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Reducing Technostress through Workstation Designs

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ABSTRACT

Our study investigates how active workstations can influence an individual's affect and cognitive alertness in helping them cope with technostress, that is, stress caused by interacting with information technology devices. Affect underlies the individual's emotional experiences and can be positive (e.g. enthusiasm) or negative (e.g. frustration). Decreasing negative affect and enhancing positive affect of an individual can help modulate the intensity of stress. From our earlier studies, we find that body postures and movements impact individuals' affect and their cognitive alertness, and therefore may be leveraged as stress moderators. Hence, we propose that the use of active workstations will alleviate technostress. We plan to conduct an experiment in which participants will use active workstations in conditions that can test our proposed ideas. We will record physiological signals and participants' perceptual responses. Our research contributes to the emergent science on technostress by exploring methods that can alleviate the impact of stressors.

Keywords

Technostress, active workstations, physiological measures

INTRODUCTION

Initially noted as a modern disease of adaptation due to the inability of individuals to cope with information technologies (IT), technostress is increasing in scope and becoming a serious health concern (Ragu-Nathan, Tarafdar, Ragu-Nathan, and Tu, 2008; Ayyagari, Grover, and Purvis, 2011). While individual and workplace productivity has improved, the dark side of IT include high levels of technostress among individuals, reducing their task performance and leading to long- term health consequences. High levels of stress directly impact a person's health and is a demonstrated risk factor for anxiety, depression, and cardiovascular diseases, as well as for diabetes and obesity, because stressed people crave for food high in sugar and fat (Torres and Nowson, 2007).

Researchers have recognized technostress, alerted us to its detrimental effects on health, identified specific stressors, such as interruptions through pop-ups, but research has not yet addressed methods that can be enacted by *individuals* to alleviate technostress. Our study will address this gap by investigating how active workstations can influence an individual's affect and their cognitive alertness to help them respond to stressors. Affect is a neurophysiological state accessible as a nonreflective feeling that underlies individual emotional experiences (Russell, 2003). Examples include pleasure, displeasure, tension, relaxation, etc. While the nature of affective states may vary in individuals depending on the situation, a person experiences affect constantly, and this state is often described as a *positive affect* or *negative affect* (Ekkekakis, 2012).

Per the transactional model of stress and coping (TMSC), when individuals appraise an event (the stressor) to be detrimental to their goals, a negative affect arises and triggers a stress response (Lazarus and Folkman, 1984). Note that the result of the appraisal, that is, whether the event is brushed off or seen as damaging, depends on the affective state of the individual. Hence, tempering negative affect and enhancing positive affect of an individual can help modulate the intensity of the stress experienced by that person (Lovallo, 2016). Because body postures and movements impact individuals' affect and their cognitive alertness, they may be leveraged as stress moderators (Ekkekakis, 2000). Our preliminary findings with active workstations indicate support for these proposed ideas.

BACKGROUND AND SIGNIFICANCE

Technostress and its impact

During the past decade, researchers have identified events in our interactions with technology that lead to technostress. These incidents include system breakdown, having to learn new technical skills, slow response time, interruptions through pop-up messages, ads, or emails, referred as episodic stressors (Riedl, Kindermann, Auinger, and Javor, 2012; Tams, Hill, de Guinea, Thatcher, and Grover, 2014; Galluch, Grover, and Thatcher, 2015). Technostress leads to adverse psychological, behavioral and physical symptoms, while taking a toll on employees' well-being through negative job-related outcomes, including decreased job satisfaction and task performance (Ragu-Nathan et al., 2008; Tarafdar, Tu, and Ragu-Nathan, 2010). The cumulative effects of daily stressful episodes, result in a state of chronic stress with deleterious health effects, including weakened immune system, cardiovascular lesions, and mental health disorders (McEwen, 2000).

Biology of technostress

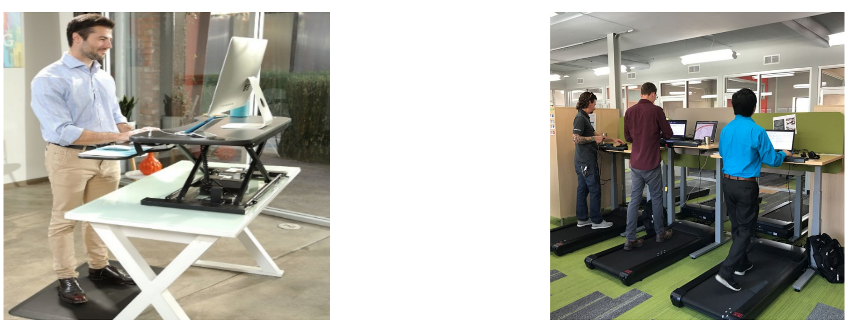
As per the TMSC, the extent to which the stress is experienced by an individual depends on that individual's appraisal of the stressor (Lazarus and Folkman, 1984). Thus, a noted stressor could lead to more alertness and task engagement, that is, a *eustress* situation. A stressor creates a *distress* situation when it negatively impacts the individual's wellbeing and performance. A stressor leads to eustress rather than distress only when the individual appraises the stressor to be a surmountable challenge rather than a burden preventing them to achieve their goals (Lazarus, 1999). Self-efficacy in one's ability to perform the specific task is paramount to a stressor leading to eustress rather than distress.

