

Development and psychometric evaluation of the Musculoskeletal Pain Intensity and Interference Questionnaire for professional orchestra Musicians (MPIIQM)

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Systematic Reviews on Prevalence

(Zaza, 1998; Wu, 2007; Silva et al., 2015)

- Heterogeneity of prevalence studies:
 - Meta-analysis difficult,
 - Methodological weaknesses of studies,
 - Lack of operational definition,
 - Low response rates,
 - Errors and omissions,
 - Measurement bias,
 - Instruments not validated and inconsistent,
 - Poorly described,
 - Deficient in collecting psychosocial factors.

Measurement in PAM

Viewpoint
Methods of Evaluation of Musician's Dystonia: Critique of Measurement Tools

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Rating scales for musician's dystonia

The state of the art

Abstract: Musician's dystonia is associated with significant morbidity. To assess treatment options, accurate and precise measurements of disease severity are critical. We describe current methods of quantitatively measuring musician's dystonia of the upper extremity including subjective, objective, and informant methods. The degree to which these methods satisfy rigorous measurement criteria, including their reliability, validity, and responsiveness, is discussed.

Keywords: Dystonia; Musician's dystonia; Rating scales; Validity; Reliability; Responsiveness

ABSTRACT: Musician's dystonia (MD) is a focal adult-onset dystonia most commonly involving the hand. It has a more gradual, insidious onset than non-musician's focal hand dystonia, exhibits task specificity at the level of specific musical passages, and is a particularly difficult form of dystonia to treat. For most MD patients, the diagnosis, course, site and of their music performance careers. Research on treatments and pathophysiology is contingent upon measures of motor function abnormalities. In this review, we comprehensively survey the literature to identify the rating scales used in MD and the distribution of their use. We also summarize the extent to which the scales have been evaluated for their clinical utility, including reliability, validity, specificity, sensitivity to MD, and practicality for a clinical setting. Out of 132 publications, almost half (62) included quantitative measures of motor function. The remaining 70 studies used a variety of chosen from among 10 major rating scales. Most used subjective scales involving either patient or clinician ratings. Only 20% (18) of the studies used objective scales. None of the scales has been completely and rigorously evaluated for clinical utility. Whether studies involved treatments or pathophysiology assays, there was a homogeneous choice of rating scales used with no clear standard. As a result, the collective interpretive value of these studies is limited because the results are confounded by measurement effects. We suggest that the development and widespread adoption of a new clinically useful rating scale is critical for accelerating basic and clinical research in MD. <https://doi.org/10.1002/md.2013>

Literature Review – Inclusion Criteria

- Measurement of pain intensity,
- Prevalence,
- Frequency and duration of pain,
- Pain interference – function,
- Pain interference – psychosocial / affective variables,
- Suitable for acute and chronic MSK pain,
- Evaluative rather than discriminative or predictive,
- Minimal respondent burden: <20 minutes to complete,
- English language.

Search Results

- Musculoskeletal Load and Physical Health Questionnaire for Musicians (Ackermann & Driscoll, 2010).
- Musculoskeletal Pain Questionnaire of Musicians (MPQM) (Lamontagne & Bélanger, 2012).
- Chronic Pain Grade Questionnaire (CPGQ) (Von Korff et al., 1992).
- Nordic Musculoskeletal Questionnaire (NMQ) and extended version (NMQ-E) (Kuorinka et al., 1987; Dawson et al., 2009).
- McGill Pain Questionnaire (LF-MPQ and SF-MPQ) (Melzack, 1975; Melzack, 1987).
- Brief Pain Inventory (BPI) (Cleeland et al., 1982).

Summary Ratings for Selected Instruments (McDowell, 2006)

Instrument	Reliability Thoroughness	Reliability Results	Validity Thoroughness	Validity Results
MSK Load Quest. for Musicians	0	0	0	0
MPQM	*	**	*	*
CPGQ	*	**	*	**
NMQ	*	*	*	*
NMQ-E	*	**	0	0
LF-MPQ & SF-MPQ	**	**	**	**
BPI	**	**	**	**

0 No reported evidence of reliability or validity
Thoroughness of reliability & validity
 * Basic information only
 ** Several types of tests, several studies and authors
 *** All major forms of tests, numerous studies

Results of reliability & validity
 Weak
 Adequate
 Excellent

Study Aims

- Develop and Validate for a population of professional orchestra musicians a new biopsychosocial self-report instrument:
 - Musculoskeletal (MSK) pain,
 - Pain interference – function,
 - Pain interference – psychosocial or affective constructs.

