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Reliability and concurrent validity of the Ccomputer Workstation Checklist

Nancy A. Baker[a,*], Heather Livengood[a] and Karen Jacobs[b]
[a]*Department of Occupational Therapy, University of Pittsburgh, Pittsburgh, PA, USA*
[b]*Department of Occupational Therapy, Boston University, Boston, MA, USA*

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Abstract.
BACKGROUND: Self-report checklists are used to assess computer workstation set up, typically by workers not trained in ergonomic assessment or checklist interpretation. Though many checklists exist, few have been evaluated for reliability and validity.
OBJECTIVE: This study examined reliability and validity of the Computer Workstation Checklist (CWC) to identify mismatches between workers' self-reported workstation problems.
METHODS: The CWC was completed at baseline and at 1 month to establish reliability. Validity was determined with CWC baseline data compared to an onsite workstation evaluation conducted by an expert in computer workstation assessment.
RESULTS: Reliability ranged from fair to near perfect (prevalence-adjusted bias-adjusted kappa, 0.38–0.93); items with the strongest agreement were related to the input device, monitor, computer table, and document holder. The CWC had greater specificity (11 of 16 items) than sensitivity (3 of 16 items). The positive predictive value was greater than the negative predictive value for all questions.
CONCLUSION: The CWC has strong reliability. Sensitivity and specificity suggested workers often indicated no problems with workstation setup when problems existed. The evidence suggests that while the CWC may not be valid when used alone, it may be a suitable adjunct to an ergonomic assessment completed by professionals.

Keywords: Ergonomics, workplace, psychometrics

1. Introduction

There are many methods to assess the ergonomics of computer workstations: from simple, self-report checklists to comprehensive evaluations with sophisticated equipment. The most effective approach for conducting an assessment of a computer workstation is an onsite, face-to-face evaluation by a professional trained in ergonomic evaluation. Ergonomic experts often use a checklist to make sure that all potential issues have been addressed. However, in many cases, computer operators do not have access to an ergonomics expert and have to rely on self-assessment or untrained personnel to identify problems and solutions.

There are many checklists and online sites that provide the basics of ergonomic assessment which can be used by computer operators to complete this self-assessment [1–4]. These checklists generally evaluate the overall workstation, chair, keyboard, input device, monitor, environmental factors, and work habits. Unfortunately, self-assessment using a checklist may not be adequate to help untrained personnel identify workstation risks and methods to reduce them [5,6]. Computer operators may not be able to correctly identify risky postures, particularly as people with pain or disorders may have decreased position sense [7,8]. Com-

*Corresponding author: Nancy A. Baker, 5012 Forbes Tower, University of Pittsburgh, Pittsburgh, PA 15260, USA. Tel.: +1 412 383 6607; Fax: +1 412 383 6613; E-mail: nab36@pitt.edu.

puter operators may not be able to identify the appropriate workstation changes, such as whether to reposition existing equipment or buy new equipment [5, 9]. In addition, computer operators may be unaware of resources to obtain new equipment, or of legislations, such as the Americans with Disability Act, that can be used to assist with obtaining reasonable accommodations [10].

Another reason that self-assessment using a checklist may not be effective is, although there are numerous computer workstation self-report forms available, very few have been psychometrically evaluated to determine if their results are reliable, and more importantly, valid measures of workstation setup. An exception to this is the validated office ergonomics checklist (i.e., the Computer Use Checklist) created by Janowitz and colleagues [11] which primarily focuses on working postures and movement patterns rather than risk factors. Psychometric testing indicated that the Computer Use Checklist was only reliable when administered by an ergonomics expert and not when used as a self-assessment by untrained workers. It also demonstrated only limited validity identifying those with musculoskeletal pain [12]. There is a need for reliable and valid measures that help computer operators self-identify risks.

The purpose of this study was to examine the psychometrics of the Computer Workstation Checklist (CWC), a self-report checklist designed to identify computer workstation items that need adjustment. In this study, we examined the test-retest reliability and the concurrent criterion validity of key diagnostic questions of the CWC by comparing the results of respondents' self-reports of workstation problems using the CWC to the results of an evaluation of the computer workstation by an expert in ergonomic assessment.

2. Method

Data for this study was collected as part of a parent study which examined the effect of an ergonomic workstation setup on musculoskeletal discomfort.

