

Received: 2020.08.17

Accepted: 2020.12.16

Available online: 2021.01.08

Published: 2021.01.22

# Cross-Cultural Adaptation and Validation of the Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians of the Polish Population (MPIIQM-P)

Authors' Contribution:  
Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
Funds Collection G

ABCDEF G 1 **Anna Katarzyna Cygańska**  
ADE 1 **Aleksandra Truszczyńska-Baszak**  
CDE 2 **Paweł Tomaszewski**

1 Faculty of Rehabilitation, Józef Piłsudski University of Physical Education in Warsaw, Warsaw, Poland  
2 Faculty of Physical Education, Józef Piłsudski University of Physical Education in Warsaw, Warsaw, Poland

**Corresponding Author:** Anna Katarzyna Cygańska, e-mail: [anna.katarzyna.cyganska@gmail.com](mailto:anna.katarzyna.cyganska@gmail.com)  
**Source of support:** Self financing

**Background:** The aim of the study was the cross-cultural adaptation and validation of the Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians.

**Material/Methods:** The process consisted of the following stages: forward translation, backward translation, analysis by committee of experts, pretest of Polish-language version of questionnaire, and cross-cultural validation: psychometric evaluation. In the last step, a convenience sample of 31 professional orchestra musicians (professional experience  $16.7 \pm 9.5$  years) was used to validate the new tool. The primary study outcome measurements were construct validity and internal consistency as measured by exploratory factor analysis (EFA) and Cronbach's alpha, respectively.

**Results:** A final Polish version of the questionnaire was developed. Using EFA, the 2-factor structure (pain intensity and pain interference) was obtained, taking into account all 9 items, explaining about 76% of the total variance. The pain interference and pain intensity factors were characterized by high internal consistency (Cronbach's alpha 0.923 and 0.784, respectively). The lifetime prevalence of playing-related musculoskeletal disorders was 87%.

**Conclusions:** Translation and a cross-cultural adaptation of the Polish version of the questionnaire was successfully completed. The results obtained show a correctly carried-out validation process, but further testing of the tool is suggested. The Polish-language version of the validated tool can be used in scientific and clinical practice. The next step would be to estimate cutoff values for severity of health status in orchestra musicians.

**MeSH Keywords:** **Musculoskeletal Diseases • Pain Measurement • Physical Therapy Modalities • Questionnaires • Validation Studies**

**Full-text PDF:** <https://www.medscimonit.com/abstract/index/idArt/928038>

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## Background

Playing-related musculoskeletal disorders (PRMDs) are a common phenomenon among instrumentalists, and in several studies 73-89.5% of musicians reported pain related to playing an instrument [1–5]. This is reflected in increasingly numerous publications on artists' health problems, as well as strategies for their prevention and treatment [6–10]. The most frequently analyzed parameter regarding musculoskeletal problems is pain and difficulties associated with playing the instrument [7,11–13].

In the available literature, no standardized Polish-language tools for assessing ailments of this professional group were found. Only the English-language MSK Load and Physical Health Questionnaire for Musicians and Musculoskeletal Pain Questionnaire for Musicians is available [14, 15]. To best assess and monitor the actions taken, Berque et al. [16] indicated the need to develop a standardized tool in this group of patients. The Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians (MPIIQM) is an objective, specific, and standardized questionnaire using the principles set out by the World Health Organization on the basis of the International Classification of Functioning, Disability and Health (ICF) [16]. It was developed as a tool dedicated for professional musicians, taking into account the specificity of the studied group. In creating MPIIQM, Berque et al. [16] used existing English-language questionnaires (Brief Pain Inventory and Disabilities of the Arm, Shoulder, and Hand [DASH] questionnaires), analyzing them and grouping the items in accordance with 3 components of ICF classifications (function, activity, and participation). After creating the MPIIQM questionnaire, it was psychometrically validated, taking into account construct validity, internal consistency, and test-retest reliability. The translation and cross-cultural validation of the German-language version of the MPIIQM questionnaire was completed by Möller et al. [17]. To evaluate construct validity, they used 3 German-language questionnaires (Brief Pain Inventory, Quick DASH, and Fatigue Severity Scale). The authors of the study emphasized the need to use valid and reliable research tools in prevalence studies [16,18,19]. The process of translation, cross-cultural adaptation, and validation of research tools enables the use of the same research tools among populations differing both linguistically and culturally [20–22].

