Indonesian Adaptations of Paper-Based Methods and Instruments in Ergonomics: A Literature Review

Indah Puspa Murni and Ardiyanto Ardiyanto*
Department of Mechanical and Industrial Engineering, Universitas Gadjah Mada
Yogyakarta, 55281, Indonesia
*Corresponding author: ardiyanto@mail.ugm.ac.id

Abstract

Some studies have been conducted to cross-culturally adapt the paper-based methods and instruments of ergonomics to minimize the accuracy discrepancy when utilized by non-English speakers, including Indonesians. However, no comprehensive reports are available on the paper-based methods and instruments in ergonomics adapted to the Indonesian versions. Hence, a systematic literature review was conducted to fill the gap. The review focused on understanding the adaptation approach, validity, and reliability of the methods and instruments. The literature review found six papers that reported adapted methods and instruments in ergonomics, including Rating Scale Mental Effort, System Usability Scale, User Experience Questionnaire, Nordic Musculoskeletal Questionnaire, Chatbot Usability Questionnaire, and me CUE 2.0 Framework. The adaptation approach to determine the Indonesian versions of the methods and instruments followed partial or complete stages of cross-cultural adaptation guidelines. It was found that several adapted instruments were valid, with the levels being "excellent" to "good." Furthermore, the reliability assessment indicated that several instruments have Cronbach alpha values ranging from 0.7 to 0.8, indicating that some of the adapted versions were reliable. Since limited methods and instruments were adapted to Indonesian versions, cross-cultural adaptation attempts have to be continued to ease the ergonomics implementations in Indonesia.

Keywords
Adaptation, Ergonomics, Paper-Based, Methods, Instruments, Indonesia

1. Introduction
Ergonomics assessments can be performed through direct measurement, self-reports, and observational methods. Direct measurement utilizes sensors for gathering physical or cognitive changes of the workers. While some technologies are required for ergonomics studies using this approach, only pen and paper are required for the other two methods and instruments. The first approach consists of self-reports that rely on workers' opinions to gather information for ergonomics studies. The second category is observational methods, requiring raters to assess the jobs based on standardized and validated paper-based instruments (David 2005; Li and Buckle 1999).

Indonesian researchers and practitioners commonly undergo ergonomics assessments utilizing paper-based methods and instruments categorized as self-reports and observational methods. The intensive utilization could be pushed due to the flexibility, the less required training, as well as the minimum required investment of the approaches. (David 2005; Li and Buckle 1999).

Some of the paper-based methods and instruments categorized as observational methods include Rapid Office Strain Assessment (ROSA), Strain Index (SI), and Rapid Entire Body Assessment (REBA). Erliana and Zaphira (2019) utilized ROSA to perform ergonomics assessments among office workers of a fertilizer company who use computers on a daily basis. Restuputri (2018) used the English version of the Strain Index (SI) to assess the ergonomic risk among batik workers. Another assessment method widely utilized to assess some jobs of Indonesian small and medium enterprises is the Rapid Entire Body Assessment (REBA) (Joanda and Suhardi 2017; Restuputri 2017; and Rizkya et al. 2018). While ROSA, SI, and REBA are widely used for undergoing the ergonomics assessments, the self-reports, e.g., Nordic Body Map (NBM), are widely utilized in ergonomics studies for assessing the musculoskeletal symptoms of Indonesian small and medium enterprises' workers (Sofyan and Amir 2019).

One of the main challenges while utilizing the paper-based methods and instruments is the language barrier since most Indonesians do not speak English in a daily basis. This could happen due the methods and instruments were primarily

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developed in English. Therefore, issues with the accuracy of the assessment results while performing the studies using the English methods and instruments could be observed (Nuruzzaman et al. 2020).

Several studies have been performed to cross-culturally adapt the methods and instruments to cope with the issues of language barriers. For example, Rapid Office Strain Assessment (ROSA) was adapted to the Portuguese version (Rodrigues et al. 2019). However, no comprehensive literature review has been written to report the methods and instruments in ergonomics that have been cross-culturally adapted to Indonesian. Therefore, this study aims to conduct a literature search and review to summarize what methods and instruments in ergonomics have been adapted to Indonesian versions. By performing the literature review, ergonomics researchers and practitioners in Indonesia could have a summarized list of adapted methods and instruments that could be utilized with less accuracy issues due to the language barriers.

