect to the dangers of and interventions for sedentary work, includes but is not limited to:

- identifying gaps that lead to a predominance of sedentary behavior;
- designing and developing optimal interventions that address these gaps;
- implementing effective solutions that decrease sedentary behavior; and,
- evaluating the efficacy of said solutions.

Introduction

What is the worst thing that can happen if you just do your job? Perhaps that depends on the kind of job you have. If you work in fire or emergency medical services, you can get burned, blown-up, hit by a car, catch a disease from a patient, or die of cardiac arrest while performing

your duties. If you are soldier, you can also get into all sorts of trouble during war time and training. If you are a cop, you might get shot or prosecuted for shooting someone else. According to the Bureau of Labor Statistics, US Department of Labor (2020) workplace fatalities due to injury were 5,333 in 2019. That is a rate of about 3.5 per 100,000 full-time equivalent workers, or about 0.2% of the total deaths for that year.

But what if you work behind a desk? It may surprise some people that sedentary work is one of the most dangerous jobs in the world. A preponderance of evidence shows that siting too much contributes significantly to disease, and is a cofactor in workplace injury (Biswas, et al., 2015). It has also been determined that workers who spend more than four hours a day sitting at their desk are among those workers most at risk for the plethora of dangers associated with sedentary behavior (Buckley, Hedge, Yates, et al., 2015). In fact, people who sit more than four hours a day (dangers increases the more time one spends without moving around) have a shorter life expectancy. They are prone to chronic pain, cardiovascular diseases, hypertension, cancer (especially bladder, breast and colon), obesity, diabetes, anxiety, depression, and dementia among others. Furthermore, a study by the Centers for Disease Control and Prevention (CDC) found that about 8% of deaths of non-disabled adults ages 25 and older were attributed to physical inactivity (Carlson, et al., 2018), in contrast to the 0.2% for those who have died due to work-place injury.

Costs to self & society

The above statistics show that chronic sedentary behavior is at least 40 times more likely to kill a worker than the incidents of more-active workers dying from an injury in all the other dangerous jobs put together. Based on these numbers, sedentary behavior could be considered the third leading cause of death in the United States after heart disease and cancer (Bureau of

Labor Statistics, US Department of Labor, 2020). This also creates a significant financial burden on the health care system. The estimated costs directly related to sedentary behaviors in the United States is $117 billion annually. This does not include indirect costs such as loss of productivity, or institutional costs from premature death and disability associated with illness caused or made worse by inactivity (Carlson, et. Al, 2015). A panel survey of economic impact (Valero-Elizondo, et al., 2012) shows that there is strong evidence that the health care expenditures and resource utilization decreases significantly for people who get regular moderate to vigorous activity according to the CDC recommendations of 150 minutes/week.

In the United States alone, the number of people who spend more than four hours a day sitting at a desk is staggering. The harm this sedentary lifestyle causes those workers is well documented (Biswas, et al., 2015). What makes it even worse is that many of those more sedentary people already have pre-existing conditions that make their circumstances even more dire and more difficult to overcome. In order to minimize that danger, it is necessary for them to move intentionally and more often throughout the day. van der Ploeg HP, et al. (2012) found that regular exercise scattered throughout the day is much more effective in combating the dangers of sedentary behavior than clumping it together (i.e., going to the gym). “Prolonged sitting is a risk factor for all-cause mortality, independent of physical activity. Public health programs should focus on reducing sitting time in addition to increasing physical activity levels” (van der Ploeg HP, et al., 2012).

According to the CDC’s Physical Activity Guidelines (CDC, 2020, pg. 56), adults benefit from doing both aerobic and strengthening exercises throughout each week. Exercise doesn’t have to be something to dread. Beneficial physical activity is considered any behavior that gets the body moving. Therefore, getting people out of their desk chair to stand and move more while

at work (even while conducting their business) is key to keeping people awake, focused, motivated, healthy, at work, and alive.

Not only is regular movement essential to one's general physical health, it is also immensely helpful to one's brain. One might argue that the most active part of a person who is primarily engaged in more sedentary types of work is their brain.

Benefits to the brain from mobilizing

According to neuroscientist Wendy Suzuki (2020), "Exercise is the most transformative thing you can do for your brain today." She gives three salient reasons in support of that statement:

1. Exercises immediately increases the amount of neurotransmitters, enhancing mood and a general sense of wellbeing.

2.Exercises increases attention and causes a lasting effect (more than two hours) on the ability to focus.

