ORIGINAL ARTICLE

Translation with cultural adaptation of the risk assessment tool for upper limbs – Hand Arm Risk Assessment Method – HARM-BR

Tradução e adaptação cultural da ferramenta de avaliação de riscos ergonômicos de membros superiores – Hand Arm Risk Assessment Method – HARM-BR

Leonardo Dutra de Salvo Mauad[1], Natalia Sartori[1], Karime Saba Ferreira[2], Ester Rodrigues do Carmo Lopes[1], Karen Ayumi Kawano Suzuki[1], Natália Claro da Silva[2], Vinícius Restani de Castro[2], Marisa de Cássia Registro Fonseca[2]

ABSTRACT

Musculoskeletal injuries in the upper limbs are closely associated with limitations and disabilities. These injuries can be work-related and are known as Repetitive Strain Injuries (RSI) or Work-Related Musculoskeletal Disorders (WRMD). The ergonomic evaluation aims to detect the risk factors for the development of RSI/WRMD and, therefore, preventive or intervention strategies can be implemented. Translated and validated observational assessments are required to achieve reliable results. The HARM 2.0 questionnaire is a specific assessment tool that indicates the risk of injury in several tasks that use the upper limbs in the work environment. **Objective:** The objective of this study is to conduct the translation and cross-cultural adaptation of the HARM 2.0 questionnaire for the assessment and prevention of work-related injuries. **Methods:** Translation and cross-cultural adaptation protocol consisting of four stages: translation, synthesis, back-translation, review by the Expert Committee, and approval by the authors of the original version. **Results:** The initial stage (Stage I) of translation of the HARM 2.0 questionnaire was regular and had no significant issues. Regarding the difficulty, the expert translator referred that translating the HARM items and instructions was easy, whereas the lay translator considered the scale moderate. **Conclusion:** The scale HARM-BR 2.0 presents satisfactory results in the process of translation and cross-cultural adaptation and its version available to use. Future studies should be conducted to establish its measurement properties for the Brazilian population.

Keywords: Ergonomics, Upper Extremity, Surveys and Questionnaires, Translating

RESUMO

Lesões musculoesqueléticas nos membros superiores estão intimamente ligadas a limitações funcionais e incapacidades. Estas lesões podem estar relacionadas ao trabalho e são conhecidas como Lesões por Esforços Repetitivos (LER) ou Distúrbios Osteomusculares Relacionados ao Trabalho (DORT). A avaliação ergonômica visa detectar os fatores de riscos para o desenvolvimento das LER/DORT e assim, intervenções e/ou ações preventivas possam ser implementadas. Para isso, são necessárias ferramentas observacionais de avaliação traduzidas e validadas para que resultados fidedignos sejam alcançados. O questionário HARM 2.0 é uma ferramenta de avaliação específica que indica se há risco de lesão em diversas tarefas que utilizam majoritariamente os membros superiores durante sua jornada de trabalho. **Objetivo:** Conduzir a tradução e adaptação transcultural do questionário HARM 2.0 para ser usado para avaliação e prevenção de riscos de lesões relacionadas ao trabalho. **Métodos:** A tradução e adaptação transcultural seguiu um protocolo composto por quatro estágios: tradução, síntese, retrotradução, revisão pelo comitê de especialistas e aprovação do conteúdo pelas autoras da versão original. **Resultados:** O estágio inicial (Estágio I) de tradução do questionário HARM 2.0 transcorreu sem intercorrências. Com relação ao grau de dificuldade, o tradutor expert referiu facilidade ao traduzir os itens e instruções do instrumento, enquanto a tradutora leiga considerou a dificuldade como moderada. **Conclusão:** O instrumento HARM-BR 2.0 apresentou resultados satisfatórios no processo de tradução e adaptação transcultural, estando sua versão disponível para uso. Futuros estudos são necessários para analisar as suas propriedades de medidas para a população brasileira de trabalhadores.