The aim of the study was the cross-cultural adaptation and validation of the MPIIQM, thus providing a professional tool for studying the Polish population of musicians.

## Material and Methods

### Translation process and cross-cultural adaptation

After obtaining written permission for translation from the authors of the original version of the MPIIQM questionnaire, the process of validating the described tool was undertaken. The consent of the Scientific Research Ethics Committee (SKE 01-37/2017) was also obtained for conducting the research. The study was conducted in accordance with the guidelines of the Helsinki Declaration. The validation process proceeded according to stages based on the guidelines of Guillemin et al. [23] and Beaton et al. [20]. The process consisted of the following stages: forward translation, backward translation, analysis by committee of experts, pretest of Polish-language version of the questionnaire, and cross-cultural validation: psychometric evaluation.

The first stage (forward translation, from English to Polish) was the execution of 4 Polish-language translations by 4 independent translators whose native language was Polish. One of the translators was familiar with the specificity of the translated tool, and the others did not have medical knowledge or were not familiar with the specificity of the translated tool. The second stage (backward translation, from Polish to English) was the execution of 4 English-language translations based on previously developed Polish-language versions of the questionnaire by 4 independent translators whose native language was English. None of the translators had either medical knowledge or knowledge of the specificity of the translated tool, or awareness of the purpose of performing the translation, to obtain the most reliable version [24]. The back translators were blinded to the original version of the questionnaire. The third stage (analysis carried out by a committee of experts) was the development of the prefinal version of the questionnaire on the basis of all translations received (8 in total) and the original version. All aspects and details related to the creation of the prefinal version of the validated tool were discussed by the committee of experts: author AC (physiotherapist; scientist; basic music education) and author AT-B (physiotherapist; scientist) and translators involved in the study (they were language experts and professional translators). The committee of experts focused on preserving semantic, idiomatic, experimental, and conceptual equivalence. The fourth stage, referred to as the pretest, was the preliminary assessment of the developed prefinal version of the questionnaire by 40 professional orchestra musicians. The musicians were asked to fill in the questionnaire and a table provided, to describe their understanding of each item of the questionnaire and add comments. These comments were intended to address comprehensibility, relevance, completeness, clarity, wording, conciseness of the items, and burden for the respondent. The authors then analyzed the results and comments and used this information in

designing the final version of the questionnaire. In the third and fourth stages, a written report was completed by the expert committee as a documentation of all decisions and changes for achieving the most accurate version of the translation.

### Cross-cultural validation – psychometric evaluation

#### Participants

Musicians from one of the Polish professional philharmonic orchestras were invited to take part in the study ( $n=70$ ). The musicians were asked to complete the prepared questionnaire twice with an interval of several days. The inclusion criteria for the study were: age over 18, Polish as the native language, playing in a professional orchestra. Amateur musicians were excluded from the study. All subjects were informed about the purpose and procedure of the study and gave informed consent to participate in the study.

#### Procedure

Cross-cultural validation: psychometric evaluation consisted of completing and assessing the psychometric properties of the final version of the questionnaire by a target group of professional musicians. The musicians were asked to complete the prepared questionnaire twice with an interval of several days. Questionnaires were personally distributed and collected by the first author during breaks in rehearsals. During the study, the author was present to provide instructions if necessary.

#### Questionnaire

The questionnaire contains 22 items and consists of the following parts: demographic and practice habits (8 items), prevalence periods of PRMD (4 “yes/no” items); item 13 is a body chart for indicating pain location. Items 14 to 17 (pertaining to pain intensity indicated on the body chart) concern pain intensity and items 18 to 22 concern pain interference (pain affective interference and pain activity interference). These questions are measured by a numeric rating scale (from 0 to 10) and can be analyzed as a sum of answers (pain intensity or pain interference) or separate answers.

#### Statistical analysis

Sample size guidelines suggest subject-to-variable ratio of 5: 1 [25] or 10: 1 [26] in studies using exploratory factor analysis (EFA). Therefore, in this study, the EFA on the 9 items would require between 45 and 90 participants.

