Online Self-Report Questionnaire on Computer Work-related Exposure (OSCWE): Validity and Internal Consistency

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Objective: *To develop an online, self-report questionnaire on computer work-related exposure (OSCWE) and to determine the internal consistency, face and content validity of the questionnaire.*
Material and Method: *The online, self-report questionnaire was developed to determine the risk factors related to musculoskeletal disorders in computer users. It comprised five domains: personal, work-related, work environment, physical health and psychosocial factors. The questionnaire's content was validated by an occupational medical doctor and three physical therapy lecturers involved in ergonomic teaching. Twenty-five lay people examined the feasibility of computer-administered and the user-friendly language. The item correlation in each domain was analyzed by the internal consistency (Cronbach's alpha; α).*
Results: *The content of the questionnaire was considered congruent with the testing purposes. Eight hundred and thirty-five computer users at the PTT Exploration and Production Public Company Limited registered to the online self-report questionnaire. The internal consistency of the five domains was: personal (α = 0.58), work-related (α = 0.348), work environment (α = 0.72), physical health (α = 0.68) and psychosocial factor (α = 0.93).*
Conclusion: *The findings suggested that the OSCWE had acceptable internal consistency for work environment and psychosocial factors. The OSCWE is available to use in population-based survey research among computer office workers.*

Keywords: *Online self-report questionnaire, Musculoskeletal disorder, Computer user*

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The computer office worker is one among several occupations being reported to have high risk of work-related musculoskeletal disorders (WMSDs). Studies have been conducted worldwide across countries and occupations[1,2]. However, studies related to the consequence of computer use have not reached a conclusion since the revolution of computer technologies continues changing rapidly. Currently, the use of tablets has increased and in conjunction with notebooks or desktop computers. Consequently, the affected body structure specific to computer tasks may be changed, for example, from typing to more touching and drawing. Therefore, studies, related to computer work, require updating for every change among the computer technologies.

In Thailand, several survey reports have started since 2000, for example, Mekhora in 2000[1] and more recently Janwantanakul in 2008[2]. Most of them used hard document questionnaires developed based on or adapted from the Nordic questionnaire[3]. The result could be compared in terms of prevalence, but not severity and other qualities of the symptoms. The survey conducted in Thailand did not include questions identifying the stages of WMSDs stated by Browne in 1987[4]. Therefore, they could not identify the cases derived from work accumulation nor observe any changes over time. As a result, if any survey is repeated, it cannot be known whether the symptoms reported by the workers remain or have worsened. The present study aimed to develop and validate an online, self-report questionnaire on computer work-related exposure.

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Materials and Method

Based on the standard ergonomic evaluation of the Nordic questionnaire[3] and stages of MSD[4], a self-report questionnaire was developed that included five domains: personal, work-related, work environment, physical health and psychosocial factors[1,7]. For question construction in each domain, ten volunteers who worked with computers at PTT Exploration and Production Public Company Limited (PTTEP) were interviewed for 30 minutes each. They provided information on risk factors related to their company according to each domain. The questionnaire was established by our team of investigators including three physical therapy lecturers engaged in ergonomic teaching for ten years and an occupational medical doctor from PTTEP. They assessed the content validity and approved the questionnaire to collect all necessary data. After that, the questionnaire was developed in the form of a soft document, so-called the online, self-report on computer work-related exposure (OSCWE) using Hypertext Preprocessor originally known as Personal Home Page (PHP) scripting language that could be accessed by all internet browsers. The questionnaire was tested for online self-administered and user-friendly language by 25 lay people (10 from PTTEP and 15 from the Faculty of Physical Therapy, Mahidol University). All were recruited by a convenient sampling method. They had worked with computers without attending any ergonomic training.

After that, the subjects who worked with computers at PTTEP were invited to complete the questionnaire through the internet. They received the OSCWE by e-mail sent by PTTEP occupational health officers. This study was approved by Mahidol University Institutional Review Board (COA. No.2013/123.2609).

The multiple-item correlation in each domain was analyzed using internal consistency. The Cronbach's alpha (α) ranged from zero to one and scored between 0.70-0.95 indicating acceptable internal consistency[8,9].

Results

Table 1 demonstrates the characteristics of the subjects registered to administer the OSCWE. The OSCWE was developed consisting of five domains with 33 questions. There were 10 items pertaining to personal, 14 items for work-related, one item related to environment, four items regarding physical health and four items for psychosocial factors. These questions were formulated by interview summary.

