Scientific validation of Wellnomics® Recorder (WorkPace®) as a tool for measuring computer use exposure

Wellnomics® White Paper

Dr Kevin Taylor, BE, PhD
Wellnomics Limited
www.wellnomics.com
research@wellnomics.com

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Validation of WorkPace for measuring computer use

High levels of computer use are generally acknowledged as an important risk factor for developing upper body symptoms and discomfort. Research suggests a dose-response relationship, with the risk increasing with higher levels of computer use.

The generally accepted mechanism for the risk involved in computer use is the static posture involved in using the computer or mouse, which causes sustained muscle tension and resulting muscle fatigue and inadequate muscle recovery. For this reason the primary metric researchers are interested is the total exposure time, rather than the number of actions performed at the computer (keystrokes or mouse clicks). (For more on this see Wellnomics white paper *Keystrokes vs Time as a Risk Factor for Musculoskeletal Discomfort and WMSDs*)

Most jobs involving computer use actually have a combination of computer and non-computer tasks (e.g. reading, meetings, telephone). Accordingly, obtaining accurate information on exposure can be difficult. One method is the traditional 'time and motion' approach where an observer watches the user during their normal work activities (either direct or by video recording) and records the time spent on each task. This provides an objective measurement of exposure.

Such observation is highly labour intensive, and accordingly many studies to date have instead relied upon user self-reports through questionnaires – asking users to asking users to estimate the number of hours they spend using the computer, keyboard and mouse each day. Of course, this method has the disadvantage of being subjective, and potentially unreliable. In fact, some recent studies on this exact question have concluded that self-reports are in fact quite inaccurate. Homan and Armstrong (2003)[2] found user self-reports overestimated computer use by between 1.5-4 times (compared to computer use as measured by video observation). Another study by Heinrich, Blatter and Bongers (2004)[1] found that self-estimation of total computer use was overestimated on average by 1.6 hours compared with computer use measured by direct observation.

As a result, researchers are increasingly turning to use of software monitoring tools such as WorkPace. Automated software monitoring has many advantages over both user self-reports, and observation. It is objective, not dependant upon subjective judgements by the user, it can provide minute-by-minute analysis over long periods of time, and it is easy to use across large numbers of computer users.

However, before measurement of exposure through software monitoring can become widely accepted the tools used need to be validated. We need to ensure that they do measure computer use exposure accurately and reliably in a way that matches to observation and that reflects the true underlying risks (static posture) that we're trying to measure.

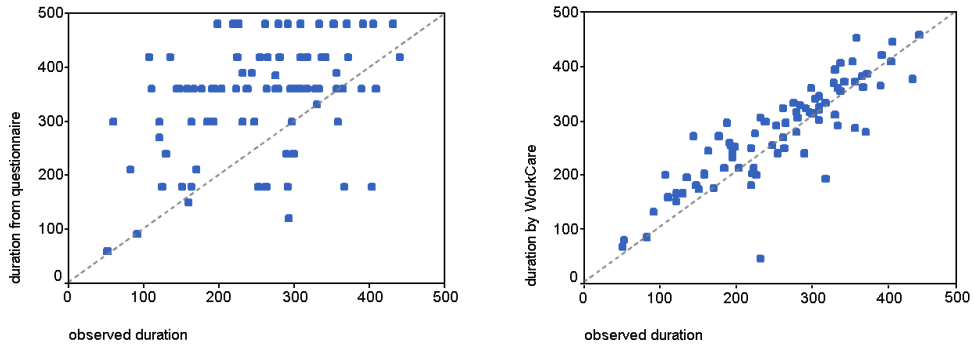
[1] Heinrich, J., Blatter, B.M. & Bongers, P.M. (2004) A comparison of methods for the assessment of postural load and duration of computer use. *Occupational and Environmental Medicine*, 61, 1027-1031

Wellnomics Limited | PO Box 31-281 | Christchurch | New Zealand
P +64 (0)3 365 3040 | 1800 769 7341 | F +64 (0)3 365 3045 | www.wellnomics.com

In the last few years a number studies have been done on WorkPace looking at just this issue. One of these is the Heinrich et al (2004)[1] paper referred to earlier, which also used WorkPace to record computer use and found that

> *"…WorkPace recorder is reliable enough to be used as a objective method in this study."*

A further study conducted by Douwes et al (2004)[2] also compared observation against self-reported computer use and data recorded by WorkPace. Results from this study are presented in the charts below.



Correlation of duration of computer use measured by questionnaire self reports and Wellnomics Recorder (WorkPace) against duration of use as measured by observation.

As these charts illustrate, WorkPace was found to be far more accurate than self-reports, and strongly correlated with observation. Douwes et al concluded

> *"…WorkPace recordings yield much better estimations of the duration of computer use than a questionnaire"*

Another study by Blangsted et al (2004)[3] designed to specifically test WorkPace's accuracy against observation concluded that

> *"The [WorkPace] software may be used as a valid tool to measure exposure in large epidemiological studies or to provide objective feedback on time spent at the computer and usage of keyboard and mouse…"*

Additional studies [4, 5, 6] have also been conducted using the WorkPace software, with WorkPace having been adopted as a defacto standard tool for measuring computer use amongst many researchers in this field.

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[2] Douwes, Blatter, Kraker (2004) Job differences in computer usage: typing, clicking and viewing the screen *Fifth Int Scientific Conf on Prevention of WMSDs, Zurich, Switzerland*. p113. A peer reviewed version of this paper is due for publication shortly.

[3] Blangsted, A. K., Hansen, K., Jensen, C. (2004) Validation of a commercial software package for quantification of computer use, *Int. Journal of Industrial Ergonomics*, 34, 237-241

[4] Toivonen, Takala (2004) Monitoring of keystrokes and mouse clicks in an ergonomic intervention study among VDU workers. *Fifth Int Scientific Conf on Prevention of WMSDs, Zurich, Switzerland*. p117

[5] Ijmker, Blatter, van der Beek, Bongers, van Mechelen (2004) Data collection using software, email and internet in the PROMO study amongst office workers. *Fifth Int Scientific Conf on Prevention of WMSDs, Zurich, Switzerland*. p109

[6] Kryer, A.I., Andersen, J.H., Lassen, C.F., Brandt, L.P.A., Vilstrup, I., Overgaard, E., Thomsen, J.F., Mikkelsen, S. (2003) Does computer use pose an occupational hazard for forearm pain; from the NUDATA study, *Occupational and Environmental Medicine*, 60:e14 (http://occenvmed.com/cgi/content/full/60/11/e14)