2.1. Respondents

Respondents were recruited at the University of Pittsburgh. The inclusion criteria were: working aged adults (18–65 years); used a computer at work for at least 20 hours weekly; and had experienced musculoskeletal symptoms of at least 2 on a numerical rating scale where 0 was no pain and 10 the worst possible pain. Respondents were excluded if they had a recent history of upper extremity musculoskeletal injury with current symptoms or had a rheumatic disorder such as rheumatoid arthritis or fibromyalgia.

Table 1
Areas assessed by the computer workstation checklist

	Total number of questions
Computer equipment	5
Overall workstation problems	4
Chair evaluation	31
Keyboard evaluation	11
Input device evaluation	9
Monitor evaluation	7
Computer table evaluation	8
Document holder evaluation	3
Environmental factors	6
Work habits evaluation	3

2.2. Instrument

2.2.1. Computer Workstation Checklist (CWC)

The CWC is an 87-item self-report checklist. The CWC was based on the *Creating the Ideal Computer Workstation: A Step-by-Step Guide (Guide)* [4]. Since 2000, the *Guide* has been extensively used by researchers in their clinical practices in ergonomics. However, over time it has become apparent that the *Guide* was missing some important questions related to computer workstation issues. The CWC was developed to address these missing aspects and to increase the comprehensiveness of the evaluation. The CWC assesses the following areas of the computer workstation: overall workstation, chair, keyboard, input device, monitor, environmental factors, and work habits (Table 1). In each area, respondents are asked to consider currently available equipment and whether the equipment is configured to match their personal specifications. The overall workstation items address relative space and the type of available equipment (e.g., a document holder and adjustable table). Chair items include the adjustability of the controls, the chair height, seat length and width, padding, the presence and position of a backrest and armrests, and the type of chair base. Keyboard items address keyboard placement relative to other workstation equipment and space, respondents' body postures, comfort, and the stability of the work surface. Input device items include placement of the input device relative to workstation equipment, available space, and respondents' body postures, comfort of the input device, ease of use, and stability of the work surface. Monitor items include adjustability and posi-

tion (e.g., height and distance) and visual needs (e.g., whether respondents wear bifocals or trifocals and the clarity of images or size of text for reading ease). Finally, respondents rate environmental factors that may affect their performance such as noise, room temperature, and glare. Respondents also consider work habits such as frequency of breaks and changes in body position.

The checklist is dichotomous (yes/no) except for computer equipment specifications. When responses are "no", these answers indicate potential problem areas.

2.3. Procedure

The study was approved by the University of Pittsburgh Institutional Review Board and respondent consent was obtained prior to assessment. To determine test-retest reliability, respondents completed the CWC during their baseline assessment during the parent study and again 1 month later. We anticipated that the 1 month interval between CWC completions should be sufficient to minimize memory bias. Both assessments were completed online using SurveyMonkey^{TM}. No intervention or feedback regarding the workstation setup was provided between the two assessment time points.

Criterion validity was assessed to establish how well the CWC identified mismatches between workstation configurations and self-perceived positions of the workers. Specifically, the CWC data obtained at baseline was compared with onsite workstation evaluations completed by an occupational therapist with clinical and research experience in computer workstation assessment.

Baseline digital photographs of the computer workstation were taken by a trained research coordinator. These photographs showed respondents seated at their computer workstations. Multiple shots were taken, including full body and close-up lateral views. The occupational therapist used these photographs to assess the workstation and identify if there were problems in 16 specific areas where mismatches between the worker and workstation commonly occur. These 16 areas corresponded to 16 diagnostic items on the CWC (See Table 2). The occupational therapist then conducted an onsite workstation evaluation, assessing these16 specific areas to confirm that problem areas were correctly identified. This onsite workstation evaluation served as the criterion reference gold standard to which the CWC responses were compared.