Descriptive statistics were used, including mean and standard deviation, median, min-max (continuous data), and percentages (categorical data).

Construct validity refers to whether the scores of a test or instrument measure the distinct dimension (construct) they are intended to measure. It determines the dimensions and internal structure of an instrument and reduces its size by removing items that do not show clear contribution to the construct [27]. EFA is a statistical method used to uncover the underlying structure of a relatively large set of variables. In this study EFA with principal axis factoring was used to assess the dimensionality of the MPIIQM. EFA is usually considered a preferable method to principal component analysis (PCA) [26] as it accounts for common variance in the data and not the total variance. This is in contrast to PCA, which is mainly considered a data reduction method [25]. The Kaiser Meyer Olkin (KMO) sampling adequacy test and Bartlett’s sphericity test were applied to determine that the data were suitable to run EFA. KMO values greater than 0.5 indicate that the data are appropriate for EFA and the analysis should produce distinct and reliable factors for the given sample size. A significant Bartlett’s test ( $P<0.05$ ) shows that a correlation matrix of variables included is not an identity matrix, which indicates that variables are unrelated and therefore unsuitable for structure detection [28]. The number of factors was determined on the basis of the Kaiser criterion (eigenvalue  $\geq 1$ ).

EFA was performed taking into account 9 items of the MPIIQM (4 items related to pain intensity and 5 items about pain interference) among participants who reported the occurrence of current PRMD ( $n=19$ ). To find the best solution, no rotation, an orthogonal Varimax, and oblique (direct oblimin) rotations were used, as was done in the study of Berque et al. [16]. Factor loadings are correlation coefficients between observed variables and latent common factors; the squared factor loading is the percentage of variance in that variable explained by the factor [28]. The cutoff value for factor loading of 0.4 is considered to meet the minimal level for interpretation of structure [29]; however, factor loading as high as 0.70 is sometimes recommended [30]. In this study a cutoff value of 0.6 for factor loadings was applied to obtain a greater amount of the variable’s total variance attributable to the factor (squared loading) and to partially compensate for small sample size.

Internal consistency was assessed by using Cronbach’s alpha statistics; calculations were performed for each dimension/factor separately [31]. Cronbach’s alpha values exceeding 0.70 were considered adequate [32]. Item-to-total correlations and changes to alpha after individual item deletion were tested [27].

Analyses were performed using SPSS software version 25 (SPSS, Inc., Chicago, Illinois, USA). The level of significance was set at  $\alpha=0.05$ .

## Results

### Translation process and cross-cultural adaptation

While working on the prefinal version of the questionnaire, the expert committee introduced a change because of cultural differences, consisting of adding the “Pan/Pani” honorific (similar to Mr/Ms in English) to items. This form of address is commonly used in Poland both in writing and in speech when addressing someone formally. The committee of experts also encountered several language interpretation difficulties. For clarification purposes certain words were changed or additionally explained. The word “weakness” literally meaning “weakness” was replaced by the words “diminished muscle strength.” The words “numbness and tingling” have no unambiguous equivalent in Polish and the words “sensory disturbance” were used instead, explaining in brackets that it relates to “numbness and tingling.” The words “aches and pains,” also having no equivalent in Polish, were translated as “pain.” However, after evaluating the prefinal version of the questionnaire, the musicians admitted to using the word “ache” more often, which was finally chosen by the committee of experts.

While analyzing the results and comments of the musicians regarding the prefinal version of the questionnaire, item no. 4 was also modified because the word “position” in Polish refers to position held at work; the musicians suggested changing it to “working time” because it refers to full- or part-time hours worked. The musicians also suggested that item nos. 7 and 8 do not fully reflect the specifics of work in the profession of orchestra musician, because so-called down times often occur, which, according to them, does not quite reflect the average number of hours per week; however, the committee of experts decided that a change in the content of the item would be an interference with the tool itself and left this item unchanged. This is an interesting issue that is worth exploring in further study. The final version of the MPIQM-P is presented in **Figure 1**.

