The Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians (MPIIQM)

User Guide

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Development of the Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians (MPIIQM)

Background

The Performing Arts Medicine literature has grown substantially since 1980, and numerous prevalence studies on playing-related musculoskeletal disorders (PRMDs) affecting musicians have been carried out worldwide. The heterogeneity of these studies prohibits, however, a meta-analysis summary estimate of the overall prevalence. Two recent systematic reviews (Zaza et al., 1998; Wu, 2007) highlighted the weaknesses of the studies, i.e. the lack of an operational definition of the observed outcome, low response rates, measurement bias, reporting errors and omissions, questionnaires that were not validated, inconsistent, poorly described, and deficient in collecting psychosocial factors. Indeed, very few of the prevalence studies carried out on professional orchestra musicians used existing validated instruments to measure musculoskeletal (MSK) pain and, if used, no attempt was made to evaluate or confirm the psychometric properties of these instruments in a population of musicians. Furthermore, none of the study authors made reference to using the bio-psycho-social principles set out by the World Health Organisation (WHO) in the international classification of functioning, disability and health (ICF)(WHO, 2002).

Measurement is central to evaluating many phenomena encountered in healthcare and epidemiology, and the quality of measurement instruments is therefore crucial. Instruments need to be valid, reliable, and responsive to change (de Vet et al., 2011).

A detailed literature review was conducted to identify instruments measuring MSK pain and pain interference which had been psychometrically tested and could be used and adapted for a population of professional orchestra musicians. The literature review revealed that two existing instruments have been thoroughly psychometrically tested in numerous studies, i.e. the McGill Pain Questionnaire (LF-MPQ)(Melzack, 1975) and its short-form (SF-MPQ)(Melzack, 1987), and the Brief Pain Inventory (BPI)(Daut et al., 1983; Cleeland and Ryan, 1994). Both instruments showed adequate construct validity, were designed as instruments for evaluative purposes, have been shown to have good responsiveness and test-retest reliability, and addressed the multidimensional aspects of pain (Melzack and Katz, 1994). Neither of

these instruments has, however, been validated in a population of musicians. Moreover, the LF-MPQ did not address bio-psycho-social dimensions relating to pain interference with function, and the activity interference items of the BPI were not suitable for PRMDs in musicians due to potential floor effects.

Criteria for the New Instrument

There was therefore a need to develop and validate, for a population of **professional orchestra musicians**, a new bio-psycho-social self-report instrument collecting demographical data, prevalence of PRMDs and pain location, and measuring musculoskeletal pain and pain interference. The following criteria were identified:

1- It should be **short** and not take more than 15 minutes to complete in order to achieve a good response rate.

2- It had to be **specific** to the population of professional orchestra musicians, especially with regard to their perceived impairment with work-related functional activity, i.e. playing their musical instrument.

3- It should follow the international guidelines set out by WHO in the ICF, and attempt to address several of the themes set out in the ICF: structure/function or impairment, activity limitation, participation restriction, personal and environmental factors (WHO, 2002).

4- It should have **evaluative qualities** (Kirshner and Guyatt, 1985), i.e. the ability to measure change over time, as this could be used as an injury surveillance tool, or to measure changes in health status following treatment interventions.

Structure and Content of the MPIIQM

A detailed account on the development and psychometric evaluation of the MPIIQM has been published in the journal "Manual Therapy", and is now available online (Berque et al., 2014).

The questionnaire was designed to gather information on the following: demographical data on age, gender, practice habits, prevalence of musculoskeletal pain and problems, pain location, pain frequency and duration, pain intensity, pain affective interference, and pain activity interference. Each topic/construct was designed by using and sometimes modifying items from previously evaluated existing instruments (Fig. 1).

Since the BPI addressed dimensions not covered by the LF-MPQ, i.e. pain interference with function, and distress resulting from pain, it was chosen as the reference instrument to measure the following core constructs of the new instrument: pain intensity and affective interference. A slightly modified version of the optional performing arts and sports module of the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire (Hudak et al., 1996) was used for the activity interference items. Written authorisation to use and modify the BPI and the DASH questionnaires was obtained.

A graphical representation of the core items of the final version of the MPIIQM is shown below, highlighting the dimensions/constructs addressed. The four pain intensity items were from the BPI (impairment). The pain interference dimension comprised two items from the BPI, representing the impact of pain on psychosocial variables (personal factors and participation restriction), and three items from the optional performing arts and sports module of the DASH questionnaire, representing the impact of pain on function (activity limitation and participation restriction)(Fig. 1).