The questionnaire comprised five domains. These included personal, work-related, work environment, physical health and psychological factors. Personal factors included age, sex, height, weight, weight gain and loss, dominant hand, leisure activity, commuting mode, average commuting time and income. The work-related information was classified in three sub-domains: work characteristics, computer use time and work station. These included the current and former jobs and the percentage of contribution on the basis of office work, averaged total time of computer use and total time of continuous work, type of computer used for work, computer monitor size and accessories, work station including desk, chair and monitor and ergonomic knowledge. The subject self-perception of work environment including lighting, noise, temperature, odor and cleanliness was rated from no problem to have problems with and without job interference. The physical health problems illustrated overall health problems and musculoskeletal disorders within the last 7 days and 12 months. The subjects had to identify the body structures with pains or injuries that occurred caused by work. Subjects identified the location and level of severity that was the most irritating to their life. Twenty items of the Suanprung Stress Test-20 (SPST-20) were used to assess the subject's stress level. The 100-point total score classified the level of emotional stress in four levels: low (0-24 points), moderate (25-42 points), high (43-62 points) and the highest ($\geq$63 points).

The 25 lay people testing the OSCWE advocated that the OSCWE was easy, simple communication and took about 20 minutes to administer. For internal consistency testing, 835 of 2,559 (32.63%) computer users at the Bangkok Office Division of the PTTEP registered for the online, self-report questionnaire (OSCWE). The results demonstrated that work environment and psychosocial factors demonstrated acceptable internal consistency (Cronbach's alpha >0.7). Cronbach's alpha of each domain is shown in Table 2.

Discussion

The OSCWE was the first online questionnaire for identifying risk factors related to WMSD of computer users in Thailand. After the interview, all possible risk factors related to PTTEP sedentary work were included. A Modified Nordic questionnaire particularly focusing on pain areas and the three stages of WMSDs proposed by Browne[4] were also included. Those three stages could classify the WMSDs based

Table 1. Characteristics of 835 computer usersat PTTEP

Characteristics	
Age (years), mean (SD)	34.38 (0.35)
Weight (kg), mean (SD)	63.21 (14.11)
Body mass index (BMI), mean (SD)	22.88 (4.34)
Male, n (%)	371 (44)
Handed, n (%)	
Right	775 (92)
Left	42 (5)
Both	22 (3)
Monthly income (baht), n (%)	
<15,000	7 (1)
15,000-30,000	101 (12)
30,001-50,000	222 (27)
50,001-100,000	321 (38)
>100,000	188 (22)

Table 2. Cronbach's alpha result for the online self-report questionnaire (OSCWE)

Questionnaire	Cronbach's alpha
Personal information	0.58
Work-related information	0.35
Work characteristics	0.36
Computer use time	0.45
Computer workstation	0.54
Work environment	0.72
Physical health information	0.68
Psychosocial factors	0.93

on the severity and irritability related to the symptoms. In addition, the authors could observe a tendency to develop the WMSDs and provide interventions according to the stage. A group of physical therapy lecturers and a doctor experienced in ergonomics developed and validated the questionnaire. The validity was not analyzed statistically but we illustrated the internal consistency with content and purposes of the questionnaire. The overall questions, related to personal, work-related and physical health information, demonstrated poor internal consistency (Cronbach's alpha <0.7). This disadvantage could be reduced by sub-group analysis and if more consistent items were created as shown in Table 2.

No report related to the internal consistency of the questionnaire has been produced in this field; therefore, we reported and are intending to encourage more survey studies related to WMSDs in other work fields using our questionnaire, which will be available and accessible free by the Internet http://www.pt.mahidol.ac.th/ergo/index.php. This online questionnaire will reduce paper use and time for data entering. In addition, the errors from manual data entering will be zero, since the raw data will be automatically ready in spreadsheet form. For further development, comments from using the questionnaire are welcomed. As a result, data in this field can be conveniently compared across studies. However, the present study represented only a starting point for the online questionnaire with a test for internal consistency.

The present study had some limitations, which can be addressed such as different work places and cultures of companies and people in each part of the country. These caused variation in each item. Further development and greater inter-reliability are warranted.