Palavras-chaves: Ergonomia, Extremidade Superior, Inquéritos e Questionários, Tradução

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INTRODUCTION

Musculoskeletal injuries in the upper limbs are highly correlated with functional limitations and disabilities. Such injuries are often work-related and are known as Repetitive Strain Injuries (RSI) or Work-Related Musculoskeletal Disorders (WRMD). An epidemiological survey conducted by the Brazilian Ministry of Health and published in March 2019 found that these two diseases accounted for 67,599 cases among workers in the previous ten years, an increase of 184% in their prevalence, compared to the prior period. According to this survey, in the chapter Overview of Work-Related Chronic Diseases in Brazil, this breakthrough in work-related musculoskeletal injuries suggests increased exposure to risk factors and consequently an increase in functional disability.[1]

The Southeastern region recorded the highest number of RSI/WMSDs (58.4%), and the most affected workers were female (51.7%), aged 40 to 49 years (33.6%), and with complete high school (32.7%). The areas with the highest prevalence for RSI/WMSDs were industry professionals, commercial, food, transportation sectors, and janitorial services.[1]

Preventive strategies are designed to promote health, stopping disabilities or injuries from occurring.[2,3] For prevention purposes, the Brazilian Ministry of Health recommends that employers put into effect the Regulatory Standard 17 (NR-17), which "establish parameters for the adaptation of the work conditions to the psycho-physiological characteristics of the workers in order to provide maximum comfort, safety, and efficient performance".[4]

Ergonomics studies the interactions between the individual and the several constituents of the work environment to apply theoretical principles, knowledge, and methods to optimize well-being and work performance.[5] Its main characteristic is interdisciplinarity, allowing optimal productivity and worker well-being by reducing unnecessary or incorrect efforts in daily routine.[6]

The Ergonomic Workplace Analysis (EWA) applies knowledge of ergonomics to assess, diagnose, and correct actual work conditions. Such conditions may be associated with several risk factors such as physical, biomechanical, organizational, cognitive, and psychosocial.[5] In this perspective, EWA is a methodology designed to eliminate or minimize work-related disabilities by dividing the conditions and analyzing every part, generating and validating hypotheses to improve the quality of life at work.[7] The EWA methodology is divided into five stages: demand analysis (general analysis of the problem situation and the limits of the system); task analysis (presentation of system conditions and resources); analysis of actual activity (identification of all problems and their solution hypotheses); diagnosis (general assessment of problems, causes and hypotheses) and specifications (presentation of recommendations and solution suggestions).[5]

Different assessments of biomechanical risks of tasks or jobs can be applied in EWA, either by direct or indirect observations, based on observational checklists or self-reported questionnaires, such as the Rapid Upper Limb Assessment (RULA),[8] Rapid Entire Body Assessment (REBA),[9] Shoulder Pain and Disability Index (SPADI),[10] Disabilities of the Arm, Shoulder and Hand (DASH),[11] and others. One of the assessments is a questionnaire developed by a Dutch group of researchers, the Hand Arm Risk-Assessment Method (HARM).[12]

This questionnaire is applied to assess and reduce the risk of upper limb injuries in workers. However, this tool is only available in English and Dutch.

These assessment tools must be translated and culturally adapted according to specific and standardized methodologies before being used with other populations of other countries.[13,14] The cross-cultural adaptation is a fundamental methodological process in which the original version and the translated version of an assessment are equivalent regarding language (semantics and idiomatic) and culture. The cultural adaptation is accomplished after following these steps: (1) translation into the language of the country in which the tool is intended to be applied; (2) translation synthesis; (3) back-translation into the original language; (4) review by a committee of experts and tests of the pre-final version of the translated scale. After the cross-cultural adaptation, the validation of the instrument is recommended, as it will ensure that the new (translated) version has the measurement properties necessary to assess what is intended (Figure 1).
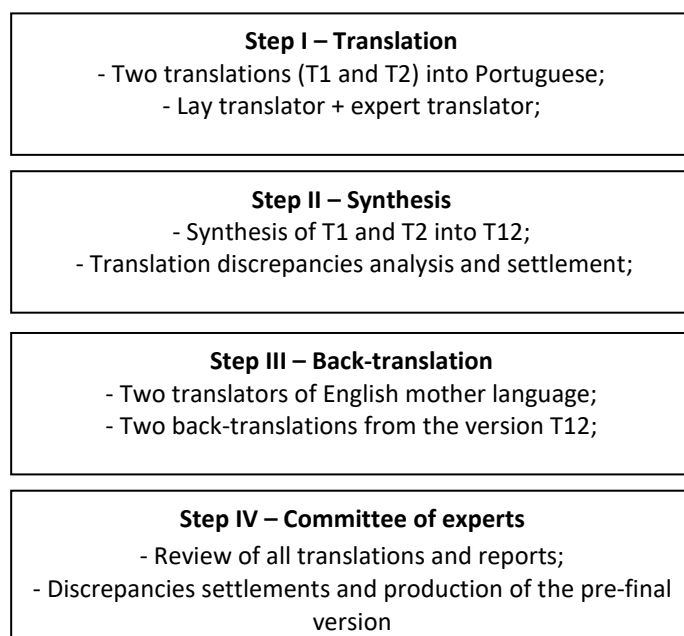
| **Step I – Translation** |
| - Two translations (T1 and T2) into Portuguese; |
| - Lay translator + expert translator; |