2.4. Statistical analyses

Statistical analyses were completed using SPSS (version 19.0). The kappa coefficient was used to assess reliability as the data were dichotomous and nominal [13]. The magnitude of the kappa coefficient is influenced by both prevalence and bias. When the distribution between concordant cells in the 2×2 table is disproportionately unbalanced, the prevalence proportion is large and results in an underestimated kappa coefficient. When the distribution between discordant cells is disproportionately unbalanced, the bias proportion is large and results in an overestimated kappa coefficient. Due to the imbalance in our data between high and low distribution of counts related to prevalence and bias, the prevalence-adjusted bias-adjusted kappa (PABAK) was used to ensure accurate results. The PABAK adjusts the average of counts between the concordant and discordant squares to minimize the influence of prevalence and bias [13]. The following scale was used to interpret the strength of the agreement using the kappa coefficient: $\leqslant 0$ = poor, 0.01–0.20 = slight, 0.21–0.40 = fair, 0.41–0.60 = moderate, 0.61–0.80 = substantial, and 0.81–1.0 = almost perfect [13].

Sensitivity, the proportion of responses in which the CWC correctly identified problems when they existed, and specificity, the proportion of responses in which the CWC correctly identified no problems when no problems existed, were calculated to determine validity. Positive predictive value (PPV), the probability a workstation had a problem area when the CWC identified a problem area, and negative predictive value (NPV), the probability a workstation had no problem area when the CWC identified no problem area, were also calculated (Table 2).

For the purposes of assessment of reliability and validity, analysis of all descriptive questions such as "Do you know how to operate your chair controls?" are not provided here. Of primary interest was the ability of the instrument to correctly identify (diagnose) the presence of the mismatches between the computer operator and the workstation that might place the operator at risk for musculoskeletal disorders. Thus, only reliability and validity were reported for the16 diagnostic questions of the CWC. The reliability of other questions is provided in Appendix 1.

3. Results

Thirty respondents were recruited (Table 3). The mean age of respondents was 47.2 years (SD, 10.6), 28

Table 2
Reliability and validity of the computer workstation checklist (16 diagnostic questions)

	Reliability		Validity			
CWC questions	Kappa	PABAK	Sens	Spec	PPV	NPV
Chair						
Is your chair height adjusted so your feet are flat on the floor (or on a footrest) with your back supported by the backrest?	0.34	0.66	0.25	1.00	1.00	0.40
With your back against the backrest, does the back of your knees extend at least 3 finger widths past the front edge of your chair seat?	0.58	0.59	0.91	0.79	0.71	0.94
Is your chair seat a comfortable width for you?	0.35	0.79	1.00	1.00	1.00	1.00
Does your backrest support your entire back?	0.38	0.38	0.80	0.93	0.92	0.82
Is your armrest height approximately the same height as your keyboard height?	0.71	0.72	0.50	0.67	0.69	0.47
Keyboard						
Is the height of your keyboard low enough so that your arms are relaxed at your sides with your elbows bent at approximately 90° (right angle)?	0.39	0.53	0.27	1.00	1.00	0.33
Is your keyboard comfortable to use?	0.61	0.80	1.00	1.00	1.00	1.00
Input device						
Is your input device positioned as close to your body as your keyboard?	0.63	0.67	0.62	0.94	0.89	0.76
Is the height of your input device low enough so that your arms are relaxed at your sides?	0.60	0.60	0.52	0.80	0.93	0.25
Is your input device comfortable to use?	−0.07	0.73	0.50	1.00	1.00	0.93
Monitor						
Is the viewing distance from your eyes to the monitor screen at your arm's length away (closed fist)?	0.52	0.53	0.56	0.86	0.82	0.63
Is your monitor positioned in front of you, so you do not have to turn your head or neck to view it?	0.65	0.93	0.20	0.96	0.50	0.86
Is your monitor positioned so that the top of the monitor is at about eye level?	0.59	0.67	0.24	0.89	0.83	0.33
Computer table						
Is your computer table large enough to accommodate work objects, and allow you to write or perform tasks other than computer use?	0.84	0.93	0.78	1.00	1.00	0.91
Have you removed all under computer table obstructions?	0.48	0.53	0.63	0.91	0.71	0.87
Document holder						
Do you need to use a document holder?	0.89	0.93	0.50	1.00	1.00	0.93

Note. CWC = Computer Workstation Checklist; PABAK = prevalence-adjusted bias-adjusted kappa; Sens = sensitivity; Spec = specificity; PPV = positive predictive value; NPV = negative predictive value.

were female, and 25 were White. All respondents were employed full-time. The average number of years respondents used a computer at work was 15.1 (SD, 9.3) and time spent per day using a computer averaged 6.2 hours (SD, 1.6).