Conclusion

The questionnaire to explore factors affecting WMSDs, pain and area of pain and stage of WMSDs was developed and made available on the internet. The content was developed and validated by experts and focus groups. Internal consistency was addressed and proved acceptable for the work environment and rated excellent for psychosocial factors. Still, some questions might need modification. Further development will be accomplished with the continuous comments from using this questionnaire by others or studies related to this field.

What is already known on this topic?

During the past two decades, WMSDs caused by computer use were widely determined. However, with the rapid change of the computer technology, computer users need to adapt themselves to the change of the factors affecting WMSDs. Many questionnaires are available, but they need to be modified for specific target and purpose.

What this study adds?.

The OSWCE was developed and reported to have validity and internal consistency. This study included possible factors affecting WMSDs based on up-to-date computer accessories. The stage of disorders was added to create a clear picture of the disorders and ways for their management.

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Potential conflicts of interest

None.

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แบบสอบถามออนไลน์เพื่อประเมินตนเองเกี่ยวกับการทำงานใช้คอมพิวเตอร์ (OSCWE): ความเที่ยงและความสอดคล้อง

คีรินทร์ เมฆโหรา, วรรธนะ คลายนเดชะ, ชุติมา ชลายนเดชะ, เพชรรัตน์ ภูอนันตานนท์, อัษฎางค์ ดุษฎีอิสริยวงศ์, รุจิเรศ เอื้อพิริยะสกุล, ขจรยศ อนุรักษ์ธรรม

วัตถุประสงค์: *เพื่อสร้างแบบสอบถามออนไลน์ประเมินตนเองเกี่ยวกับการทำงานใช้คอมพิวเตอร์ (OSCWE) และศึกษาความเที่ยงและการวัดความสอดคล้องของเนื้อหา*

วัสดุและวิธีการ: *แบบสอบถามออนไลน์ประเมินตนเองถูกพัฒนาขึ้นเพื่อศึกษาปัจจัยเสี่ยงที่สัมพันธ์กับการผิดปกติ ทางระบบกระดูกและกล้ามเนื้อในกลุ่มผู้ใช้คอมพิวเตอร์ แบบสอบถามประกอบด้วย 5 องค์ประกอบได้แก่ ข้อมูลบุคคล งานที่สัมพันธ์ สภาพแวดล้อมในที่ทำงาน สุขภาพทางกายและปัจจัยจิตสังคม เนื้อหาของแบบสอบถามตรวจสอบ ความเที่ยงโดยอาจารย์ทางกายภาพบำบัดที่ทำงานด้านการยศาสตร์ 3 ท่านและแพทย์อาชีวอนามัย 1 ท่าน ประชาชนจำนวน 25 ราย ประเมินความง่ายในการตอบแบบสอบถามออนไลน์ในคอมพิวเตอร์และการใช้ภาษา แต่ละองค์ประกอบของแบบสอบถามจะถูกวิเคราะห์ความสอดคล้องด้วย Cronbach's alpha (α)*

ผลการศึกษา: *เนื้อหาในแบบสอบถามได้รับพิจารณาว่ามีความสอดคล้องกับวัตถุประสงค์ในการวัดพนักงานที่ทำงานใช้คอมพิวเตอร์ของบริษัท ปตท.สผ. จำกัด (มหาชน) จำนวน 835 ราย ลงทะเบียนเข้าตอบแบบสอบถามออนไลน์ เพื่อประเมินตนเองผลความสอดคล้องของเนื้อหาในแบบสอบถามทั้ง 5 องค์ประกอบ: ข้อมูลบุคคล (α = 0.58) งานที่สัมพันธ์ (α = 0.348) สภาพแวดล้อมในที่ทำงาน (α = 0.72) สุขภาพทางกาย (α = 0.68) และปัจจัยจิตสังคม (α = 0.93)*

สรุป: *แบบสอบถามออนไลน์ เพื่อประเมินตนเองเป็นเครื่องมือวัดที่มีค่าความตรงมีค่าความน่าเชื่อถือ Cronbach's alpha (α) ในระดับยอมรับได้สำหรับสภาพแวดล้อมในที่ทำงานและปัจจัยจิตสังคม แบบสอบถามนี้สามารถนำมาใช้ในการวิจัย เชิงสำรวจกลุ่มประชากรที่ทำงานคอมพิวเตอร์ในสำนักงาน*