### Cross-cultural validation: psychometric evaluation

#### Participants

Thirty-one professional musicians from 1 of the Polish symphony orchestras (n=70), 17 (54.8%) women and 14 (45.2%)

**A**

1. Ile ma Pani/Pan lat? \_\_\_\_\_ lat(a)
2. Płeć:  Mężczyzna  Kobieta
3. Na jakim instrumencie gra Pan/Pani w orkiestrze? \_\_\_\_\_
4. W jakim wymiarze jest Pan/Pani zatrudniony(a) w orkiestrze?  
 cały etat  pół etatu
5. Od ilu lat gra Pan/Pani na swoim instrumencie? \_\_\_\_\_ lat(a)
6. Od ilu lat gra Pan/Pani zawodowo w orkiestrze? \_\_\_\_\_ lat(a)

7. Ile godzin średnio w tygodniu gra Pan/Pani na swoim instrumencie **w orkiestrze** (wliczając w to próby, nagrania, występy)? \_\_\_\_\_ **godzin(y) w tygodniu**
8. Ile godzin średnio w tygodniu gra Pan/Pani na swoim instrumencie **poza obowiązkami związanymi z orkiestrą** (wliczając w to ćwiczenia indywidualne, muzykę kameralną, występy solowe, grę podczas lekcji, koncerty i inne)? \_\_\_\_\_ **godzin(y) w tygodniu**