3. Exercise improves one's reaction time sharpening the minds activity.

Longer lasting effects of exercise on the brain over time include growing brain cells, which actually increase brain volume and long term memory. There are also marked improvements in attention function, and longer lasting mood enhancing effects. One example of the protective effects of having a bigger, stronger, and faster pre-frontal lobe and hippocampus is that the brain can resist the onset of dementia and Alzheimer disease longer.

There is much consensus that exercise is indeed great for one's health. Again, what may surprise people is that just putting in an hour or so at the gym before or after work will do little to mitigate the deleterious effects of too much sustained sitting throughout the day (Biswas, 2015).

Promising interventions that address sedentary behavior

So how do we get people to change? How do we get people to get up and move throughout the day?

A research review by Gardner, et al. (2016), found that some interventions worked better than others with respect to successful change in sedentary behavior. The most promising interventions were based on environmental restructuring (setting up a standing desk), persuasion, and education to get people to be less sedentary. The Gardner review takes a look at what could be considered instructional technology driven approaches to the solution for sitting too much. In the review, 26 studies were considered, investigating 38 different interventions. It was found that placing an emphasis on educating sedentary people as to the dangers of sedentary behavior was much more effective than just focusing on generally encouraging them to increase their exercise. This study focused on trying to find the most successful interventions and best practices for getting people on their feet and moving more often throughout the day.

Gardner's review (2016) showed that the most promising interventions investigated include:

- self-monitoring of sedentary behaviors and exercise;
- problem solving activities that address sedentary behavior and movement;
- modifying social and physical environments in the work-place; and,
- giving subjects clear information as to the dangerous health impacts of too much sitting.

These results were similar to previous work identifying the use of standing desks and personalized advice as effective in reducing sedentary behavior (Shrestha et al., 2015).

Gardner (2016) found that education, environmental restructuring, and enablement were often used with more success than trying to get people to exercise more. Among the most

commonly used techniques were setting behavioral goals, providing social support, and utilizing activity monitors and sit-stand desks:

> "This suggests that intervention developers have tended to conceive of sedentary behaviour as largely determined by external environments, or as a self-regulatory problem, and that people would be willing to reduce their sedentary time if the environment were modified, or if supported in developing self-regulatory skills for sitting less" (Gardner, 2016).

Other studies have shown that it is even more effective to combine self-regulatory behavior change techniques than to use them independently (Dombrowski et al., 2012; Michie, Abraham, et al., 2009).

Conclusion

It is clearly evident that people spend too much time sitting and reclining, and that these sedentary behaviors have significant deleterious effects on health. This is especially egregious with respect to people who are required to spend hours sitting at their desks for their livelihood because they have less choice in the matter. In order to get people to upend their sedentary behavior, it is necessary to clearly inform them, of the dangers of sitting too much, in ways that sink in. It is crucial not only to show them alternatives, provide goal-setting opportunities and self-monitoring systems, but also to provide them with a work-place environments that are conducive to standing and moving more.

These data also show the value of the motivational information and encouraging physical activity throughout the workday. Therefore, "by incorporating light activity into otherwise sedentary routines, substantial reductions may be achieved in sedentary behavior" (Rovniak et al., 2014; Steeves et al., 2012). Furthermore, it would be beneficial if employers not only educate

desk-workers about the benefits of moving more and standing at their desk, but enable them to do so by providing standing desks, social support, and work environments conducive to periodic light physical activity.

And for even greater health benefits, walk more (Smith-McLallen, et al., 2016).

References

Biswas, A., Oh P.I., Faulkner, G.E., Bajaj, R.R., Silver, M.A., Mitchell, M.S., Alter, DA. (2015, Jan 20). Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults: a systematic review and meta-analysis. *Annals of Internal Medicine*, *162(*2),123-32. doi: 10.7326/M14-1651. PMID: 25599350

Buckley, J. P., Hedge, A., Yates, T., et al. (2015). The sedentary office: an expert statement on the growing case for change towards better health and productivity, *British Journal of Sports Medicine.* 49:1357-1362.