Emotional and cognitive regulation can help individuals deal with stressors such that they can alleviate negative psychological outcomes and long-term ill-effects on health. In fact, a positive affective state, which is a state of pleasant emotions, can be a buffer and reduce the impact of stress (Folkman, 1997). We therefore propose that if individuals are in a positive affective state, as is likely when they use active workstations to interact with technology, then they are better able to cope with stressors, such as pop-ups, and complete their tasks. Moreover, individuals using active workstations show higher cognitive alertness and greater attention to task compared to when they are sitting, which will influence more positive appraisals of stressors (Labonté-Lemoyne, Santhanam, Léger, Courtemanche, Fredette, and Sénécal, 2015).

Recent research shows that stress responses can also be generated unconsciously as classical conditioned responses acquired through prior exposure to stressors (Lovallo, 2016). The amygdala plays an important role in the conditioned responses as demonstrated by animal models and studies in humans (Davis and Whalen, 2001). The unconscious nature of stress responses must be emphasized, since self-report questionnaires will provide only a partial account of stress responses experienced by individuals. Therefore, physiological measures must be used to obtain a comprehensive understanding and assessment of stress.

New workstations as methods to alleviate technostress

New types of workstations, as shown in Figure 1, aimed to decrease ill-effects of sitting for long hours, are becoming popular and could keep individuals in relatively positive affective state. Human body postures and movements, such as walking, enhance an individual's positive affect (Ekkekakis, Hall, VanLanduyt, and Petruzzello, 2000). The physiological mechanisms of body posture influencing affect involve proprioceptive receptors that are in muscle spindles and tendons and transmit information on body position to the central nervous system through specific spinal tracts (Izard, 1993). The arousal observed during the upright position is due to the activation of the reticular activated system, a neurological structure involved in wakefulness, REM sleep, muscle tone and locomotion. High arousal is a key component of positive affect (Russell, 1980). Individuals sitting, or in a slumped physical posture, reported more negative affect compared to their counterparts who kept an upright posture (Riskind and Gotay, 1982). In another study, participants who stood upright compared to their counterparts who sat in in slumped position, indicated higher affect in terms of "higher self-esteem, more arousal, better mood, and lower fear" (Nair, Sagar, Sollers, Consedine, and Broadbent, 2014). Since upright posture creates a positive affective state, and a greater cognitive alertness, we can expect that individuals completing tasks on a computer using standing and treadmill desks are likely to be less stressed when facing episodic stressors, such as pop-ups, compared to those at sitting desks.



a) Standing desk b) Treadmill desk

Figure 1. Recent human-computer interaction trends: new workstations

PILOT STUDY AND PRELIMINARY RESULTS

A pilot study designed as a randomized controlled experiment with 15 research participants aged between 20 and 35 years (7 females; 8 males) was conducted during the fall of 2018. The participants were asked to perform a cognitive task, developed from prior studies, on a desktop computer across different types of workstations (sitting desk, standing desk, or treadmill desk).

Data collected during each experimental session included electroencephalogram, electrodermal activity, respiratory rate, and skin temperature. After each session, participants filled self-report questionnaires based on validated scales that measured their focused immersion denoting engagement in task, their attention to task, and their affect. Their task performance accuracy was also determined.

It was observed that focused immersion was larger in standing and treadmill workstations compared to the sitting position. Test scores on the experimental task and attention to task ratings did not differ substantially across workstations. Results on affect were mixed, with some positive affect items being higher during the standing position compared to the sitting and treadmill workstations. Physiological data showed higher arousal and alertness when participants used a standing or treadmill desk compared to when they used a sitting desk.

RESEARCH DESIGN AND METHODS

The study is a 3 x 2 between-within subject experimental design. The between-subject factor includes the three workstation modalities (sitting, standing, and treadmill desk). The within-subject factor is the exposure and non-exposure to the stressful stimulus. Participants will be randomized to one of the three between-subject factors. The sequence of the within-subject factor (interruptive messages) for each participant will be randomly determined. Each selected individual will take part in two experimental sessions (task performance under techno-stressors and without techno-stressors) according to their assigned group, and the two sessions will be held in two different days. These tasks will be developed based on prior research on cognition and brain executive functions, which comprise working memory, set shifting, and inhibition (Diamond, 2013).