| **Step II – Synthesis** |
| - Synthesis of T1 and T2 into T12; |
| - Translation discrepancies analysis and settlement; |

| **Step III – Back-translation** |
| - Two translators of English mother language; |
| - Two back-translations from the version T12; |

| **Step IV – Committee of experts** |
| - Review of all translations and reports; |
| - Discrepancies settlements and production of the pre-final version |

Figure 1. Graphic representation for transcultural adaptation protocol of Beaton et al.[14]

According to the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN)[13,15] the measurement properties of an instrument should be evaluated once it is crucial to reassess the final version of the questionnaire and investigate whether it maintains the quality of its original version. The assessment of the final version is based on its measurement properties.[13]

The existence of tools translated into Brazilian Portuguese to assess ergonomic risks is fundamental to detect and prevent RSI/WMSDs and to propose preventive strategies and interventions.

OBJECTIVE

The objective of this study is to provide the translation and cross-cultural adaptation into Brazilian Portuguese of the HARM 2.0 questionnaire.

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METHODS

This cross-sectional study was approved by the Independent Review Board (IRB) *Comitê de Ética em Pesquisa do Hospital das Clínicas da Faculdade de Medicina de Ribeirão Preto – HCFMRP*, and was registered with the number 99310717.3.0000.5440.

Hand Arm Risk Assessment-Method (HARM)

The HARM is a simplified and specific tool for evaluating and analyzing musculoskeletal symptoms of the wrist, elbow, shoulder, and/or neck during labor activities that require the upper limbs movements. The method is intended to assess tasks that recruit the hands and arms, in which leg and trunk activity is minimal, such as assembling or disassembling components, hairdressing, barbering, packaging, or woodworking.

The HARM must be applied for tasks that require more than 1 hour a day and applied with a force of less than 6 kg (60 N). The purpose of the HARM is to classify the tasks, which is accomplished with a graduated scale of colors: green (low risk of arm, neck, or shoulder symptoms for working population), yellow (medium risk or increased risk of arm, neck, or shoulder symptoms for some employees meaning preventive measures should be taken to reduce the risk), or red (high risk for symptoms of arm, neck, or shoulder, meaning preventive interventions should be taken immediately).[12]

The developers of HARM (Marjolein Douwes and Heleen De Kraker) allowed this assessment's cultural adaptation and translation into Brazilian Portuguese. The chosen method was based on Beaton's studies, which determine the steps to conduct the translation and cultural adaptation proocess[14] (Figure 1).

In this methodology, two translations into Portuguese were performed: the first, by a lay translator, and the second, by a translator who was aware of the study objectives (Stage I).

After both translations, weekly meetings were held with the Committee of Experts and the expert translator to resolve discrepancies between the two versions of the translation and synthesize them into a single third version, which should be understandable and applicable to the target population (Stage II).

Stage III comprises the back-translation process, in which the third version was sent to an English-speaking translator, who should validate the possibility of applying the translated questionnaire and review the final version.

RESULTS

Stage I of the HARM 2.0 translation had no significant issues. Regarding the degree of difficulty, the expert translator reported that translating the items and instructions of the instrument was easy, whereas the lay translator rated the translation as moderate. Most of the items were translated with the same terms by both translators, and the differences did not cause discrepancies in understanding.

Chart 1 shows the original terms of the HARM questionnaire with the translations and adaptations made to the HARM-Br.