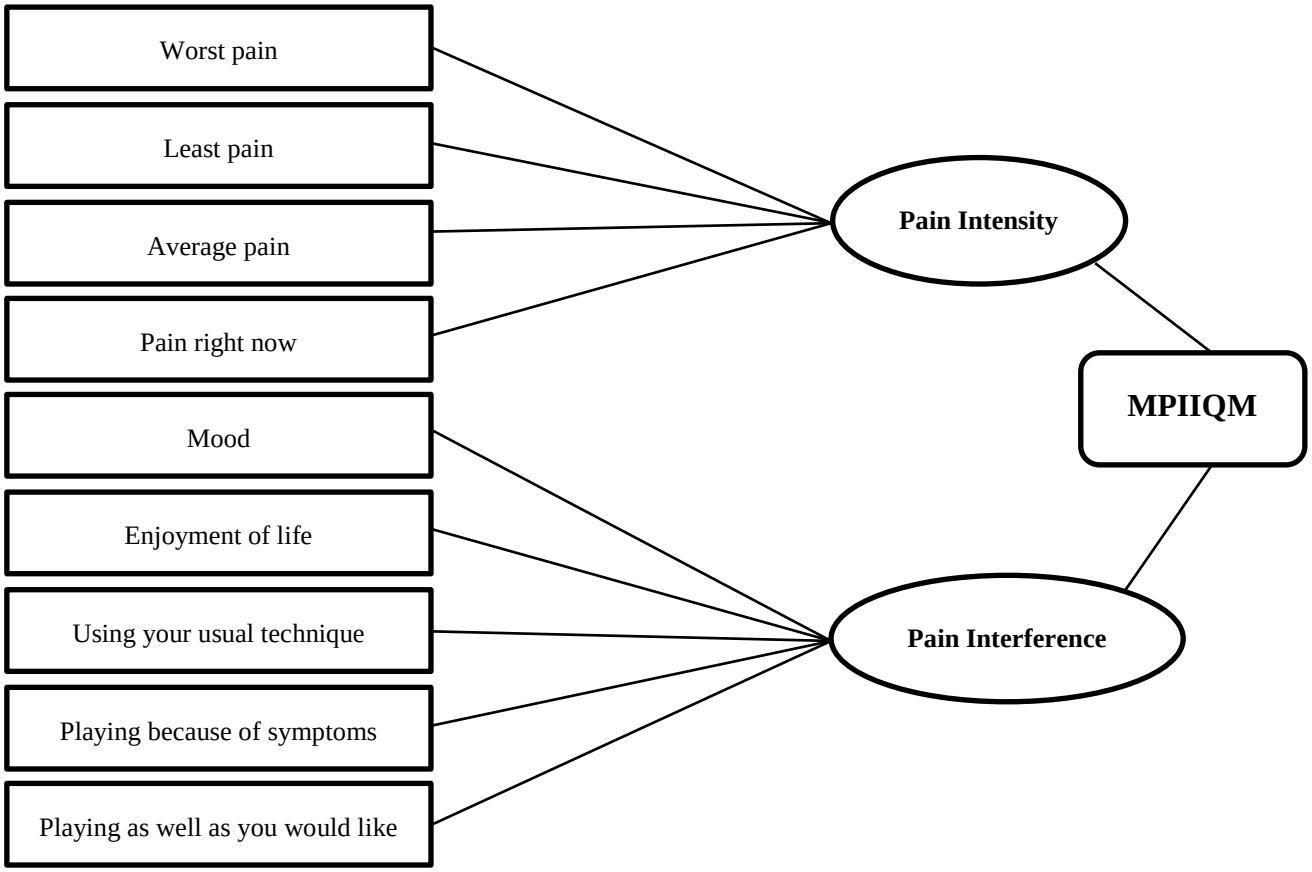

Fig.1. Structure of the MPIIQM

Psychometric Properties of the MPIIQM

Guidelines from the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) checklist were followed during development and psychometric testing of the new instrument (Terwee et al., 2007; Mokkink et al., 2010).