The PABAK scores for test-retest reliability collectively ranged from fair to almost perfect (0.38 to 0.93; Table 2). PABAK scores for setup of the chair (0.38 to 0.79) ranged from fair to substantial and the keyboard (0.53 to 0.80) ranged from moderate to substantial. The PABAK scores for the input device (0.60 to 0.73), monitor (0.53 to 0.93), and computer table (0.53 to 0.93) ranged from moderate to almost perfect. The one question for the document holder had an almost perfect PABAK score (0.93).

Overall, the validity of the CWC demonstrated greater specificity than sensitivity for most items (Table 2). A score of greater than or equal to 0.90 was used as an indicator of excellent validity. Only 3 of 16 questions met this metric for sensitivity, while 11 of 16 questions met it for specificity. Two questions, one each for chair and keyboard, had 100% sensitivity and specificity. The PPV was greater than the NPV for all questions except three related to chair, monitor, and computer table areas. There were 7 questions with 100% PPV and 2 questions with 100% NPV.

4. Discussion

Self-report checklists are commonly used to assist computer operators identify if there are problems with workstation setup. Workers use the checklists to identify problems and are expected to self-identify solutions for these problems. In some cases, computer operators identify problems and an expert uses this information to develop solutions. The CWC uses typical questions seen in many of the current self-report instruments. The purpose of this study was twofold: 1) examine the test-retest reliability of the CWC and 2) determine the concurrent criterion validity of key CWC diagnostic questions by comparing the results of respon-

Table 3
Respondent demographic and clinical characteristics

Demographic	n (%) Mean ± SD
Age	47.2 ± 10.6
Gender	
Male	2 (6.7)
Female	28 (93.3)
Race	
Black or African American	4 (13.3)
White	25 (83.3)
More than 1 answer	1 (3.3)
Highest level of education	
Secondary	1
Post high school	29
Use of pain medication	
Prescription	2
Non-prescription	9
Both	3
Level of discomfort	
Eyes	1.85 ± 0.35
Neck/Shoulders	2.67 ± 0.41
Back	1.78 ± 0.31
Right elbow/forearm/wrist/hand	2.59 ± 0.34
Left elbow/forearm/wrist/hand	1.93 ± 0.30

Note. Level of discomfort scores collected from the Work Discomfort Survey. Higher scores indicate more discomfort on a 0–10 scale.

dents' self-report to the results of an onsite workstation evaluation completed by an expert in ergonomic assessment. The diagnostic questions were examined as these questions are ones that will be used to identify problem areas that need remediation. If respondents cannot correctly identify problem areas, then they cannot correctly remediate problems.

Test-retest reliability is a measure of how consistently the CWC reproduced the same result following repeated administration, given no true changes to the workstation setup. In general, the CWC items demonstrated moderate to near perfect reliability once we controlled for prevalence and bias. The only exception was for the item related to the backrest (Does your backrest support your entire back?). This question may require further specification as to what constitutes the "entire back."

Although the PABAK statistic was used to minimize the influence of prevalence and bias, variability of reliability across items remained. This variability may be explained by several factors. Of the CWC areas that we assessed, items that addressed the monitor and computer table had the strongest agreement. This finding may reflect the stationary nature of these workstation items compared to the chair, keyboard, or input device. Also, the monitor and computer table are external points of reference to respondents in regard to awareness of body position, and therefore may be easier to understand. Completion of the CWC at baseline may have influenced respondents' perceptions of workstation setup, prompting respondents to make subtle changes to their workstation. The variability in scores may then reflect true differences of the measures when there was, in fact, a change to the workstation setup.