Chart 1. Original phrases and the arguments for translation choices made during the translations

Original phrase	Rationale
Purpose	Translated into *propósito* (reason) instead of *função* (function)
Worker	Translated into *trabalhador* (worker), instead of *funcionário* (employee), as an attempt to include jobs such as hairdressers, barbers, and others
Task	Translated into *tarefa* (task) instead of *atividade* (activity)
Steps	Translated into *passo* (step), instead of *etapa* (stage), due to its idea of continuation
Personnel officers	Translated into *funcionários de recursos humanos* (human resources personnel)
Snapshots	Translated into *fotos* (pictures) instead of *fotos instantâneas* (instant photos) for a more contemporary definition
Force exertions	Translated into *empregos de força* (force exertions) instead of *esforços de força* (force effort) avoiding redundancy
Deduct	Translated into *subtrair* (reduce or subtract) instead of *deduzir* (deduct) to bring the idea of the math operation instead of logical deduction or inference
Gray box	Translated into *caixa cinza* (gray box) instead of *quadro cinza* (gray board) for a ludic or playful understanding
Tick	Translated into *assinalar* (check) instead of *marcar* (mark) for a ludic or playful understanding
Measurement form	Translated into *formulário* (form) instead of *ficha de medição* (measuring form), to emphasize the questionnaire objective to evaluate the tasks
Amber	Translated into *amarelo* (yellow), similar to a traffic light

DISCUSSION

During the translation and cultural adaptation of the HARM 2.0 questionnaire into Brazilian Portuguese, the methodological recommendations of the COSMIN checklist[13] were observed and followed.

The discrepancies between the words suggested by the lay translator and the translator who was aware of the project's objective (expert translator) were resolved by the Committee of experts during weekly meetings in the presence of the expert translator. In these meetings, the objective was to facilitate understanding the target population, assuring the formality

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and technicality of the terms with discrepancies.

Evaluating the quality of forces or efforts applied at work for identifying, preventing, and reducing RSI/WRMD risk factors is of paramount importance. In this perspective, it is possible to reduce the resources destined for the treatment of such workers, also increasing their productivity. In Brazil, there is a limited number of workplace questionnaires and assessments translated and adapted to Brazilian Portuguese, making their application difficult and, consequently, reducing the prevention of occupational injuries. However, in a bibliographic review, it is observed that many studies use foreign scales without the proper cultural adaptation, jeopardizing the validity and reliability of the assessment results. Therefore, the process of transcultural translation and adaptation is as relevant as the development of a new functional assessment.[16-20]

We understand that evaluating a new tool should be continuous and that the present study concluded an initial step of the possible analyses. Based on this assumption, we suggest further studies should be conducted with this new assessment to increase its scope and evaluate the yet unknown measure properties such as reliability, validity, and responsiveness.

CONCLUSION

The scale HARM-BR 2.0 showed satisfactory results in the process of translation and cross-cultural adaptation, and its version is available for use. Future studies should establish its measurement properties for the Brazilian population of workers of different occupations. We understand that knowing its applicability as an observational assessment available for the ergonomic analysis of the work environment may provide early detection of possible risk factors for the development of RSI/WRMD.

REFERENCES

1. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Saúde Brasil 2018 uma análise de situação de saúde e das doenças e agravos crônicos: desafios e perspectivas. Brasília: Ministério da Saúde; 2019.

2. Ferreira VMV, Shimano SGN, Fonseca MCR. Fisioterapia na avaliação e prevenção de riscos ergonômicos em trabalhadores de um setor financeiro. Fisioter Pesqui. 2009;16(3):239-45. Doi: http://doi.org/10.1590/S1809-29502009000300009

3. Fonseca MCR, Ramos BG. Gestão de qualidade na produção de refeições. In: Vieira MNCM, Japur CC. Ergonomia aplicada às unidades de alimentação e nutrição. Rio de Janeiro: Guanabara Koogan; 2012. p. 65-70.