183 professional orchestra musicians from three orchestras in Scotland were eligible for the study. 101 completed the MPIIQM (55% response rate), with almost an equal split between males (50.5%) and females (49.5%). The mean age of participants was 47.7 ± 10.4 (mean ± SD) years (range 25-65 years). On average, musicians had been playing professionally in an orchestra for 23.5 ± 11.1 (mean ± SD) years.

37 participants reported current prevalence of PRMDs and completed the MPIIQM after question 12 (p.15). Data from those participants were used for psychometric evaluation.

Face and Content Validity

A panel of four experts, with experience in the field of psychometrics, pain management, neurological and pain syndromes affecting musicians, were asked to comment on item relevance (Lawshe, 1975), item comprehensiveness, presence of ambiguous or confusing items, clarity, conciseness, and wording of the items (de Vet et al., 2011; De Vellis, 2012). The draft instrument was pilot tested with three professional orchestra musicians who were not part of the study sample.

Members of the experts' and professional musicians' panels who reviewed the relevance, comprehensiveness, and clarity of the MPIIQM agreed unanimously that face validity was present. All three musicians completed the questionnaire in less than 10 minutes. Of the 14 initial core items, three did not reach the minimum agreement of at least half the experts considering the item as "essential". These items were identified as being possibly problematic and were considered during exploratory factor analysis for potential deletion.

Construct Validity: Two-Factor Structure

Construct validity aims to determine the dimensionality and internal structure of an instrument, i.e. how many groups of variables, or constructs, underlie a set of items, and to reduce its size by deleting items which do not clearly contribute to a construct (de Vet et al., 2011).

Exploratory factor analysis (EFA), with principal axis factoring (PAF), was used in the study (Field, 2011). For item reduction, the cut-off for significance of factor loading was set to 0.4 (Floyd and Widaman, 1995). Factor loading represents the correlation between an item and a factor, and the square of the factor loading represents a measure of the substantive importance of a particular item to a factor, i.e. the percentage of the variance of an item that is explained by a factor (Field, 2011). The process was iterative, i.e. a new PAF analysis was re-run after each item deletion. Factor rotations were run in the following order: no rotation, orthogonal rotation (varimax), oblique rotation (direct oblimin). Oblique rotations consistently yielded the best solutions.

Items with consistently low factor loadings (< 0.4) and low communalities, with low content validity ratios (Lawshe, 1975), or cross-loading onto two factors were deleted. One deletion involved an item with poor test-retest reliability. In total, five items of the original 14 core items of the MPIIQM were deleted. A two-factor solution emerged, with 9 items explaining 71.3% of the variance (Fig.1). All 9 items had substantial communalities after extraction (range 0.614 – 0.928). Four items were loading highly on **factor 1 (pain intensity)**, and five items were loading highly on **factor 2 (pain interference)**(Table 1). The final two-factor and 9-item version of the MPIIQM is reproduced on p. 15 (items 14-22).

The results from the PAF analyses demonstrated that the MPIIQM had a strong two-factor and 9-item structure (Table 1) and also addresses several of the themes set out in the bio-psycho-social ICF (WHO, 2002). The MPIIQM showed good construct validity, with a factor structure similar to the factor structure of the BPI, in keeping with psychometric studies of the BPI carried out in large cohorts of MSK pain patients (Keller et al., 2004; Mendoza et al., 2006).

Table 1: Factor loadings for 9 items of the MPIIQM following PAF analysis with oblique rotation (direct oblimin)

	Factor 1 Pain intensity	Factor 2 Pain interference
Worst pain	0.830	
Least pain	0.814	
Average pain	0.979	
Pain right now	0.783	
Mood		0.848
Enjoyment of life		0.818
Using your usual technique		0.797
Playing because of symptoms		0.695
Playing as well as you would like		0.895

Internal Consistency

Internal consistency of the MPIIQM, with Cronbach's alpha values of 0.91 for each subscale, is in keeping with values obtained by studies investigating the BPI (Keller et al., 2004; Mendoza et al., 2004; Mendoza et al., 2006). The MPIIQM also shows good overall scale homogeneity with a Cronbach's alpha value of 0.88.

Test-Retest Reliability

Results from the intra-class correlation (ICC) Model (2,1) showed substantial test-retest reliability for the four pain intensity items (Factor 1), with ICC values ranging between 0.78 and 0.82, and a set of fairly narrow 95% CI. For the pain interference items (Factor 2), the ICC Model (2,1) revealed moderate to substantial test-retest reliability for the five pain interference items, with values ranging between 0.56 and 0.76, and a set of perhaps wider than desired, but reasonable 95% CI.