2. Research Method

2.1 Search Strategies

The literature search was conducted on three databases: Google Scholar, ScienceDirect, and IEEE explore to identify any paper-based ergonomic methods and instruments adapted to the Indonesian versions. The search process utilized a combination of keywords both in Indonesian and English with Boolean Operator (AND, *DAN*): risk assessment, ergonomics, adaptation, Indonesian, cross-cultural, translation, "adaptasi," "ergonomi," "Indonesia". The identified papers were then selected by the first author (IPM) by reviewing the titles and abstracts. This search process was completed over three months, from January to March 2022. The Mendeley software was utilized to organize citations in the bibliography.

2.2 Inclusion and Exclusion Criteria

The papers analyzed in the study were limited to articles published in the last ten years (2012 to 2022). The articles should report Indonesian versions of paper-based ergonomics methods and instruments previously developed in English. The articles were not limited to papers that follow a robust cross-cultural adaptation process. Articles emphasizing the application of the methods and instruments in ergonomics were excluded from the study.

2.3 Paper Analysis

The analysis of the selected papers focused on identifying adaptation aspects, including the name of the ergonomic methods or instruments, the specific area in ergonomics, the adaptation approach, and the associated reliability and validity instruments. In determining the specific ergonomics area associated with the adapted methods and instruments, International Ergonomics Association (IEA) classification, which includes physical, cognitive, and organizational factors, was utilized (International Ergonomics Association, 2000). Physical factors consist of human anatomy, physiology, anthropometry, and biomechanics. Cognitive factors include perception, memory, reasoning, motor response, and human-computer interaction. Meanwhile, the organizational factors include communication, teamwork, participation, socio-technical systems, and environment.

Another analysis was conducted to understand what approach was chosen to get the Indonesian version adaptation of the methods or instruments. To the authors' knowledge, six adaptation approaches are present. The six adaptation approaches include International Society for Pharmacoeconomics and Outcomes Research (ISPOR) of Translation and Cultural Adaptation Process by Wild et al. (2005); Scientific Advisory Committee by Trust (1997); and Guidelines produced by Beaton et al. (2000); Brislin (1970); Brislin et al. (1973); Bullinger et al. (1998); Guillemin (1995). In general, the six approaches have similar stages such as the following steps: translation, synthesis of translation, back translation, expert committee review, pretesting, and submission of documentation. Some guidelines have fewer steps, such as does not explicitly require the submission of documentation is Bullinger et al. (1998); Guillemin (1995); Trust (1997). On the other hand, some adaptation guidelines require significantly shorter steps, including translation, back translation, and expert committee review (3 steps) is Trust (1997) as well as forward and back translation (2 steps) is Brislin (1970); Brislin et al. (1973).

Validity and reliability assessments of the adapted methods and instruments were also investigated in the study. Validity testing analyzes the ability of an instrument or other object to perform the measurement and analysis accurately (Arafat et al. 2016; Kimberlin and Winterstein 2008). Face validity, content validity, construct validity, criterion validity, convergent validity, divergent validity, concurrent validity, discriminative validity, and predictive

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validity are some types of validity might present in the papers. The reliability assessment that could present as test-retest reliability and inter-rater reliability determines the instrument's consistency (Arafat et al. 2016; Kimberlin and Winterstein 2008).

3. Results and Discussion

3.1 Search Results

The literature search on the three databases followed by title reviews identified 16 articles (Figure 1). An additional article was identified from the reference list of the papers. The abstract screening of the 17 articles yielded eight articles. The nine articles were excluded from the full-text review since they do not report any cross-cultural adaptation process or results on ergonomics instruments and methods to the Indonesian versions. Among the eight articles that were processed for full-text review, two of them did not meet the eligibility criteria. At the end of the selection process, six papers were included to be reviewed for this study. The summary of the articles can be seen in Table 1.