The criterion validity of the CWC was much more accurate for specificity than sensitivity, indicating a high number of false negative outcomes. Respondents were more likely to indicate they had no problems with their workstation, whether they had problems or not. For clinical application, an instrument with very high specificity is most accurate identifying those who have the problem of interest rather than ruling out those who do not have problems. Items with high specificity and low sensitivity have high positive predictive values (PPV) and low negative predictive values (NPV). While this would seem counterintuitive, it is an example of the rule of SpPin described by Sackett and colleagues [14]. In SpPin when an item has high Specificity, a Positive response rules in the problem area. In the case of the CWC, if respondents identified that they had problems with their workstation setup, it was almost certain that they did (PPV); whereas, if they identified that they did not have problems with their workstation setup, it was uncertain whether they did or did not have a problem (NPV). Table 4 demonstrates why high specificity suggests that positive responses on the CWC indicated problems at the workplace. Twenty-four people responded "no" on the CWC to the question "Is the height of your keyboard low enough so that your arms are relaxed at your sides with your elbows bent at approximately 90° (right angle)?" Of those 24 people, 8 actually did not have problems, while 16 actually did. Conversely, while only 6 people reported "yes" they had problems; each of those 6 actually had problems with their keyboard height. Thus, the ability of respondents to self-identify problems using the CWC is poor for many of the diagnostic questions.

This study design had several limitations with regard to validity. Three criteria to judge the validity of an instrument are measurement, representation, and ascertainment [15]. Measurement is whether the reference gold standard (i.e., the onsite workstation evaluation by the occupational therapist) was measured independent and blind of the CWC. Representation is whether the respondents were representative of the larger population for whom the CWC is intended. Ascertainment is whether the onsite workstation evaluation was com-

Table 4
Keyboard height as an example of why a positive result on an instrument with high specificity indicates the presence of the disorder (SpPin)

		Results of ergonomic assessment of computer workstation (reference standard)		
		Problem	No problem	Total
Results of CWC	Problem	6	0	6
	No Problem	16	8	24
	Total	22	8	30

Sensitivity, 6/22 = 0.27 Of respondents who had a problem with keyboard height only 27% were correctly identified by the CWC; Specificity, 8/8 = 1.00 Of respondents who did not have a problem with keyboard height 100% were correctly identified by the CWC; PPV, 6/6 = 1.00 100% of respondents who answered "yes" on the CWC actually had a problem with keyboard height; NPV, 16/24 = 0.33 33% of respondents who answered "no" on the CWC actually had no problem with keyboard height.

pleted regardless of the results of the CWC and digital photographs. The onsite evaluation was completed by the same occupational therapist who reviewed both the baseline CWC and digital photographs. Therefore, the occupational therapist was not blind to potential workstation problem areas at the onsite evaluation, which introduced bias (measurement). Additionally, the reference gold standard was based on clinical expertise, not an objective measure. The intent of the study design was to conduct a pilot test of the CWC, therefore, the number of respondents and convenient recruitment places limitation on generalization of the sample to a spectrum of the population (representation). There was 100% compliance with CWC completion and every participant received an onsite workstation evaluation, each independent of the other (ascertainment).

The results of this study do not support the use of self-administered checklists to identify problem areas in computer workstations. While there have been no other studies in the peer-reviewed literature on the validity of self-report for identifying computer workstation setup problems, the results of conference proceedings on ErgoFix, a computer workstation self-assessment program, also found poor reliability in 6 out of 11 questions related to self-report of computer related problems [16]. Thus, the usefulness of a self-report computer workstation assessment appears to be limited. Our results suggest that self-report should be used as an adjunct to an assessment completed by an expert in computer workstation setup.

This study considered whether the CWC could reliably and correctly identify problem areas in computer workstation setup. Overall, the evaluation of the psychometrics of the CWC suggests that respondents generally answer items in a similar manner over time (reliability), but that many of their answers are not valid. That, in fact, most respondents vastly underestimate the number of problems there are with their workstation setup, particularly when they relate to subtle body postures. Research on chronic pain suggests that proprioceptive abilities are altered when people experience pain [17]. The people most likely to be interested in adjusting their computer workstation, those experiencing pain during computer use, therefore, are least likely to be able to accurately report their postures. If the respondent identifies that they have a problem, this would be strong evidence to support an intervention in that area (high PPV). However, if a respondent indicates that there was no problem, further evaluation would be needed to ensure that problems were not missed (low NPV). The CWC would benefit from further consolidation to reduce the number of questions, and further clarification to increase the specificity of certain items. Additionally, identifying appropriate interventions for problem areas should be studied further.

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References

[1] Cal/OSHA Consultation Service Research and Education Unit. Easy ergonomics for desktop computer users. Department of Industrial Relations; 2005 [cited 2010 February 25]; Available from: http://www.dir.ca.gov/dosh/dosh_publications/ComputerErgo.pdf.