Future Research

Firstly, future studies are required to confirm validity and reliability on a larger sample of orchestra players, and with other groups of musicians. Secondly, there are other important aspects of psychometrics which could be tested in future studies to strengthen the overall validity and evaluative characteristics of the MPIIQM: criterion validity, convergent validity, responsiveness, and interpretability (de Vet et al., 2011).

Conclusion

The MPIIQM is the first instrument of its kind. It is a promising instrument with robust psychometric properties that can be used to gather epidemiological data on PRMDs, and to measure musculoskeletal pain intensity and pain interference in a population of professional orchestra musicians.

Additionally, due to its evaluative properties, it could be used as an outcome measure in clinical practice or intervention studies.

Finally, the instrument could also be used as injury surveillance tool within the context of health and safety in professional orchestras.

Scoring of the MPIIQM

Pain Intensity Subscale

1- The **pain intensity score** can be defined as the **sum of the four pain intensity items**, i.e. a score ranging from 0 to 40.

2- Since the MPIIQM uses the four pain intensity items from the BPI, it is also suggested that a **mean pain intensity score** can be used instead as a composite measure of these four items (0 to 10 mean score). The mean pain severity score has been used in several studies on the BPI (Keller et al., 2004; Mendoza et al., 2004; Krebs et al., 2010), and has been advocated by the developer of the BPI (Cleeland, 2009).

Pain Interference Subscale

1- The MPIIQM measures pain interference using five items including “mood”, “enjoyment of life”, “using your usual technique”, “playing because of symptoms”, and “playing as well as you would like” (Fig.1). The **pain interference score** can be defined as the **sum of the five pain interference items**, i.e. a score ranging from 0 to 50.

2- A **mean pain interference score** can be used instead as a composite measure of the five interference items (0 to 10 mean score).

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1. What is your age? _____ **years**
2. Gender: ☐ Male ☐ Female
3. What instrument do you play in the orchestra? _____
4. With respect to your position in the orchestra, do you work: ☐ Full time ☐ Part time
5. For how many years have you played your instrument? _____ **years**
6. For how many years have you played professionally in an orchestra? _____ **years**

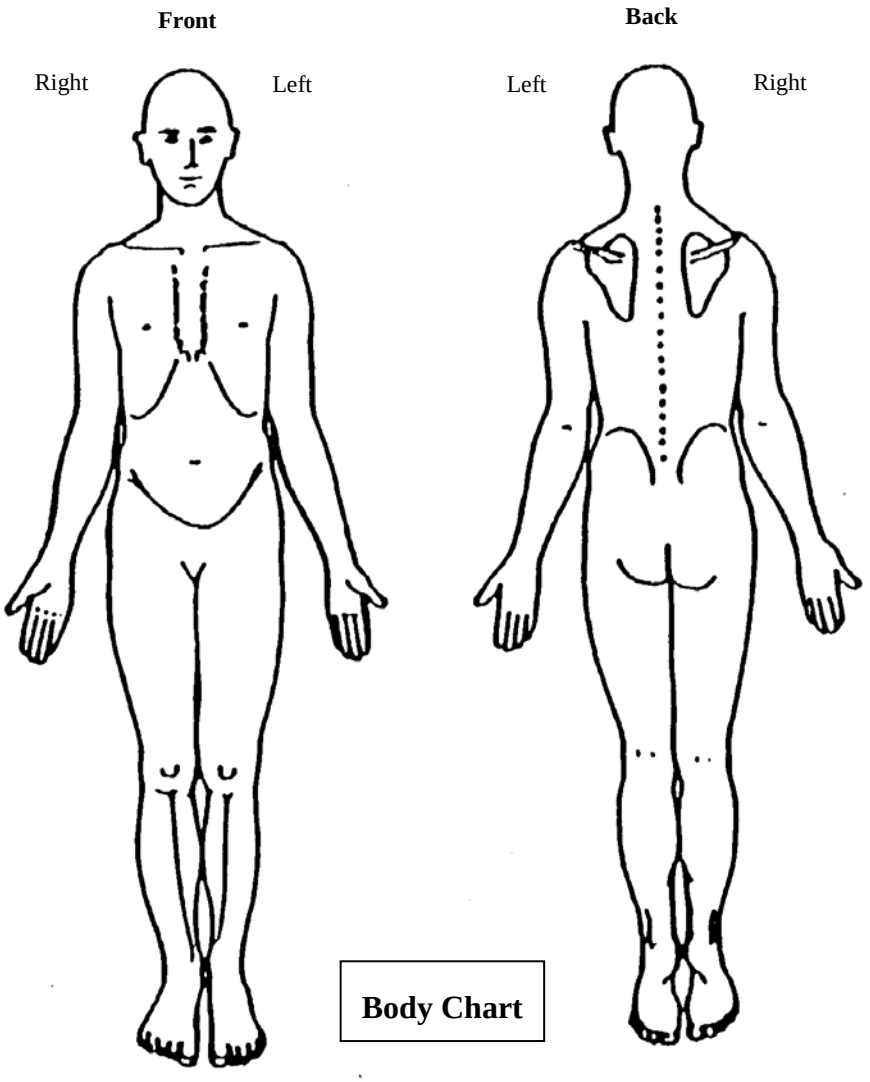
7. On average, how many hours per week do you spend playing your instrument **in the orchestra** (this includes rehearsals, performances, recordings)? _____ **hours per week**
8. On average, how many hours per week do you spend playing your instrument **outside** orchestra duties (this includes individual practice, chamber music, solo performances, demonstration when teaching, gigs, other)? _____ **hours per week**