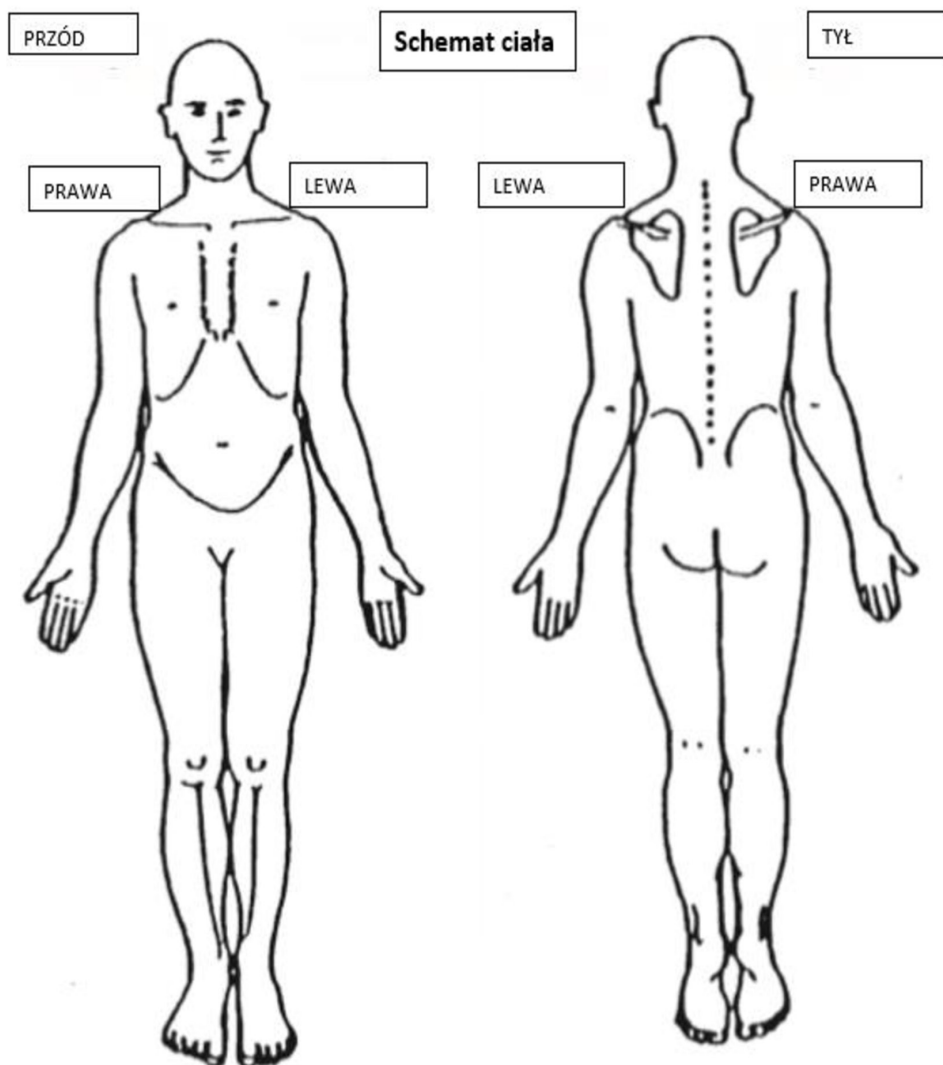
**B**

**Problemy mięśniowo-szkieletowe związane z graniem na instrumencie definiuje się jako „ból, osłabienie siły mięśni, zaburzenie czucia (mrowienie i drętwienie) lub inne objawy, które zaburzają grę na instrumencie na poziomie do którego jest Pan/Pani przyzwyczajony(a)”. Ta definicja nie uwzględnia przejściowych, łagodnych poboлеваń.**

9. Czy **kiedykolwiek** miał(a) Pan/Pani bóle/ problemy które zaburzały Panu/Pani grę na poziomie, do którego jest Pan/Pani przyzwyczajony(a)?  Tak  Nie
10. Czy **w ciągu ostatnich 12 miesięcy** miał(a) Pan/Pani bóle/problemy, które zaburzały Panu/Pani grę na poziomie, do którego jest Pan/Pani przyzwyczajony(a)?  Tak  Nie
11. Czy **w ciągu ostatnich 4 miesięcy** miał(a) Pan/Pani bóle/problemy, które zaburzały Panu/Pani grę na poziomie, do którego jest Pan/Pani przyzwyczajony(a)?  Tak  Nie
12. Czy **obecnie (w ciągu ostatnich 7 dni)** ma Pan/Pani bóle/problemy, które zaburzają grę na instrumencie na poziomie, do którego jest Pan/Pani przyzwyczajony(a)?  Tak  Nie

**Jeśli odpowiedział(a) Pan/Pani na pytanie 11 i/lub 12 twierdząco, proszę kontynuować ankietę. W przeciwnym razie proszę w tym miejscu zakończyć ankietę i zwrócić kwestionariusz lub odesłać go używając załączonej koperty.**

- C 13. Na schemacie ciała proszę ZACIENIOWAĆ **każdy** z obszarów, w którym odczuwa Pan/Pani **ból/problem**. Proszę wstawić znak X w **JEDNYM** miejscu, w które BOLI najbardziej.



**D** Następane cztery pytania odnoszą się TYLKO do BÓLU. Proszę zaznaczyć odpowiedzi odnosząc się tylko do JEDNEGO miejsca, **które zaznaczył(a) Pan/Pani znakiem X** na poprzednim schemacie ciała. W przeciwnym razie, proszę przejść do pytania nr 18.

14. Proszę określić natężenie bólu zakreślając jedną liczbę, która najlepiej oddaje **najsilniejszy** ból w zeszłym tygodniu.

0 1 2 3 4 5 6 7 8 9 10

Brak bólu

Najsilniejszy ból jaki można sobie wyobrazić

15. Proszę określić natężenie bólu zakreślając jedną liczbę, która najlepiej oddaje **najsłabszy** ból w zeszłym tygodniu.

0 1 2 3 4 5 6 7 8 9 10

Brak bólu

Najsilniejszy ból jaki można sobie wyobrazić

16. Proszę określić natężenie bólu zakreślając jedną liczbę, która najlepiej oddaje **średni** ból w zeszłym tygodniu.

0 1 2 3 4 5 6 7 8 9 10

Brak bólu

Najsilniejszy ból jaki można sobie wyobrazić

17. Proszę określić natężenie bólu zakreślając jedną liczbę, która najlepiej oddaje **obecny ból teraz**.

0 1 2 3 4 5 6 7 8 9 10

Brak bólu

Najsilniejszy ból jaki można sobie wyobrazić

**E** **Pozostała część ankiety odnosi się zarówno do BÓLU jak i/albo do PROBLEMÓW.**

Dla każdego z pytań proszę zakreślić jedną liczbę, która określa jak bardzo w zeszłym tygodniu **bóle/problemy** zaburzały Pana/Pani:

18. **Nastrój**

0 1 2 3 4 5 6 7 8 9 10

Nie zaburzały w żaden sposób.

Zaburzały całkowicie.

19. **Radość z życia**

0 1 2 3 4 5 6 7 8 9 10

Nie zaburzały w żaden sposób.

Zaburzały całkowicie.