[2] Division of Occupational Health and Safety (DOHS). Ergonomics for computer workstations. Office of Research Services; ND [cited 2010 February 25]; Available from: http://dohs.ors.od.nih.gov/ergo_computers.htm.

[3] Ergonomics Working Group. Creating the ideal computer workstation: A step-by-step guide. Department of Defense; 2002 [cited 2010 February 25]; Available from: http://www.ergoworkinggroup.org/ewgweb/SubPages/ProgramTools/Publications/Workstation_Guide_Web.pdf.

[4] Occupational Safety and Health Administration. eTool – Computer workstations. United States Department of Labor; ND [cited 2010 February 25]; Available from: http://www.osha.gov/SLTC/etools/computerworkstations/index.html.

[5] Schreuer N, Myhill WN, Aratan-Bergman T, Samant D, Blanck P. Workplace accommodations: Occupational therapists as mediators in the interactive process. Work-a Journal of Prevention Assessment and Rehabilitation. 2009; 34(2): 149-60.

[6] Shaw WS, Feuerstein M. Generating workplace accommodations: Lessons learned from the integrated case management study. Journal of Occupational Rehabilitation. 2004; 14(3): 207-16.

[7] Brouwer B, Mazzoni C, Pearce GW. Tracking ability in subjects symptomatic of cumulative trauma disorder: does it relate to disability? Ergonomics. 2001; 44(4): 443-56.

[8] Juul-Kristensen B, Lund H, Hansen K, Christensen H, Donneskiold-Samsoe B, Bliddal H. Poorer elbow proprioception in patients with lateral epicondylitis than in healthy controls: A cross-sectional study. J Shoulder Elbow Surg. 2008; 17(1): 72S-81S.

[9] Shaw W, Hong QN, Pransky G, Loisel P. A literature review describing the role of return-to-work coordinators in trial programs and interventions designed to prevent workplace disability. Journal of Occupational Rehabilitation. 2008; 18(1): 2-15.

[10] Hernandez B, Keys C, Balcazar F. The Americans with Disabilities Act Knowledge Survey: Strong psychometrics and weak knowledge. Rehabil Psychol. 2003; 48(2): 93-9.

[11] Janowitz I, Stern A, Morelli D, Vollowitz E, Hudes M, Rempel D, editors. Validation and field testing of an ergonomic computer use checklist and guidebook, 2002.

[12] Menendez CC, Amick BC, Chang C-H, Harrist R, Jenkins M, Robertson M, et al. Evaluation of two posture survey instruments for assessing computing postures among college students. Work. 2009; 34(4): 412-30.

[13] Sims J, Wright CC. The kappa statistic in reliability studies: Use, interpretation, and sample size requirments. Physical Therapy. 2005; 85: 257-68.

[14] Sackett DL HR, Guyatt GH, Tugwell P. Clinical epidemiology: A basic science for clinical medicine, 2nd ed., 1991 ed. Boston: Little, Brown and Company, 1991.

[15] Straus S, Richardson WS, Glasziou P, Haynes RB. Evidence-based medicine. Philadelphia: Elsevier, 2005.

[16] Pentikis J. ErgoFix: A field test of a computer workstation self-assessment program. 2009 [cited 2012 July 23]; Available from: www.denix.osd.mil/ergoworkinggroup/upload/Ergo FIX-Pentikis.pdf.

[17] Nijs J, Daenen L, Cras P, Struyf F, Roussel N, Oostendorp RAB. Nociception affects motor output: A review on sensory-motor interaction with focus on clinical implications. Clin J Pain. 2012; 28(2): 175-81.