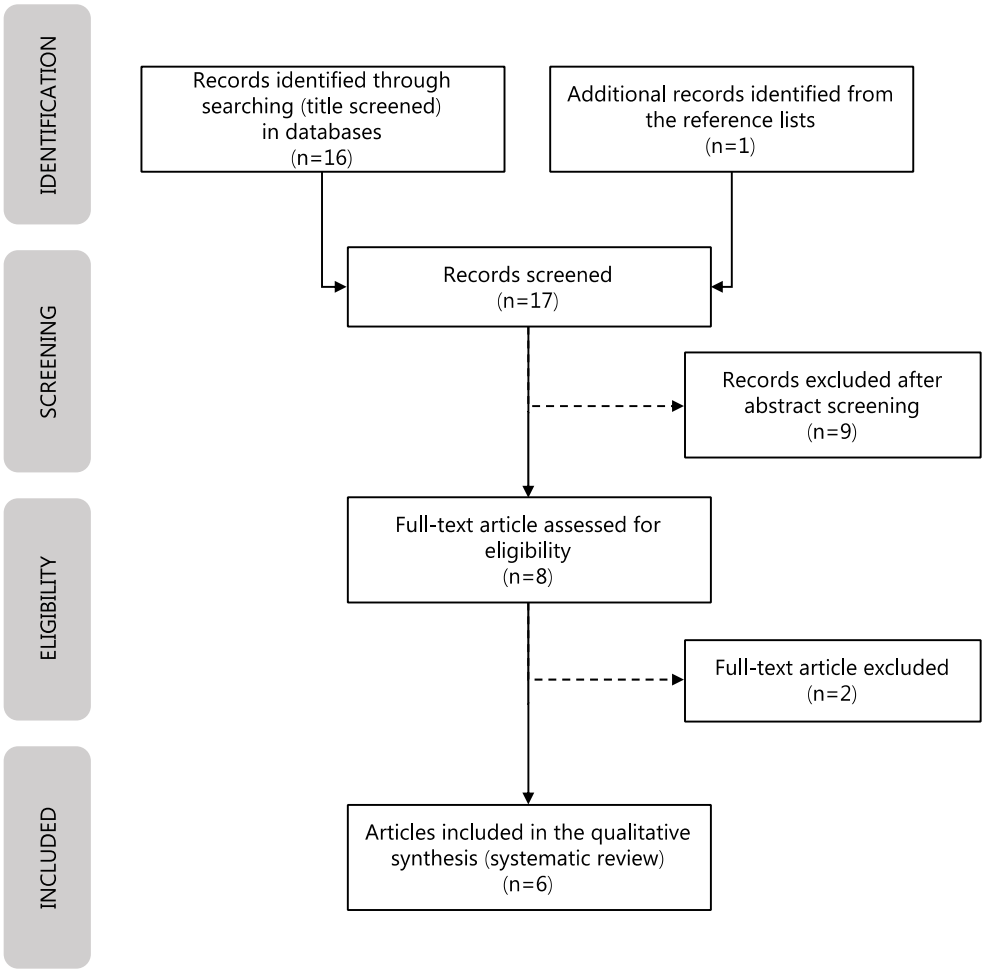

Figure 1. Articles selection process

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Table 1. Summary of The Studies Referring to Adaptation Approach, Validity and Reliability