Bureau of Labor Statistics, US Department of Labor. Press Release, National census of fatal occupational injuries in 2019. (2020, December 16). https://www.bls.gov/news.release/pdf/cfoi.pdf

Carlson, S. A., Adams, E. K., Yang, Z., Fulton, J. E. (2018). Percentage of deaths associated with inadequate physical activity in the United States. *Preventing Chronic Disease* 15:170354. DOI: http://dx.doi.org/10.5888/pcd18.170354.

Center for Disease Control and Prevention (2020). *Physical Activity Guidelines 2nd edition.* U.S. Department of Health and Human Services. Physical_Activity_Guidelines_2nd_edition.pdf#page=56

Carlson. S. A., Fulton, J. E., Pratt, M., Yang, Z., Adams, E. K. (2015). Inadequate Physical Activity and Health Care Expenditures in the United States, *Progress in Cardiovascular Diseases, Volume 57, Issue 4*,. https://doi.org/10.1016/j.pcad.2014.08.002

Dombrowski, S. U., Sniehotta, F. F., Avenell, A., Johnston, M., MacLennan, G., Araújo-Soares, V. (2012). Identifying active ingredients in complex behavioural interventions for obese adults with obesity-related co-morbidities or additional risk factors for co-morbidities: A

systematic review. *Health Psychology Review*. 7–32. doi: 10.1080/17437199.2010.513298.

Gardner, B., Smith, L., Lorencatto, F., Hamer, M., & Biddle, S. J. (2016). How to reduce sitting time? A review of behaviour change strategies used in sedentary behaviour reduction interventions among adults. *Health psychology review*, *10*(1), 89–112. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4743603/

Michie, S., Abraham, C., Whittington, C., McAteer, J., Gupta, S. (2009). Effective techniques in healthy eating and physical activity interventions: A meta-regression. *Health Psychology*. 690–701. doi: 10.1037/a0016136.

Rovniak, L. S., Denlinger, L., Duveneck, E., Sciamanna, C. N.. Kong, L., Freivalds, A., Ray, C. A. (2014). Feasibility of using a compact elliptical device to increase energy expenditure during sedentary activities. *Journal of Science and Medicine in Sport*. 376–380. doi: 10.1016/j.jsams.2013.07.014.

Shrestha, N., Ijaz, S., Kukkonen-Harjula, K. T., Kumar, S., Nwankwo, C. P. (2015) Workplace interventions for reducing sitting at work. *Cochrane Database of Systematic Reviews.* CD010912. doi: 10.1002/14651858.CD010912.pub2.

Smith-McLallen, Aaron & Heller, Debbie & Vernisi, Kristin & Gulick, Diana & Cruz, Samantha & Snyder, Richard (2016). Comparative Effectiveness of Two Walking Interventions on Participation, Step Counts, and Health. *American Journal of Health Promotion.* 31. 10.1177/0890117116658012.

Steeves, J.A., Bassett, D. R., Fitzhugh, E. C., Raynor, H. A., Thompson, D. L. (2012). Can sedentary behavior be made more active? A randomized pilot study of TV commercial

stepping versus walking. *International Journal of Behavioral Nutrition and Physical Activity*. 95. doi: 10.1186/1479-5868-9-95.

Suzuki, W. (2018, March 21) *The brain-changing benefits of exercise* [video]. TED Talk. https://www.youtube.com/watch?v=BHY0FxzoKZE&ab_channel=TED

van der Ploeg, H. P., Chey, T., Korda, R. J., Banks, E., Bauman, A. (2012, March 26) Sitting time and all-cause mortality risk in 222,497 Australian adults. *Arch Intern Med. 172(6):494-500*. doi: 10.1001/archinternmed.2011.2174. PMID: 22450936.

Valero-Elizondo, J., Salami, J. A., Chukwuemeka, U. O., Ogunmoroti, O., Arrieta, A., Spatz, E. S., Younus, A., Rana, J. S., Salim, S. V., Blankstein, R., Blaha, M. J., Veledar, E., & Nasir, K. (Originally published 7 Sep 2016). Economic Impact of Moderate-Vigorous Physical Activity Among Those With and Without Established Cardiovascular Disease: 2012 Medical Expenditure Panel Survey *Journal of the American Heart Association.* https://doi.org/10.1161/JAHA.116.003614