Development of a short form of the Workstyle measure

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Background ‘Workstyle’, or how a worker behaviourally, cognitively and physiologically responds to increased or stressful work demands, has been proposed to help explain the link between ergonomic and psychosocial factors in work-related upper limb disorder symptoms and disorders (WRULD).

Aim To describe the psychometric properties of a shortened version of the original Workstyle measure.

Methods Factor analyses of the Workstyle measure items were conducted to reduce the number of total items. Each of the subscales was then further reduced by randomly selecting half of the items within each subscale. Additionally, two subscales from the original survey (Pain/Tension and Numbness/Tingling) were eliminated because they were not used to calculate the original workstyle total score in order to reduce the influence of current symptoms on an individual’s total score.

Results The Workstyle Short Form was reduced to 32 items. Cronbach’s α was 0.89 and the test–retest reliability was \( r = 0.88, P < 0.01 \), for the total score. The short form score was significantly correlated with the full workstyle total score, \( r = 0.98, P < 0.01 \). Higher total workstyle scores were significantly associated with pain, functional limitations and adverse mental and physical health.

Conclusion The Workstyle Short Form demonstrated acceptable psychometric properties. These findings indicate its potential utility in research on WRULD.

Key words Ergonomics; job stress; occupational; pain; risk factors; upper limb symptoms; workstyle; WRULD.

Introduction Work-related upper limb disorder (WRULD) includes a heterogeneous group of symptoms and conditions involving the muscles, nerves and tendons of the upper limb that are developed, exacerbated and/or maintained by the workplace [1]. Research into the aetiology and course of WRULD has indicated that medical conditions, adverse biomechanical exposures, work organizational factors, work demands and individual psychosocial variables all play a role in the onset and maintenance of WRULD [1,2]. The presence of these risk factors and their interactions have been shown to be important when considering the course of WRULD and developing appropriate interventions [3,4]. ‘Workstyle’ is proposed as a mechanism by which ergonomic and psychosocial risk factors interact to affect the development, exacerbation and/or maintenance of upper limb pain and functional limitations [5,6].

Workstyle is characterized as an individual’s response to increased work demands. These increased demands can lead to heightened levels of physiological and psychological arousal, which may interact with specific physical and psychosocial risk factors in the workplace. The individual’s physiological reactivity, overt behaviour and cognitive appraisals are components of his/her workstyle which, when work demands or job stress are high, may lead to ‘risky’ biomechanical and cognitive work-related processes [6]. Examples are awkward postures, failure to rest or take breaks, high personal work expectations and ignoring and/or tolerating existing symptoms in order to keep working. Repeated elicitation of this adverse workstyle and concomitant physiological stress reactions may result in the development and/or maintenance of WRULD. It has been proposed that workstyle responses can exacerbate symptoms because workers respond in a way that increases exposure to biomechanical risk factors while reducing the likelihood of symptom relief [5,6].

Preliminary investigation into the role of workstyle related to WRULD has been promising [7–9] but limited...
by the absence of a validated measure of workstyle. To gain a clearer understanding of workstyle’s influences and characteristics, Feuerstein et al. [10] conducted an investigation into the components and experience of workstyle in office workers. This generated items that were hypothesized to reflect components of workstyle and developed a self-report Workstyle measure [10]. There are 10 factors in the measure, with the following subscales: Working Through Pain, Social Reactivity, Limited Workplace Support, Deadlines/Pressure, Self-imposed Workplace/Workload, Breaks, Mood, Pain/Tension, Autonomic Response and Numbness/Tingling. The full-scale Workstyle measure demonstrated high internal consistency among the subscales (α = 0.61–0.91) and good test–retest reliability of the total score (r = 0.90).

The 91 items in the Workstyle measure take ~15 min to complete. Because many studies employ a battery of different surveys, it is desirable to use shortened measures of various constructs. Therefore, a shorter version of the Workstyle measure that retains its reliability and valid psychometric properties was developed and this study aims to assess its reliability and consistency.

Methods

The 91 items from the original Workstyle measure were subjected to two factor analyses (one for the categorical items and one for the dichotomous items) to examine their factor loadings in the context of the Workstyle measure and independently from the items excluded in the original survey development process. Items with factor loadings <0.50 were excluded from the factor structure.

The total number of items for the survey was further reduced by a random split-half sampling of the remaining items within each subscale. Sampling was conducted from within the subscales rather than selecting half of the total remaining items so that the subscales would retain their original proportions and representations in the shorter survey. This was done so that the subscales with fewer items (e.g. Autonomic Response, which had only four items with factor loading >0.50) would not be seriously underrepresented or lost entirely in the new survey. The exception to this procedure was the Breaks subscale, which had only two items in the original survey. Both items were included in the short form so that this subscale would be represented in the new survey. The random sampling within each subscale was accomplished using the random selection function of Statistical Package for the Social Sciences (SPSS) version 10.0 for Windows.