Appendix 1 Reliability of the computer workstation checklist

CWC questions	Reliability	
	Kappa	PABAK
Overall Workstation Problems		
Is the work area large enough to accommodate you?	0.35	0.80
Does the work area provide enough room for your equipment and the materials that make up the workstation?	0.36	0.67
Are the items you use most often placed directly in front of you?	0.19	0.67
Do you use a headset for lengthy telephone work?	1.00	1.00
Chair		
Is your chair easily adjustable, requiring the use of just one hand?	0.43	0.52
Are your chair's controls easy to reach and adjustable from the standard seated work position?	0.63	0.72
Do your chair controls provide immediate feedback?	0.52	0.59
Is the operation of your chair's controls logical and consistent?	0.70	0.72
Do you know how to operate your chair controls?	0.30	0.38
Is your chair height easily adjustable?	0.52	0.72
Is your chair padded?	1.00	1.00
Is the padding comfortable?	0.61	0.79
Is the front of your chair seat rounded?	0.65	0.93
Does your chair backrest support the curve of your back?	0.30	0.38
Does your backrest support your entire back?	0.38	0.38
Can your backrest move forward and back?	0.52	0.59
Does your chair back have lumbar (low back) support?	0.78	0.79
Can you adjust your lumbar (low back) support?	0.37	0.38
Is your lumbar (low back) support wide enough to comfortably support your low back?	0.33	0.45
Does your chair have armrests?	−0.04	0.86
Do your armrests adjust?	0.70	0.72
Are your armrests removable?	0.72	0.72
Are your armrests low enough to fit under your work surface?	0.29	0.31
Are your armrests long enough to support your forearms?	0.61	0.66
Are your armrests padded and soft?	0.72	0.72
Is the distance between your armrests adjustable?	0.85	0.86
Does your chair roll without difficulty?	0.37	0.79
Does your chair have a stable base supported by five legs with casters?	0.00	0.79
Does your chair turn 360°?	0.00	0.79
If your feet do not rest completely on the floor when the chair is properly adjusted, do you use a footrest?	0.70	0.72
Is your footrest large enough to support the soles of both feet?	0.56	0.59
Keyboard		
Is the surface that you place your keyboard on stable?	0.78	0.93
Is the surface that you place your keyboard on large enough to hold your keyboard and an input device?	0.63	0.73
Is your keyboard detached from your monitor?	−0.05	0.73
Is your keyboard easy to use?	1.00	1.00
Can you activate the keyboard keys without excessive force?	1.00	1.00
Do you rest your palm or wrist while typing?	0.60	0.67
Do your wrists or hands rest on sharp or hard edges?	0.29	0.60
Do you have a wrist rest for your keyboard?	0.87	0.87
Do you rest your elbows and/or forearms on a support (e.g., armrests) while you are using your keyboard?	0.60	0.60
Input device		
Is your mouse located next to your keyboard on a work surface or tray?	0.76	0.87
Is your input device work surface stable?	0.37	0.80
Is your input device work surface large enough to comfortably manipulate the device?	0.63	0.87
Do you use a wrist rest with your input device?	0.92	0.93
Do you rest your elbows and/or forearms on a support (e.g., armrests) while you are using your input device?	0.60	0.60
Monitor		
Is your monitor height adjustable?	0.80	0.93
Are the images displayed on your monitor clear?	0.00	0.87
Is the character size displayed on your monitor easy to read?	−0.03	0.07
If you wear bifocals or trifocals, can you read the screen without bending your head or neck?	−0.08	0.93

CWC questions	Reliability	
	Kappa	PABAK
Computer table		
Is your computer table surface large enough to accommodate a computer monitor and a separate adjustable keyboard in front of you?	0.00	0.93
Is the space under your desk long enough to accommodate your leg length?	0.00	0.93
Do you have enough space between the top of your thighs and your computer table/keyboard platform (thighs are not trapped)?	0.27	0.73
Is your computer table stable?	1.00	1.00
Is your computer table surface adjustable?	0.26	0.73
If your computer table has a fixed height, do you have an adjustable keyboard tray?	0.86	0.87
Document holder		
Is your document holder positioned next to your monitor?	1.00	1.00
Is your document holder at the same height as your monitor?	0.00	0.17
Environmental factors		
Is your room temperature comfortable?	0.73	0.73
Is the noise level in your workstation acceptable?	0.67	0.80
Is your monitor screen free of glare?	0.52	0.80
Have you arranged your workstation so that your monitor screen is not in front of a window?	0.82	0.89
Does your workstation have matte or nonglare surfaces?	0.68	0.73
Do you have blinds on the windows near your computer?	0.93	0.93
Work habits		
Do you take short and frequent breaks every 20–30 minutes?	0.59	0.60
Do you frequently change your body positions while working?	0.68	0.73
Do you experience discomfort or pain while working on your computer?	0.68	0.73

Note. CWC = Computer Workstation Checklist.