Dla każdego z pytań proszę zakreślić JEDNĄ liczbę określającą czy w zeszłym tygodniu w wyniku **bólów/problemów** pojawiły się u Pani/Pana **trudności z:**

20. **Zastosowaniem tej co zwykle techniki grania na instrumencie?**

0 1 2 3 4 5 6 7 8 9 10

Brak trudności

Całkowita niezdolność

21. **Graniem na instrumencie z powodu dolegliwości?**

0 1 2 3 4 5 6 7 8 9 10

Brak trudności

Całkowita niezdolność

22. **Graniem na instrumencie tak dobrze jak Pan/Pani tego chciał(a)?**

0 1 2 3 4 5 6 7 8 9 10

Brak trudności

Całkowita niezdolność

**Dziękuję za udział w badaniu.****Proszę o zwrot kwestionariusza lub odesłanie go używając załączonej koperty.**

**Figure 1. (A–E)** The final version of the Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians – Polish.



**Table 1.** Participant characteristics (mean, standard deviation [SD], min–max).

Parameter	Participants (n=31)		
	Mean	SD	Min–max
Age (years)	39.5	9.4	24–54
Playing time on the instrument (years)	29.8	9.6	14–45
Playing time in the orchestra (years)	16.7	9.5	1–29

**Table 2.** Exploratory factor analysis results after Varimax and oblimin rotation. Values represent factor loadings.

Item	Varimax		Oblimin	
	Factor 1: pain interference	Factor 2: pain intensity	Factor 1: pain interference	Factor 2: pain intensity
Worst pain	–	0.811	–	0.755
Least pain	–	0.815	–	0.838
Average pain	–	0.743	–	0.825
Pain right now	0.800	–	0.754	–
Mood	0.889	–	0.928	–
Enjoyment of life	0.688	–	0.650	–
Using usual technique	0.834	–	0.768	–
Playing because of symptoms	0.857	–	0.875	–
Playing as well as you would like	0.873	–	0.963	–

men, took part in cross-cultural validation. The response rate was 44% (verified on the basis of the musicians' attendance at rehearsal, n=70). Subjects' data are presented in **Table 1**. Lifetime prevalence of PRMD was 87%, 12-month prevalence was 81%, 1-month prevalence was 71%, point-prevalence was 52%. Twenty-three subjects completed the MPIQM-P after item 12 (11 or 12 items). Missing scores concerned 4 subjects (lack of some data). Ultimately, 19 participants were included in the EFA. The questionnaire took about 15 min to complete.

### Exploratory factor analysis

EFA was performed among participants who reported the occurrence of current PRMD (n=19). The value of the KMO coefficient was at an acceptable level (0.703>0.5); also, the Bartlett sphericity test proved to be significant ( $\chi^2=114.25$ ;  $P<0.001$ ), indicating the validity of factor analysis and a justifiable factor solution. Two eigenvalues were  $\geq 1$ , thus meeting Kaiser's criterion when determining the number of factors. Thus, 2 factors were differentiated.

The results of the EFA conducted without rotation did not return satisfactory results. An easy-to-interpret solution was not

obtained; moreover, for 3 of 9 analyzed items (least pain, average pain, and enjoyment of life), the simple factor structure criterion was not met; these items showed quite high factor loadings (>0.5) for both separate factors. After the Varimax rotation, the first factor consisted of 5 items related to the pain interference and, surprisingly, the item "pain right now," with high factor loadings ( $\geq 0.8$ ) for most items. The second factor was formed by the other pain-intensity items (worst pain, least pain, average pain). Since the pain-intensity and pain-interference dimensions are related and therefore are believed to correlate with one another [28], an oblique rotation was performed. Unexpectedly, direct oblimin rotation yielded virtually the same structure as obtained in Varimax rotation and did not result in transfer of the pain-right-now item to factor 2. **Table 2** shows the factor loadings after Varimax and oblique rotation (direct oblimin). After Varimax rotation, 7 of 9 items had high communality values (range 0.725–0.867) after separating 2 factors; slightly lower values, although at an acceptable level, were observed for the items average pain and enjoyment of life (0.587 and 0.475, respectively). After oblimin rotation, the communality values ranged from 0.384 (enjoyment of life) to 0.864 (mood). The solution taking into account 2 factors explained about 76% and 73% of the total variance

after Varimax and oblimin rotations, respectively. This indicates slightly better estimates for an orthogonal rotation; therefore, the Varimax solution was used in internal consistency analyses.