Authors	Methods or Instruments	Adaptation Approaches	Testing	
			Validity	Reliability
Widyanti et al. (2013)	Rating Scale Mental Effort (RSME)	Brislin (1970); Brislin et al. (1973): The adaptation stage is forward and back translation.	Validity: Comparing RSME's original result with RSME has been filed by the participant. The result of the validity test is that the RSME Indonesian version is more sensitive to changes in mental workload than the RSME Dutch version.	Test-retest Reliability: Involved 79 participants who were asked to transpose the descriptive label in the RSME English version 2 times.
Sharfina and Santoso (2016)	System Usability Scale (SUS)	Beaton et al. (2000): The adaptation stage is translation, translation synthesis, back-translation, expert committee review, and pretesting.	Face validity: Using 10 participants who came from technical and non-technical. The scaled average and their understanding analyzed the result.	Internal Consistency: Involved 108 participants with Cronbach Alpha sig. value > 0.7 it's mean reliable.
Santoso et al. (2016)	User Experience Questionnaire (UEQ)	-	-	Internal Consistency: Involved 213 participants using the Cronbach Alpha with sig. value > 0.8 on each component of the Indonesian version of the UEQ.
Ramdan et al. (2019)	Nordic Musculoskeletal Questionnaire (NMQ)	-	Construct Validity: Using Pearson Correlation (r) by producing "excellent" and "good" validity levels for each component	Internal Consistency: Using Cronbach Alpha by generating a sig. value is 0.726, then the Indonesian version of NMQ can be said to be reliable for repeated use.
Noviyanti et al. (2021)	Chatbot Usability Questionnaire (CUQ)	Beaton et al. (2000): The adaptation stage is translation, synthesis of translation, back-translation, expert committee review, and pretesting	Validity: Chatbot Usability Questionnaire (CUQ) is already validated in the study conducted by Holmes, S. & Bond, R. (2020)	Internal Consistency: Involved 100 participants with Cronbach Alpha sig. value > 0.7 it's means CUQ Indonesian version is reliable.
Darmawan et al. (2021)	me CUE 2.0 Framework	Beaton et al. (2000): The adaptation stage is translation, synthesis of translation, back-translation, expert committee review, and pretesting	Face Validity: Involved 15 participants in an adaptation of the me CUE 2.0 Framework in the Indonesian version.	Internal Consistency: Involved 60 participants with Cronbach Alpha sig. value > 0.7 each module in me CUE 2.0 Framework in Indonesian version.

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3.2 Description of The Methods and Instruments

Most of the methods and instruments in ergonomics that were adapted to the Indonesian versions fall under the category of human-computer interaction (HCI), which includes the System Usability Scale (SUS) (Sharfina and Santoso 2016); User Experience Questionnaire (UEQ) (Santoso et al. 2016); Chatbot Usability Questionnaire (CUQ) (Noviyanti et al. 2021); meCUE 2.0 Framework (Darmawan et al. 2021). The rest of the methods and instruments adapted to the Indonesian version could be classified under cognitive and physical ergonomics, including Rating Scale Mental Effort (RSME) and Nordic Musculoskeletal Questionnaire (NMQ).

The adaptation to the Indonesian version of the System Usability Scale (SUS) was reported by Sharfina and Santoso (2016). SUS is one of the most utilized usability questionnaires since it can quickly determine the usability level of any interface (Lewis and Sauro 2009; Martins et al. 2015). Hence, due to the Indonesian ergonomics community's high potential uses of this questionnaire, particularly those involved a lot in UX or HCI studies, this instrument was adapted to the Indonesian version (Mufti and Aprianingsih 2022; Sharfina and Santoso 2016). The other HCI instruments adapted to the Indonesian version were the CUQ (Noviyanti et al. 2021); MeCUE 2.0 Framework (Darmawan et al. 2021); UEQ (Santoso et al. 2016). The CUQ was utilized to help determining usability issues associated with chatbot, an application used to replace the customer service function in providing services to customers during the pandemic (Noviyanti et al. 2021). Darmawan et al. (2021) undergone studies to determine the Indonesian version of the meCUE 2.0 Framework. This method is utilized to measure qualitative user experience based on emotions, feelings, trust, and user behavior (Martin and Hanington 2019). The last HCI instrument adapted to the Indonesian version is User Experience Questionnaire (UEQ) (Santoso et al. 2016). The User Experience Questionnaire (UEQ) could evaluate and measure user experience while interacting with an interface (Laugwitz et al. 2008).