The Pain/Tension and Numbness/Tingling subscales were excluded entirely from the Workstyle Short Form since these subscales are not used in the computation of the total workstyle score.

The Workstyle Short Form was tested using the existing data set from the original workstyle development and validation study [10]. Data were collected via an internet-based survey. This study employed 282 office workers from the Washington, DC, metro area recruited via advertisements in local newspapers, posted fliers and by word-of-mouth from participants who had already completed the survey. Participants completed an online consent form and a screening on the website. Before accessing the test survey, participants had to meet the following criteria: aged 21–60 years, not currently pregnant and had not been pregnant in the last year, employed full time (≥35 h/week), worked on a computer keyboard for a minimum of 4 h/day and worked in the current job for at least the last year. Participants who did not report inclusion criteria were unable to access the test survey.

The online survey consisted of a set of questionnaires including the workstyle items and measures of the following: sociodemographics, work history, upper limb symptoms, history, lifestyle, work stress, social desirability, function and health, ergonomic exposures and the percentage of time spent per workplace task during the workday. Respondents rated their level of pain within the past week by using a single-item visual analogue scale of pain [11], which ranged from 0 to 10 (no pain to severe pain, respectively) [12]. Symptoms were reported via a modified National Institute of Occupational Safety and Health symptom survey [13,14]. Participants completed the Job Stress subscale of the Life Stressors and Social Resources Inventory [15], subscales of the Job Content Questionnaire [16] and questions regarding workload, workload variability and workload exhaustion to assess perceived work demands [17]. Function and health status were assessed using the Upper Extremity Function Scale [18] and the Short Form 12 Health Survey [19]. The Job Requirements and Physical Demands Survey [20] was used to assess ergonomic exposure in the workplace. The Marlowe–Crowne Social Desirability Scale [21] was included to assess social desirability or the tendency to present oneself in what is assumed to be a socially acceptable light. The Workstyle Short Form and its scoring are provided in the Appendix.

All statistical analyses were conducted using SPSS version 10.0 [22].

Results

The average age of the participants was 41 years (SD = 10.9). The majority (76%) of these respondents were females and most had advanced educational degrees. Participants worked an average of 42.3 h/week (SD = 9.9) and had been at their current jobs for 6.2 years (SD = 6.6). Other specific subject characteristics and their distributions by group are presented in Table 1 (available as Supplementary data at Occupational Medicine Online).

The factor structure selection and random split-half processes resulted in a total of 32 items for the Workstyle
The reliability of the Workstyle Short Form was examined in terms of its internal consistency and stability over time. The measure demonstrated a high degree of internal consistency with a reliability coefficient of $\alpha = 0.89$. Test–retest reliability was assessed by examining the correlation of the baseline short form total workstyle score with the short form total workstyle score from the surveys completed 3 weeks after the baseline assessment. This analysis indicated stable test–retest reliability with a correlation coefficient of $r = 0.88$, $P < 0.01$

The Workstyle Short Form’s total workstyle score was significantly correlated with the total workstyle score from the original Workstyle measure, $r = 0.98$, $P < 0.01$ [10]. The short form score demonstrated significant correlations with measures of pain, $r = 0.41$, $P < 0.01$; upper extremity symptoms, $r = 0.33$, $P < 0.01$; functional limitation, $r = 0.43$, $P < 0.01$; and an inverse relationship to overall physical health, $r = -0.23$, $P < 0.01$.

In addition to correlations between the total workstyle score and clinical measures, trend analyses were conducted to investigate the relationship of increasing workstyle scores with levels of clinical outcomes. A trend analysis of the short form total workstyle score indicated a significant linear trend for increasing adverse outcomes including pain, $F = 38.53$, df = 1, $P < 0.01$, and functional limitation, $F = 66.41$, df = 1, $P < 0.01$.

Discussion

The Workstyle Short Form is a reliable and valid version of the Workstyle measure for use in studies regarding WRULD. The high levels of internal consistency and test–retest reliability indicate that the Workstyle Short Form is reliable and stable (in the short term) in detecting workstyle responses. Construct validity examinations indicate that the Workstyle Short Form captures those physiological, cognitive and behavioural responses that are proposed as characteristics of the workstyle concept and risk factors for the development, exacerbation and maintenance of WRULD. The significant correlations between the Workstyle Short Form and the Workstyle Survey indicate that the short form is representative of, and adequately collects much of, workstyle-related data obtained by the original survey.