Stages

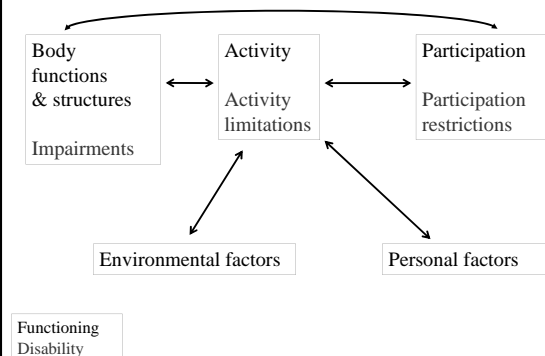
- Phase 1 – Development of the new instrument – adaptation and modification of selected instruments.
- Phase 2 – Psychometric evaluation of the new instrument.

Criteria for the New Instrument

- Short: <15 minutes to complete.
- Specific to population of orchestra musicians.
- Evaluative qualities, i.e. ability to measure change over time, and changes in health status following interventions (Kirshner & Guyatt, 1985).
- Follow the biopsychosocial principles set out by WHO in the International Classification of Functioning, Disability and Health (ICF) (WHO, 2002).

ICF Model – 3 levels

(WHO, 2002)



Operational Definition of PRMDs

(Zaza et al., 1998)

- *“Pain, weakness, numbness, tingling, or other symptoms that interfere with (their) ability to play (their) instrument at the level (they) are accustomed to.”*
- Qualitative study: semi-structured interviews.
- Musicians could clearly distinguish between “normal aches and pains” and a PRMD.

COSMIN Checklist

(Terwee et al., 2007; Mokkink et al., 2010; de Vet et al., 2011)

Guidelines from the “COnsensus-based Standards for the selection of health Measurement INstruments” checklist were followed at every stage of instrument development and psychometric testing.

Phase 1 – Instrument Development

- Participants.
- Draft instrument.
- Content validity.
- Pilot testing.
- Face validity.

Structure of the MPIQM

Structure / items	Question type	Source	Reference
Demographics	Binary Open-ended	MLPHQM	Ackermann & Driscoll (2010) Berque & Gray (2002)
Prevalence	Binary	NMQ-E	Dawson et al. (2009) Zaza & Farewell (1997)
Pain location	Body chart	BPI	Cleeland & Ryan (1994)
Pain frequency & duration (2)	VAS 10cm	ÖMPSQ ÖMSQ	Linton & Boersma (2003) Gabel et al. (2011)
Pain intensity (4)	NRS: 0-10	BPI	Cleeland & Ryan (1994)
Affective interference (4)	NRS: 0-10	BPI	Cleeland & Ryan (1994)
Activity interference (4)	NRS: 0-10	DASH	Hudak et al. (1996) Lamontagne & Bélanger (2012)

Face & Content Validity – 26 items

(de Vet et al., 2011; De Vellis, 2012)

- Evaluate relevance of each item – rating them as “essential”, “useful but not essential”, or “not necessary”.
- Relevance to:
 - Construct measured,
 - Target population (orchestra musicians),
 - Type of instrument used (evaluative),
 - Comprehensiveness of the items.
- Content Validity Ratios (CVR) calculated to assess agreement among experts, value between -1 and +1 (Lawshe, 1975).

Face & Content Validity Results

- Respondent burden: 10 minutes to complete.
- Content Validity Ratios (CVR): The items “relations with people”, “sleep”, and “playing your instrument as well as you would like” did not reach the minimum agreement of at least half of the experts.
- Changes made to the instrument to improve wording and clarity.

Phase 2 Psychometric Evaluation – 14 items

- Recruitment and data collection.
- Construct validity.
- Internal consistency.
- Test-retest reliability.
- Statistical analysis.

Participants’ Characteristics

- N=183 professional orchestra musicians.
 - Royal Scottish National Orchestra (RSNO).
 - BBC Scottish Symphony Orchestra (BBC SSO).
 - Scottish Chamber Orchestra (SCO).
- Response rate = 55%, i.e. 101 questionnaires.
- Orchestra playing: 23.5 ± 11.1 (mean ± SD) years.
- PRMD prevalence rates:
 - Lifetime: 77.2%, 1-year: 45.5%.
 - Point prevalence: 36.6% (n=37).
- Missing scores: <3%, very low.

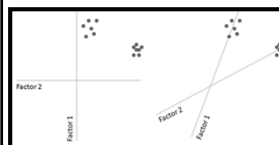
Construct Validity

(de Vet et al., 2011; Field, 2011; De Vellis, 2012)

- Determine dimensionality and internal structure of an instrument (set of items), i.e. how many constructs/dimensions underlie a set of items.
- Reduce the size of the instrument by deleting items that do not contribute to a construct.
- Terminology: constructs, dimensions, clusters of variables, components, factors.

Exploratory Factor Analysis (EFA) – 14 items

(de Vet et al., 2011; Field, 2011; De Vellis, 2012)



Steps involved:

1. Inter-item correlation matrix.
2. Factor extraction: number of factors retained.
3. Factor rotation: enhance interpretation of factors.
4. Item reduction: optimising the dimensionality.
5. Iterative process: EFA re-run after each item deletion.