The Rating Scale Mental Effort (RSME) was the only instrument under the category cognitive and reasoning that adapted to the Indonesian version. The RSME is one of subjective measure to assessment mental effort in less than a minute (Widyanti et al. 2013). Another Indonesian adaptation of the paper-based methods and instruments was the Nordic Musculoskeletal Questionnaire (NMQ), which could be classified under the physical science and physiology area (Ramdan et al. 2019). This free-for-use instrument was designed for assessing and detecting musculoskeletal symptoms among a large population (Laugwitz et al. 2008; López-Aragón et al. 2017).

3.3 Adaptation Approach

The adaptation approach introduced by Beaton et al. (2000) was utilized in Darmawan et al. (2021); Noviyanti et al. (2021); Sharfina and Santoso (2016). The stages carried out include translation, synthesis of translation, back-translation, expert committee review, and pretesting. A different group of participants were involved in each adaptation phase (Darmawan et al. 2021; Noviyanti et al. 2021; Sharfina and Santoso 2016). During the adaptation phase in Sharfina and Santoso (2016) two translators are involved. The first translator was an experienced usability experimenter, while the second one was a novice user of the instrument. The back translator stage involved two other translator and the expert committee review stage involved an expert evaluating the result to obtain a translation consensus for the pretesting stage. This stage involved ten participants with technical and non-technical backgrounds (Sharfina and Santoso 2016). The other study involved two translators in the translation stage (Noviyanti et al. 2021). The first is an Indonesian citizen proficient in English, and the other is a professional translator. The translators discussed the meaning of Chatbot and Chatbot Capabilities until getting one CUQ instrument in the Indonesian version. The back translation stage involved two other translators with a background in English and Indonesian proficiency. For the final phase, the expert committee reviewed the result of translation as well as back translation and they found minor issue on them regarding the sentences. The next study involved a writer and professional translators in the translation stage, while the back translation stage involved two translators. Two translators in the back translation stage were professional translators with minimum knowledge about me.CUE 2.0 Framework. The other stage is the expert committee review stage for comparing all the results. The pretesting stage involved fifteen participants for assessing face validity of the adapted version of me.CUE 2.O Framework (Darmawan et al. 2021).

Another adaptation approach, Brislin (1970) and Brislin et al. (1973) was utilized in Widyanti et al. (2013). The forward translation was performed by ten master students. The results of the translations were compared to those of two language experts with TOEFL score criteria of ≥575 with ≥4 years of experience living in the United States. The back translation stage involved two new translators conducting re-translation from Indonesian to English. The back-translators were doctoral graduates who had a TOEFL score higher than 475. The review by the expert committees

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indicated no issues of translation and back translation that made the process could move forward to the reliability assessment.

Two studies did not clearly explain the adaptation approach utilized to determine the Indonesian versions. It includes the Indonesian version of the Nordic Musculoskeletal Questionnaire (NMQ) (Ramdan et al. 2019) and the User Experience Questionnaire (UEQ) (Santoso et al. 2016). The adaptation of the NMQ began by translating the instruments. Following this step, a content and Indonesian grammar evaluation were conducted (Ramdan et al. 2019). On the other hand, translation and back-translation were conducted to determine the Indonesian version of the UEQ (Santoso et al. 2016).

3.4 Validity and Reliability Test

The six papers reported different validity and reliability assessments. The face validity involved 10 to 15 participants was undergone to evaluate the Indonesian versions of the SUS and meCUE 2.0 Framework (Darmawan et al. 2021; Sharfina and Santoso 2016). The validity test involved 80 participants by comparing the original and Indonesian versions of RSME (Widyanti et al. 2013). The construct validity assessment using Pearson Correlation (r) as the parameter was conducted by involving 50 participants to evaluate the accuracy of the NMQ (Ramdan et al. 2019). The validity levels of some items of the adapted NMQ were "excellent" and "good". In addition to testing the validity, there is also reliability testing to analyze the adapted instrument. In the adaptation instruments, internal consistency was used to determine component stability in adapting an instrument with Cronbach Alpha by producing sig. values > 0.7. The all papers reported the reliability testing to have a sig. value > 0.7, that's mean all methods of adaptation in the Indonesian version are reliable.