### Internal consistency

The Cronbach's alpha values obtained for the 6 items making up factor 1 and the 3 items making up factor 2 (Varimax rotation) were 0.923 and 0.784, respectively. For factor 1, the lowest correlation value with the overall score (0.525) was found for the enjoyment-of-life item; removing it resulted in an increase in Cronbach's alpha value to 0.938. Removing the other items from factor 1, as well as any of the items that settled factor 2, did not increase Cronbach's alpha value. Cronbach's alpha for the entire scale consisting of 9 items was 0.923. A dependable analysis of test-retest reliability results based on intraclass correlation coefficient (ICC) values was not possible because of the smaller-than-recommended ( $n=50$ ) number of people completing the questionnaire again ( $n=10$ ).

## Discussion

This work presents the results of translation, cross-cultural adaptation, and validation of the MPIIQM questionnaire into Polish. This process was based on guidelines [20,23] and preserved semantic, idiomatic, experimental, and conceptual equivalence of the questionnaire. Analysis of the results obtained in the pilot study indicates a correctly carried-out process.

EFA identified 2 factors, pain intensity and pain interference, in the structure of items, similarly to the work by Berque et al. [16] and Möller et al. [17], but with the difference that in this work the pain-right-now item has been included in the pain interference factor, despite using the same rotation procedures. The slightly different structure is thus difficult to interpret and may be due to small sample size used in this study. It is also possible that participants perceived the pain-right-now item as being related to items concerning mood, enjoyment of life, and playing an instrument (items 18–22), as these are based on present symptoms (pain right now). Nevertheless, the resulting structure is largely consistent with the biopsychosocial ICF model, which allows use of this tool both in scientific research and for the clinical evaluation of musicians. At the same time, it shows a high internal consistency of both subscales, measured by the Cronbach's alpha index ( $>0.78$ ). In further research, it would be worth examining the population of orchestra musicians to estimate cutoff values so as to facilitate the assessment of changes in the health of the subjects to implement the necessary medical care or preventive measures.

**Strengths:** The indisputable advantage of the presented work is the creation of the first Polish-language tool for assessing

the occurrence of musculoskeletal problems in a group of musicians. The authors validated a standardized questionnaire dedicated to instrumentalists, and the resulting tool shows very good understanding by the respondents. The development of the Polish-language version of the MPIIQM questionnaire will allow for further development of research in this area. It will also allow comparison and analysis of research results with researchers from other language and cultural areas.

**Limitations:** The presented results should also be analyzed taking into account the limitations of the study. Because of the lack of consent of the respondents to complete several questionnaires, the authors of the study could not compare the results of the newly created tool and thus assess the convergent and divergent validity of the Polish-language MPIIQM questionnaire. The author of the English version was not asked to check the back-translated version. An insufficient number of respondents who returned questionnaires made the test-retest reliability analysis impossible. This seems to be an important aspect that needs to be addressed in further studies. Moreover, the sample size available for EFA ( $n=19$ ) was considerably smaller than the recommended size ( $n\geq 45$ ), which may have affected the stability of the factor pattern [25]. This is probably why the results in this study do not fully correspond to the results presented by Berque et al. [16] and Möller et al. [17]. Therefore, the model needs to be studied again at a later stage with more participants.

Despite the awareness that the interventions are an important element in understanding and treating the health problems of musicians, artists with professional obligations cannot afford to undertake subsequent time-consuming commitments arising from participation in scientific research and are reluctant to participate in research. Other researchers also point to similar difficulties [14,33,34]. The indicated constraints, however, do not diminish the value of the work done, which fills a gap in the existing Polish literature.

## Conclusions

Translation and a cross-cultural adaptation of a Polish version of a questionnaire was successfully completed. The results obtained show a correctly carried-out validation process, but further testing of the tool is suggested. The Polish-language version of the validated tool can be used in scientific and clinical practice. The next step would be to estimate cutoff values for severity of health status in orchestra musicians.

### Conflict of interest

None.

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