EFA = Principal Axis Factoring

- N=37 subjects who reported point prevalence.
- Principal Axis Factoring (PAF), SPSS.
- 14 items measured by VAS and NRS.
- Cut-off for significance of factor loading: 0.4.
- Iterative process.

Guideline sample size:
Subject-to-item ratio of 5:1 = 70

MPIIQM: 14 initial items	Source	Deletion
Duration of pain	ÖMPSQ / ÖMSQ	1 (<0.4)
Frequency of pain	ÖMPSQ / ÖMSQ	3 (CL)
Worst pain	BPI	
Least pain	BPI	
Average pain	BPI	
Pain right now	BPI	
Mood	BPI	
Relations with other people	BPI	5 (test-retest)
Sleep	BPI	4 (low CVR)
Enjoyment of life	BPI	
Using your usual technique	DASH	
Playing because of symptoms	DASH	
Playing as well as you would like	DASH	
Spending your usual amount of time playing	DASH	2 (<0.4)

MPIIQM: factor loadings for 9-item solution explaining 71.32% of the variance	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 usual technique		0.797
Playing because of symptoms		0.695
Playing as well as you would like		0.895

Internal Consistency: 9-item solution

- Homogeneity of items within a scale or subscale, i.e. items are measuring the same construct.

Guideline sample size:
Subject-to-item ratio of 5:1 = 70

- Cronbach's alpha:
 - Overall scale: 0.88,
 - Factor 1 - pain intensity subscale: 0.91,
 - Factor 2 - pain interference subscale: 0.91.

Test-retest Reliability

MPIIQM: Test-retest reliability 10-item solution	ICC	95% CI	p-value
Worst pain	0.82	0.59-0.93	<0.001
Least pain	0.80	0.54-0.92	<0.001
Average pain	0.78	0.52-0.91	<0.001
Pain right now	0.82	0.60-0.93	<0.001
Mood	0.69	0.36-0.87	<0.001
Relations with people	0.13	-0.36-0.55	0.294
Enjoyment of life	0.76	0.47-0.90	<0.001
Using usual technique	0.64	0.28-0.85	0.001
Playing because of symptoms	0.56	0.14-0.80	0.007
Playing as well as you would like	0.67	0.32-0.86	0.001

Guideline sample size: 50

Measurement property tested	MPIIQM	MPQM
Target population	Permanent	Freelance
Sample for psychometric testing	N=37	N=31
Reference to WHO - ICF	Yes	No
Reference to instrument purpose, i.e. evaluative	Yes	No
Prevalence items	Yes	No
Face validity	Yes	Assumed
Content validity	Yes	No
Pilot testing	Yes	No
Missing scores	Yes	No
Construct validity	Yes – EFA 2-factor structure 9 items	Yes – PCA 3-component structure – 10 items
Criterion validity	No	Yes – but with CPGQ
Internal consistency	Yes	Yes
Test-retest reliability	Yes	No

Limitations

- Sample size for EFA, internal consistency, and test-retest reliability was smaller than desired.
- Other aspects of psychometrics could be tested in future studies:
 - Criterion validity, convergent validity,
 - Responsiveness, interpretability.

MPIIQM - Recommendations

- Guidelines from COSMIN checklist followed.
- Short completion time.
- Face and content validity.
- Good construct validity with a strong two-factor structure.
- Compliant with the WHO-ICF biopsychosocial themes.
- Reliable with potential evaluative properties.

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article info

ABSTRACT

Objectives: Musculoskeletal system and psychosocial health-related questionnaire (MPIIQM) have been developed to professional musicians; but none have evaluated or confirmed the psychometric properties of the self-report instrument that was used. The aim of the current study was to develop and validate a self-report instrument for professional orchestra musicians to measure musculoskeletal (MSK) pain and pain interference in terms of functional and psychosocial outcomes. The professional orchestra musician sample (N=37) completed the Musculoskeletal Pain Intensity and Interference Questionnaire for Validation (MPIIQM) over a 2-week period and completed the appropriate assessment measuring self-reported pain. Followed by psychometric evaluation of the new instrument. For self-assessment validity was established to report results if participants completed the questionnaire. The percentage of correct scores was very low (0.7%). Exploratory factor analysis revealed that the MPIIQM had a strong and stable two-factor structure, with lower internal consistency (0.70) of the instrument in the data set. This study's self-report instrument was the strongest among self-reported instruments for orchestra musicians and professional musicians. The MPIIQM is a valid and reliable self-report instrument for the measurement and evaluation of MSK pain and pain interference in a professional orchestra musician population.

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

User Guide

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Prevalence Rates?

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