4. Discussion

The studies conducted by Darmawan et al. (2021), Noviyanti et al. (2021), Sharfina and Santoso (2016) followed some adaptation stages as introduced by Beaton et al. (2000). However, Sharfina and Santoso (2016) had translators from limited backgrounds. To ensure the adapted versions of the methods or instruments have not been reviewed only from a linguistic perspective, adaptation should also include subject-matter experts (Barros and Alexandre 2003; Noviyanti et al. 2021; Nuruzzaman et al. 2020; Petersen et al. 2019). Furthermore, no submission of documentation was observed in Darmawan et al. (2021), Noviyanti et al. (2021), Sharfina and Santoso (2016). The submission of the documentation stage is essential to verify the adapted instrument to the tool developers (Nugraha et al. 2019). Although some articles reported the details of the adaptation process, Ramdan et al. (2019) did not report the comprehensive strategies to get the Indonesian versions of the NMQ. These steps should be reported to ensure that the adaptations follow credible processes (Coluci et al. 2009).

One of the promising paper-based instruments in ergonomics utilized by Indonesian is the Indonesian version of the NMQ that was adapted by the Indonesian Ergonomics Association (*Perhimpunan Ergonomi Indonesia*). However, the adaptation process, as well as the validity and reliability were not yet reported. Furthermore, due to the high utilization of the English version of the ergonomics methods such as Rapid Entire Body Assessment (REBA) (Anggraini and Bati 2016; Joanda and Suhardi 2017; Restuputri 2017; Rizkya et al. 2018; Tiogana and Hartono 2020), this could be a future attempt to adapt this method. By adapting the REBA, language misperception that could cause inaccuracy of the assessment results could be minimized (Nugraha et al. 2019; Nuruzzaman et al. 2020).

5. Conclusion

Based on the results of the literature review, we found six paper-based methods and instruments that were adapted to Indonesian versions, including Rating Scale Mental Effort (RSME), System Usability Scale (SUS), User Experience Questionnaire (UEQ), Nordic Musculoskeletal Questionnaire (NMQ), Chatbot Usability Questionnaire (CUQ), and meCUE 2.0 Framework. Most of the methods and instruments are aimed to be utilized for performing HCI and UX studies. The adaptation approach that was performed to determine the Indonesian versions of the methods and instruments followed partial or complete stages of cross-cultural adaptation standards. Moreover, it was found that several adapted instruments were valid, with the levels being "excellent" to "good." The reliability assessment indicated that several instruments have Cronbach alpha values ranging from 0.7 to 0.8, indicating the adapted versions

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were reliable. Since only six methods and instruments were cross-culturally adapted to Indonesian versions, some opportunity exists to adapt other widely utilized ergonomics methods, such as Rapid Entire Body Assessment (REBA).

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References

Anggraini, D. and Nico, B., Analisa Postur Kerja dengan Nordic Body Map & Reba pada Teknisi Painting di PT. Jakarta Teknologi Utama Motor Pekanbaru, *Photon: Jurnal Sain Dan Kesehatan*, vol. 7, no. 2, 2016.

Arafat, S., Chowdhury, H., Qusar, M. and Hafez, M., Cross Cultural Adaptation and Psychometric Validation of Research Instruments: A Methodological Review, *Journal of Behavioral Health*, vol. 5, no. 3, 2016.

Beaton, D., Bombardier, C., Guillemin, F. and Ferraz, M., Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures, *Spine*, vol. 25, no. 24, 2000.

Brislin, R., Back-Translation for Cross-Cultural Research, *Journal of Cross-Cultural Psychology*, Vol. 1, No. 3, 1970.

Brislin, R., Lonner, W. and Thorndike, R., Cross-Cultural Research Methods, *New York: John Wiley & Sons*, vol 5. no. 2, 1973.

Bullinger, M., Alonso, J., Apolone, G., Leplège, A., Sullivan, M., Wood-Dauphinee, Sharon., Gandek, B., Wagner A., Aaronson, N., Bech, P., Fukuhara, S., Kaasa, S. and Ware, J., Translating Health Status Questionnaires and Evaluating Their Quality: The IQOLA Project Approach, *Journal of Clinical Epidemiology*, vol. 51, no. 11, 1998.