The significant cross-sectional correlations with clinical data and the linear trend for increasing adverse outcomes with increasing Workstyle Short Form score suggest that the workstyle score is associated with levels of pain, function and symptoms. The intent of this study was not to elaborate on causal links. This will need to be determined in future research. The use of a convenience sample could have biased the findings. Participants were not randomly drawn from a population of office workers. The sample comprised mainly of highly educated women in their 40s. More detail on the participants is available [10]. Future research needs to use a more representative sample of the workforce in general.

The Workstyle Short Form and the original Workstyle measure both serve a useful function in the study of WRULD. As increasing evidence emerges for workstyle’s contribution to the course of WRULD [7,8,23–26], a standardized measure of workstyle may be useful for future epidemiological and clinical research.

Conflicts of interest

The opinions and assertions contained herein are the private views of the authors and are not to be construed as being official or as reflecting the views of the Uniformed Services University of the Health Sciences or the Department of Defense.

References


14. If I bring up problem(s) to my supervisor, like a co-worker not pulling his/her weight, it won’t make any difference anyway, so I just go ahead and do the work myself.
15. It is frustrating to work for those who don’t have the same sense of quality that I do.
16. I have too many deadlines and will never be able to get all my work done.
17. Even if I organize my work so that I can meet deadlines, things change and then I have to work even harder to get my work done on time.
18. My schedule at work is very uncontrollable.
19. I feel pressured when I’m working at my workstation.
20. I push myself and have higher expectations than my supervisor and others that I have to deal with at work.
21. My co-workers don’t pull their weight and I have to take up the slack.
22. Others tell me I should slow down and not work so hard.
23. I take time to pause or stretch during a typical day at work.
24. I take breaks when I am involved in a project at my workstation.

Scale

Part 2

Check all the behaviours/emotions/symptoms that you experience only during periods of high work demands/workload.

25. Anger [[]]
26. Out of control [[]]
27. Have trouble concentrating/focusing on work [[]]
28. Depleted/worn-out [[]]
29. Overwhelmed [[]]
30. Short fuse/irritable [[]]
31. Cold feet [[]]
32. Cold hands [[]]

Workstyle Short Form scoring procedures

There are three summary scores that can be calculated as indicated below. These have different scoring routines.

Summary score 1—Workstyle characteristic responses to the workplace score (Part 1): This summary score is a measure of the cognitive/behavioural responses of workstyle to the workplace in general. To score this subscale, add the scores of the Working Through Pain, Social Reactivity, Limited Workplace Support, Deadlines/Pressure and Self-imposed Workspace/Workload subscales and subtract the score from the Breaks subscale.

Summary score 2—Workstyle reactivity to high work demands score (Part 2): This summary score is the total of the dichotomous items factors. The reactivity to high work demands score is believed to be representative of subjective and physiological distress/arousal experienced during periods of high-risk workstyle. Items include the sum of the Mood and Autonomic subscales.

1. Individual questions should be scored according to the possible responses listed below.

<table>
<thead>
<tr>
<th>Question numbers</th>
<th>Response options</th>
<th>Scoring values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questions 1–24</td>
<td>Almost never</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Rarely</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Frequently</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Almost always</td>
<td>4</td>
</tr>
<tr>
<td>Questions 25–32</td>
<td>Blank</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Checked</td>
<td>1</td>
</tr>
</tbody>
</table>

2. Each subscale is scored by adding the scores of all the questions in that subscale.

<table>
<thead>
<tr>
<th>Workstyle subscale</th>
<th>Questions included</th>
<th>Summary score</th>
<th>Questions included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working Through Pain</td>
<td>1–6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Reactivity</td>
<td>7–11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited Workplace Support</td>
<td>12–15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deadlines/Pressure</td>
<td>16–19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-imposed Workplace/Workload Breaks</td>
<td>20–22</td>
<td>(Sum of 1–22) minus (sum of 23–24)</td>
<td></td>
</tr>
<tr>
<td>Mood</td>
<td>25–30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autonomic</td>
<td>31–32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Workstyle characteristic responses to the workplace score (Part 1) = (Sum of 1–22) minus (sum of 23–24)

Workstyle reactivity to high work demands (Part 2) = (Sum of 25–32)

Total score = (Part 1 + Part 2)*

*Workstyle score is considered ‘at risk’ if total is ≥28.
Summary score—Total workstyle score: This summary score is a summation of Part 1 and Part 2. It was calculated for the purpose of differentiating groups based on workstyle scores. This score excludes the subscale that focuses on symptoms in response to increased work demands. The summary score has been used in most comparisons and predictions of group status and outcomes thus far because it is assumed to be a measure of workstyle that is not impacted by pain and symptoms, i.e. it does not contain the subscale related to pain and other symptoms.

According to the initial validation sample, a total Workstyle Short Form score is considered high risk if the score is $\geq 28$. 