4. NR 17 - Ergonomia [texto na Internet]. Curitiba: Guia Trabalhista; c2020 [citado 2020 jun 12]. Disponivel em: http://www.guiatrabalhista.com.br/legislacao/nr/nr17.htm

5. Iida I, Buarque LBM. Ergonomia: projeto e produção. 3 ed. São Paulo: Blucher; 2016.

6. Moreira LF, Pessôa MCM, Mattana DS, Schimitz FF, Volkweis BS, Antoniazzi JL, et al. Adaptação cultural e teste da escala de complicações cirúrgicas de Clavien-Dindo traduzida para o Português do Brasil. Rev Col Bras Cir. 2016;43(3):141-8. Doi: http://doi.org/10.1590/0100-69912016003001

7. Abrahão JI, Sznelwar L, Silvino A, Sarmet M, Pinho D. Introdução à ergonomia: da teoria à prática. São Paulo: Blucher; 2009.

8. McAtamney L, Nigel Corlett E. RULA: a survey method for the investigation of work-related upper limb disorders. Appl Ergon. 1993;24(2):91-9. Doi: http://doi.org/10.1016/0003-6870(93)90080-s

9. Hignett S, McAtamney L. Rapid entire body assessment (REBA). Appl Ergon. 2000;31(2):201-5. Doi: http://doi.org/10.1016/s0003-6870(99)00039-3

10. Roach KE, Budiman-Mak E, Songsiridej N, Lertratanakul Y. Development of a shoulder pain and disability index. Arthritis Care Res. 1991;4(4):143-9.

11. Beaton DE, Katz JN, Fossel AH, Wright JG, Tarasuk V, Bombardier C. Measuring the whole or the parts? Validity, reliability, and responsiveness of the disabilities of the arm, shoulder and hand outcome measure in different regions of the upper extremity. J Hand Ther. 2001;14(2):128-46.

12. de Kraker H, Douwes M. New risk assessment tools in The Netherlands. Work. 2012;41 Suppl 1:3984-9. Doi: http://doi.org/10.3233/WOR-2012-0697-3984

13. Prinsen CAC, Mokkink LB, Bouter LM, Alonso J, Patrick DL, de Vet HCW, et al. COSMIN guideline for systematic reviews of patient-reported outcome measures. Qual Life Res. 2018;27(5):1147-57. Doi: http://doi.org/10.1007/s11136-018-1798-3

14. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976). 2000;25(24):3186-91. Doi: http://doi.org/10.1097/00007632-200012150-00014

15. Pilatti LA, Pedroso B, Gutierrez GL. Propriedades psicométricas de instrumentos de avaliação: um debate necessário. Rev Bras Ens Ciên Tecnol. 2010;3(1). Doi: https://doi.org/10.3895/S1982-873X2010000100005

16. Valentim DP, Sato TO, Comper MLC, Silva AMD, Boas CV, Padula RS. Reliability, Construct Validity and Interpretability of the Brazilian version of the Rapid Upper Limb Assessment (RULA) and Strain Index (SI). Braz J Phys Ther. 2018;22(3):198-204. Doi: http://doi.org/10.1016/j.bjpt.2017.08.003

17. Lamarão AM, Costa LCM, Comper MLC, Padula RS. Translation, cross-cultural adaptation to Brazilian-Portuguese and reliability analysis of the instrument Rapid Entire Body Assessment-REBA. Braz J Phys Ther. 2014;18(3):211-7. Doi: http://doi.org/10.1590/bjpt-rbf.2014.0035

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18. Comper ML, Costa LO, Padula RS. Quick Exposure Check (QEC): a cross-cultural adaptation into Brazilian-Portuguese. Work. 2012;41 Suppl 1:2056-9. Doi: http://doi.org/10.3233/WOR-2012-0430-2056

19. Turci AM, Bevilaqua-Grossi D, Pinheiro CF, Bragatto MM, Chaves TC. The Brazilian Portuguese version of the revised Maastricht Upper Extremity Questionnaire (MUEQ-Br revised): translation, cross-cultural adaptation, reliability, and structural validation. BMC Musculoskelet Disord. 2015;16:41. Doi: http://doi.org/10.1186/s12891-015-0497-2

20. Rodrigues MS, Sonne M, Andrews DM, Tomazini LF, Sato TO, Chaves TC. Rapid office strain assessment (ROSA): Cross cultural validity, reliability and structural validity of the Brazilian-Portuguese version. Appl Ergon. 2019;75:143-54. Doi: https://doi.org/10.1016/j.apergo.2018.09.009