Coluci, M., Alexandre, N. and Rosecrance, J., Reliability and Validity of an Ergonomics-Related Job Factors Questionnaire, *International Journal of Industrial Ergonomics*, vol. 39, no. 6, 2009.

Darmawan, A., Setyawan, M., Cobantoro, A., Masykur, F., Komarudin, A. and Waijeh, M., Adaptation of the MeCUE 2.0 Version for User Experience (UX) Measurement Approach into Indonesian Context, *6th International Conference on Informatics and Computing, ICIC 2021*, 2021.

David, G., Ergonomic Methods for Assessing Exposure to Risk Factors for Work-Related Musculoskeletal Disorders, *Occupational Medicine*, vol. 55, no. 3, 2005.

de Barros, E. and Alexandre. N., Cross-Cultural Adaptation of the Nordic Musculoskeletal Questionnaire, *International Nursing Review*, vol. 50, no. 2, 2003.

Erliana, C. and Zaphira, M., Analisis Postur Kerja Untuk Mengurangi Tingkat Risiko Kerja Menggunakan Metode Rapid Office Strain Assessment (ROSA), *Talenta Conference Series: Energy and Engineering* (EE), vol. 2, no. 3, 2019.

Guillemin, F., Cross-Cuttural Adaptation and Validation of Heatth Status Measures, *Scandinavian Journal of Rheumatology*, vol. 24, no. 2, 1995.

International Ergonomics Association (IEA). What Is Ergonomics. Accessed: 3 January 2022. https://iea.cc/what-is-ergonomics/, 2000.

Joanda, A. and Suhardi, B., Analisis Postur Kerja Dengan Metode REBA Untuk Mengurangi Resiko Cedera Pada Operator Mesin Binding Di PT. Solo Murni Boyolali, *Seminar Dan Konferensi Nasional*, 2017.

Kimberlin, C. and Winterstein, A., Validity and Reliability of Measurement Instruments Used in Research, *American Journal of Health-System Pharmacy*, vol. 65, no. 23, 2008.

Laugwitz, B., Held, T. and Schrepp, M., Construction and Evaluation of a User Experience Questionnaire. *HCI and Usability for Education and Work*, vol. 5298, 2008.

Lewis, J. and Sauro, J., The Factor Structure of the System Usability Scale, *Human Centered Design,* Vol. 5619, 2009

Li, G. and Buckle, P., Current Techniques for Assessing Physical Exposure to Work-Related Musculoskeletal Risks, with Emphasis on Posture-Based Methods, *Ergonomics*, vol. 42, no. 5, 1999.

López-Aragón, L., López-Liria, R., Callejón-Ferre, A. J. and Gómez-Galán, M., Applications of the Standardized Nordic Questionnaire: A Review, *Sustainability*, vol. 9, no. 9, 2017.

Martin, B. and Hanington, B., Universal Methods of Design, 2019.

Martins, A., Rosa, A., Queirós A., Silva, A. and Rocha, N. European Portuguese Validation of the System Usability Scale (SUS), *Procedia Computer Science*, vol. 67, 2015.

Mufti, S. M. and Aprianingsih, A., Customer Analysis Using Business Buying Behavior Framework to Develop a B2B Marketing Strategy for User Experience (UX) Studio, Uxgala, *European Journal of Business and Management Research*, vol. 7, no. 1, 2022.

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Noviyanti, C., Santoso, H. and Putra, P., A Cross-Cultural Adaptation of Chatbot Usability Questionnaire (CUQ): Indonesian Version, 2021 4th International Conference on Information and Communications Technology (ICOIACT), 2021.

Nugraha, M., Antari, N. and Saraswati, N., The Validity and Reliability of the Modification of Northwick Park Neck Pain Questionnaire in Indonesian Version Following Cross-Cultural Adaptation in Mechanical Neck Pain, *Majalah Ilmiah Fisioterapi Indonesia*, vol. 7, no. 3, 2019.