Playing-related musculoskeletal problems are defined as "pain, weakness, numbness, tingling, or other symptoms that interfere with your ability to play your instrument at the level to which you are accustomed". This definition does not include mild transient aches and pains.

9. Have you **ever** had pain/problems that have interfered with your ability to play your instrument at the level to which you are accustomed? ☐ Yes ☐ No
10. Have you had pain/problems that have interfered with your ability to play your instrument at the level to which you are accustomed **during the last 12 months**? ☐ Yes ☐ No
11. Have you had pain/problems that have interfered with your ability to play your instrument at the level to which you are accustomed **during the last month (4 weeks)**? ☐ Yes ☐ No
12. **Currently (in the past 7 days)**, do you have pain/problems that interfere with your ability to play your instrument at the level to which you are accustomed? ☐ Yes ☐ No

If your answer to questions 11 and/or 12 is YES, please continue. Otherwise stop here, and hand your survey back or post it back using the stamped addressed envelope provided.

13. On the body chart, SHADE IN **each** of the areas where you experience **pain/problems**. **Put an X** on the **ONE area** that HURTS the most.



Body Chart

The next four questions relate ONLY to PAIN. Please answer with reference to the ONE area that you **marked with an X** on the body chart. Otherwise go to Question 18.

14. Please rate your pain by circling the one number that best describes your pain at its **worst** in the last week.

0	1	2	3	4	5	6	7	8	9	10
No pain										Pain as bad as you can imagine

15. Please rate your pain by circling the one number that best describes your pain at its **least** in the last week.

0	1	2	3	4	5	6	7	8	9	10
No pain										Pain as bad as you can imagine

16. Please rate your pain by circling the one number that best describes your pain on **average** in the last week.

0	1	2	3	4	5	6	7	8	9	10
No pain										Pain as bad as you can imagine

17. Please rate your pain by circling the one number that tells how much pain you have **right now**.

0	1	2	3	4	5	6	7	8	9	10
No pain										Pain as bad as you can imagine

The remainder of the survey relates to both PAIN and/or PROBLEMS.

For each of the following, circle the one number that describes how, during the past week, **pain/problems have interfered** with your:

18. Mood

0	1	2	3	4	5	6	7	8	9	10
Does not interfere										Completely interferes

19. Enjoyment of life

0	1	2	3	4	5	6	7	8	9	10
Does not interfere										Completely interferes

For each of the following, during the past week, as a result of your **pain/problems**, did you have any **difficulty** (please circle ONE number):

20. Using your usual technique for playing your instrument?

0	1	2	3	4	5	6	7	8	9	10
No difficulty										Unable

21. Playing your musical instrument because of your symptoms?

0	1	2	3	4	5	6	7	8	9	10
No difficulty										Unable

22. Playing your musical instrument as well as you would like?

0	1	2	3	4	5	6	7	8	9	10
No difficulty										Unable

Thank you for your participation.
Please hand your survey back or post it back using the stamped addressed envelope provided.