NeuroIS Measures of Technostress: On the Use of α-Amylase as an Alternative to Cortisol

Stefan Tams, HEC Montréal
stefan.tams@hec.ca

Recent IS research has called for investigating the physiological factors underlying IT-related human behavior (Dimoka et al. 2011, 2012; Riedl et al. 2010). Such an investigation may be particularly useful in the context of technostress, an emerging phenomenon of strong practical significance (e.g., Dimoka et al. 2012; Riedl 2013), because stress can be found in both the human mind and the human body (Cooper et al. 2001). Yet, while the job stress literature has long recognized the potential of such biological measures as cortisol to complement psychological ones (i.e., self-reports) (Cooper et al. 2001), technostress research is slow in its adoption of biological measures. Only one published study to date (Riedl et al. 2012) has examined technostress from a biological perspective by measuring – largely consistent with the job stress literature – cortisol in saliva. This nascence of technostress research employing biological measures can perhaps be explained with the fact that the most widely known hormone in stress research (i.e., cortisol) peaks relatively late, about 20 minutes poststressor (Granger et al. 2007), a characteristic that may create logistical issues when studying stressful technological events in laboratory settings. However, besides cortisol, there are other important stress hormones such as adrenaline, which has only recently been approximated through the salivary stress enzyme α-amylase (sAA) (Granger et al. 2007). sAA is a marker of the sympathetic nervous system component of the psychobiology of stress and, as such, reflects changes in adrenaline. In contrast to cortisol, sAA peaks much faster (usually within 5 minutes poststressor), implying that its collection may entail a lower logistical burden than that of cortisol. Hence, sAA has become prominent as a cutting-edge measure of stress in biobehavioral research (Granger et al. 2007). The objective of the present paper is to explore *whether sAA may also be useful for research on technostress*.

Salivary α-amylase, which is officially classified as family 13 of the glycosyl hydrolases, reacts to both physical and psychological stressors (Granger et al. 2007). The latter characteristic renders it useful for research on technostress since such research has been informed by both biological and psychological theories to justify proposed relationships (e.g., Ayyagari et al. 2011; Riedl et al. 2012). Additionally, sAA can be collected non-invasively (Tams 2011), rendering it useful for research on technostress since the data collection itself does not create an alternative explanation for stress effects. Further, the amount of α-amylase in the saliva captured can easily be assessed by shipping the samples in a frozen condition to assay companies, such as the Center for Interdisciplinary Salivary Bioscience Research at Johns Hopkins University. These companies return a MS Excel file containing the α-amylase concentration per subject to the researcher, who can, then, directly import the data into statistical software packages. Thus, assessing the concentration of α-amylase in saliva is practical for technostress researchers, who most often do not have direct access to an assay lab.

Due to its useful properties, sAA has recently been employed successfully in technostress research. An early study by Tams (2011) used psychological theories complemented with biological concepts to hypothesize relationships among technological stressors, stress, performance, and related cognitive concepts. He evaluated his model using a lab experiment that integrated a memory task with the collection of sAA and other measures, and he found that sAA was predicted by stress-related psychological concepts and that it, in turn, predicted performance on the memory task. Hence, sAA constitutes a viable alternative to cortisol in technostress research for experiments requiring short-interval or repeated measurement points and simplified logistics.

REFERENCES

- Ayyagari, R., Grover, V., and Purvis, R. L. 2011. "Technostress: Technol. antecedents and implications," *MIS Quarterly* (35:4), 831-858.
- Cooper, C. L., Dewe, P. J., and O'Driscoll, M. P. 2001. "*Organizational stress: A review and critique of theory, research, and applications*," Thousand Oaks, US: Sage Publications, Inc.
- Dimoka, A., Banker, R.D., Benbasat, I., and Davis, F.D. et al. 2012. "On the Use of Neurophysiological Tools in IS Research: Developing a Research Agenda for NeuroIS," *MIS Quarterly* (36:3), 679-702.
- Dimoka, A., Pavlou, P.A., and Davis, F. 2011. "NeuroIS: The Potential of Cognitive Neuroscience for Information Systems Research," *Information Systems Research* (22:4), 687–702.
- Granger, D. A., Kivlighan, K. T., El-Sheikh, M., Gordis, E. B., and Stroud, L. R. 2007. "Salivary alpha-amylase in biobehavioral research: Recent developments and applications," *Annals of the New York Academy of Sciences* Vol. 1098, pages 122–144.
- Riedl, R. 2013. "On the Biology of Technostress: Literature Review and Research Agenda," *DATA BASE for Advances in Information Systems* (44:1), 18-55.
- Riedl, R., Banker, R., Benbasat, I., Davis, F.D., Dennis, A., Dimoka, A., Gefen, D., Gupta, A., Ischebek, A., Kenning, P., Pavlou, P.A., Muller-Putz, G., Straub, D., van Brocke, J., and Weber, B. 2010. "On the Foundations of NeuroIS: Reflections on the Gmunden Retreat 2009," *Communications of the AIS* (27:15), 243-264.
- Riedl, R., Kindermann, H., Auinger, A., Javor, A. 2012. "Technostress from a Neurobiological Perspective," *Business & Information Systems Engineering* (4:2), pp. 61-69.
- Tams, S. 2011. "*The Role of Age in Technology-Induced Workplace Stress*," Unpublished Doctoral Dissertation, Clemson University, USA.