Nuruzzaman, A., Satyawati, R. and Wulan, S., Cross-Cultural Adaptation of Indonesian Version of Activities Specific Balance Confidence Scale for Elderly In Surabaya, vol. 56, no. 4, 2020.

Petersen, R., Tennant, A., Nakagawa, T. and Marziale, M., Translation, Adaptation and Validation of the Nurse-Work Instability Scale to Brazilian Portuguese, *Revista Latino-Americana de Enfermagem*, vol. 27, 2019.

Ramdan, I., Duma, K. and Setyowati, D., Reliability and Validity Test of the Indonesian Version of the Nordic Musculoskeletal Questionnaire (NMQ) to Measure Musculoskeletal Disorders (MSD) in Traditional Women Weavers, *Global Medical & Health Communication (GMHC)*, vol. 7, no. 2, 2019.

Restuputri, D. and Wibisono, M., Metode REBA Untuk Pencegahan Musculoskeletal Disorder Tenaga Kerja. *Jurnal Teknik Industri*, vol. 18, no. 1, 2017.

Restuputri, D., Penilaian Risiko Gangguan Musculoskeletal Disorder Pekerja Batik Dengan Menggunakan Metode Strain Index, *Jurnal Teknik Industri*, vol. 19, no. 1, 2018.

Rizkya, I., Syahputri, K., Sari, R. and Anizar, I., Evaluation of Work Posture and Quantification of Fatigue by Rapid Entire Body Assessment (REBA), *IOP Conference Series: Materials Science and Engineering*, vol. 309, no. 1, 2018.

Rodrigues, M., Sonne, M., Andrews, D., Tomazini, L., Sato, T. and Chaves, T., Rapid Office Strain Assessment (ROSA): Cross Cultural Validity, Reliability and Structural Validity of the Brazilian-Portuguese Version, *Applied Ergonomics*, vol. 75, 2019.

Santoso, H., Schrepp, M., Isal, R., Utomo, A. and Priyogi, B. Measuring User Experience of the Student-Centered E-Learning Environment. *Journal of Educators Online*, vol. 13, no. 1, 2016.

Sharfina, Z. and Santoso, H. B., An Indonesian Adaptation of the System Usability Scale (SUS), *International Conference on Advanced Computer Science and Information Systems* (ICACSIS), 2016.

Sofyan, DK., Amir., Determination of Musculoskeletal Disorders (MSDs) Complaints Level with Nordic Body Map (NBM). *IOP Conference Series: Materials Science and Engineering*, vol. 505, no. 1, 2019.

Tiogana, V. and Hartono, N., Analisis Postur Kerja Dengan Menggunakan REBA Dan RULA Di PT X. *Journal of Integrated System*, vol. 3, no. 1, 2020.

Trust, M. O. Trust Introduces New Translation Criteria. *Medical Outcomes Trust Bulletin*, Vol. 5, Hal. 1, 1997.

Widyanti, A., Johnson, A. and de Waard, D. Adaptation of the Rating Scale Mental Effort (RSME) for Use in Indonesia. *International Journal of Industrial Ergonomics*, vol. 43, no. 1, 2013.

Wild, D., Grove, A., Martin, M., Eremenco, S., Mcelroy, S., Verjee-lorenz, A. and Erikson, P. Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: Report of the ISPOR Task Force for Translation and Cultural Adaptation, *Value in Health*, vol. 8, no. 2, 2005.

Biography

Indah Puspa Murni is currently a master's degree student in industrial engineering program, Universitas Gadjah Mada, Indonesia. Her bachelor's degree in industrial engineering was obtained at the industrial engineering program, Universitas Mercu Buana, Indonesia. She is currently developing a risk assessment method for helping the Indonesian workers who use computers daily establishing an ergonomic workstation.

Ardiyanto Ardiyanto is an assistant professor of the Department of Industrial Engineering, Universitas Gadjah Mada, Indonesia. His bachelor's and master's degree in industrial engineering were obtained from Universitas Gadjah Mada in 2011 and 2013. He received his doctorate degree in industrial and systems engineering at The Ohio State University in 2020. His research interests primarily in ergonomics or human factors focusing on risk assessment and display/controls.

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