Among the events identified as creating technostress, interruptions through pop-ups are considered serious (Tams et al., 2014; Galluch et al., 2015). Pop-ups will be used in the experiment because they are contemporary, ubiquitous, and of a frequent occurrence in daily interactions with technology. The interruptions through pop-up messages will be sent every 30 seconds and will be varied so as to avoid adaptation (Lovallo, 2016).

CONCLUSION

The broader impact of the proposed study draws attention to the emergent research topic of technostress in individuals and provides a framework to enable better technology-based methods and devices to be developed that can eventually benefit individual health and well-being. Our research is strongly motivated by the urgency to help people manage technostress specifically, but the study will also provide ways to deal with general stress that has long term chronic health effects.

REFERENCES

1. Ayyagari, R., Grover, V., and Purvis, R. (2011). Technostress: technological antecedents and implications. *MIS Quarterly*, 35, 4, 831-858.
2. Davis, M., and Whalen, P. J. (2001). The amygdala: vigilance and emotion. *Molecular Psychiatry*, 6, 1, 13-34.
3. Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, *64*, 135-168.
4. Ekkekakis, P., Hall, E.E., VanLanduyt, L.M. and Petruzzello, S. (2000). Walking in (affective circles): Can Short walks enhance affect? *Journal of Behavioral Medicine*, 23, 3.
5. Ekkekakis, P. (2012) Affect, Mood and Emotion, in *Measurement in sport and exercise psychology*,eds., Tenebaum, G., Eklund, R.C. and Kamata, A. *Human Kinetics*.
6. Folkman, S. (1997). Positive psychological states and coping with severe stress. *Social Science & Medicine*, 45, 8, 1207-1221.
7. Galluch, P. S., Grover, V., and Thatcher, J. B. (2015). Interrupting the workplace: Examining stressors in an information technology context. *Journal of the Association for Information Systems*, 16, 1, 1-47.
8. Izard, C. E. (1993). Four systems for emotion activation: cognitive and noncognitive processes. *Psychological Review*, 100, 1, 68-90
9. Labonté-LeMoyne, É., Santhanam, R., Léger, P. M., Courtemanche, F., Fredette, M., and Sénécal, S. (2015). The delayed effect of treadmill desk usage on recall and attention. *Computers in Human Behavior*, 46, 1-5.
10. Lazarus, R. S. (1999). Stress and emotion: A new synthesis. *Springer Publishing Company*.
11. Lazarus, R. S., and Folkman, S. (1984). Stress, appraisal, and coping. *Springer Publishing Company*.
12. Lovallo, W.R. (2016). Stress and Health: Biological and Psychological Interactions; 3rd edition. *Sage Publications.*

13. McEwen, B. S. (2000). The neurobiology of stress: from serendipity to clinical relevance. *Brain Research*, 886(1-2), 172-189.
14. Nair, S., Sagar, M., Sollers III, J., Consedine, N., and Broadbent, E. (2015). Do slumped and upright postures affect stress responses? A randomized trial. *Health Psychology*, 34, 6, 632-641.
15. Ragu-Nathan, T. S., Tarafdar, M., Ragu-Nathan, B. S., & Tu, Q. (2008). The consequences of technostress for end users in organizations: Conceptual development and empirical validation. *Information Systems Research*, *19*, 4, 417-433.
16. Riedl, R., Kindermann, H., Auinger, A., and Javor, A. (2012). Technostress from a neurobiological perspective. *Business & Information Systems Engineering*, *4*, 2, 61-69.
17. Riskind, J. H., and Gotay, C. C. (1982). Physical posture: Could it have regulatory or feedback effects on motivation and emotion? *Motivation and Emotion*, *6*, 3, 273-298.
18. Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, 39, 6, 1161-1178
19. Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, 110, 1, 145-172.
20. Tams, S., Hill, K., de Guinea, A. O., Thatcher, J., and Grover, V. (2014). NeuroIS-alternative or complement to existing methods? Illustrating the holistic effects of neuroscience and self-reported data in the context of technostress research. *Journal of the Association for Information Systems*, 15, 10, 723-753
21. Tarafdar, M., Tu, Q., and Ragu-Nathan, T. S. (2010). Impact of technostress on end-user satisfaction and performance. *Journal of Management Information Systems*, 27, 3, 303-334.
22. Torres, S. J., and Nowson, C. A. (2007). Relationship between stress, eating behavior, and obesity. *Nutrition*, 23, 11-12, 887-894.