Playing-Related Musculoskeletal Problems Affecting Musicians

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Pipes and Drums Trust
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Musician's Focal Hand Dystonia

(Elbert et al. 1998, Lederman 2002, Schuele & Lederman 2003, Brandfonbrener et al. 2004, Frucht 2004, Lim et al. 2004, Frucht 2009, Altenmuller & Jabusch 2010, Peterson et al. 2013)

- Painless movement disorder: Focal Task Specific Dystonia (FTSD), Musician's Dystonia (MD).
- Involuntary loss of fine motor control and coordination of individual finger movements.
- Deterioration of sensorimotor skills, task-specific.
- Usually involving 3rd to 5th digits.
- Estimated prevalence of less than 1% of the population of professional musicians.

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Risk Factors

(Altenmüller & Jabusch, 2010)

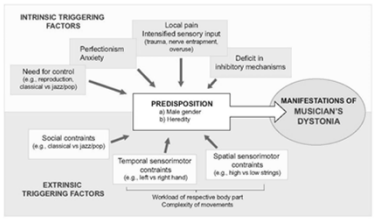

FIGURE 4. The possible interplay between predisposition and intrinsic and extrinsic triggering factors in the manifestation of musician's dystonia. (Adapted from Jabusch H, Altenmüller E: Adv Cogn Psychol 2006; 2:207-220.7)

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Pipers (n=23)

(Berque, 2014)

Categories	Numbers
Professionals	8
Amateurs	15
Male	22
Female	1
Focal Hand Dystonia	20
Other diagnosis	3

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Pipers – Other (n=3)

(Berque, 2014)

Diagnosis	Numbers
Left thumb muscle pain	1
Left elbow epicondylitis	1
Left median nerve entrapment – elbow / bag compression	1
Total	3

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Pipers – Focal Dystonia (n=20)

(Berque, 2014)

Age Range	Numbers
<20	1
20-29	3
30-39	5
40-49	4
50-59	6
>60	1
Total	20

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Pipers – Focal Dystonia (n=20)
(Berque, 2014)

Affected Hand	Numbers
Left	15
Right	4
Both	1
Total	20

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Piper Left Hand – Day 1
(Berque, 2009)

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Piper Left Hand – Month 3
(Berque, 2009)

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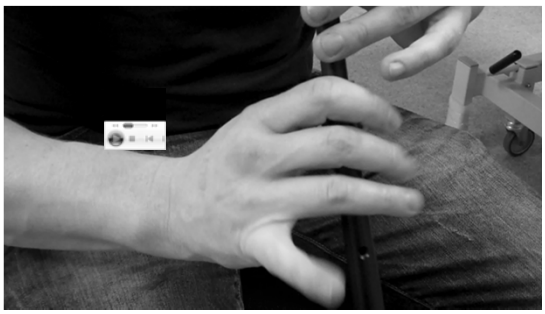
Piper Right Hand – Day 1
(Berque, 2014)



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Pipers - FHD (n=20)
(Berque, 2014)

Affected finger	Left	Right	Total
Thumb	1	0	1
Index	5	1	6
Middle	9	3	12
Ring	13	4	17
Small	9	3	12

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Peterson et al. (2013)

VIEWS & REVIEWS

Rating scales for musician's dystonia
The state of the art

David A. Peterson, PhD
Patrice Berque, BSc
Hans-Christian Jabusch, MD
Eckart Altenmüller, MD, MA
Steven J. Frucht, MD

ABSTRACT

Musician's dystonia (MD) is a focal adult-onset dystonia most commonly involving the hand. It has much greater relative prevalence than non-musician's focal hand dystonias, 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 confirms the end 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, sensitivity, specificity to MD, and practicality for a clinical setting. Out of 135 publications, almost half (62) included no quantitative measures of motor function. The remaining 73 studies used a variety of choices from among 10 major rating scales. Most used subjective scales involving either patient or clinician ratings. Only 25% (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 pathophysiologic assays, there was a heterogeneous choice of rating scales used with no clear standard. As a result, the collective interpretive value of those studies is limited because the results are confounded by measurement effects. We suggest that the development and wide-spread adoption of a new clinically useful rating scale is critical for accelerating basic and clinical research in MD. *Neurology*® 2013;81:589–598

GLOSSARY

ADDS = Arm Dystonia Disability Scale; **DES** = Dystonia Evaluation Scale; **FAM** = Frequency of Abnormal Movements scale; **FHD** = focal hand dystonia; **FM** = Fahn-Marsden scale; **GDS** = Global Dystonia Rating Scale; **IOI** = interonset interval; **MD** = musician's dystonia; **MDI** = Musical Instrument Digital Interface; **mIOI** = IOI of interonset intervals; **TCS** = Tubiana and Chamagne Scale; **TRE** = Test Repertoire Evaluation; **UDRS** = Unified Dystonia Rating Scale; **VAS** = visual analog scale.

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Problematic Movement Patterns
Berque (2013)

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Problematic Movement Patterns
Berque (2013)

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Alterations in Cortical Representation
(Elbert et al., 1995)

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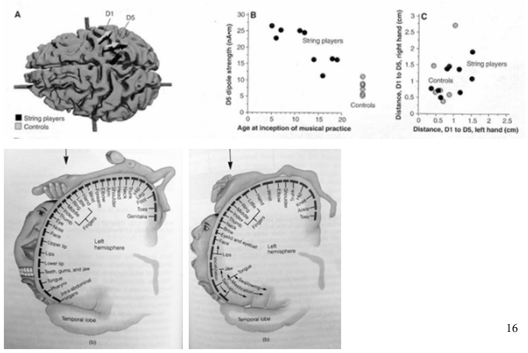
Increased Cortical Representation of the Left Hand Fingers in String Players (Elbert et al., 1995)



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Conclusions: Use-dependent CNS Plasticity
(Elbert et al., 1995)

- String players exhibit a use-dependent enlargement of portions of the somatosensory map in cortical representational zones of the digits of the left hand, which are used intensively to play the instrument.

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Focal Hand Dystonia Neurological Changes
(Elbert et al.,1998)

Extensive simultaneous stimulation of the digits and other types of prolonged, unusual types of sensory input can produce a use-dependent reorganisation of digital receptive fields.

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Fusion of Cortical Representations

(Elbert et al., 1998)

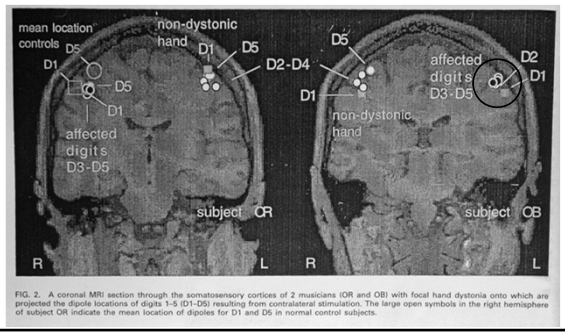

FIG. 2. A coronal MRI section through the somatosensory cortices of 2 musicians (OR and OB) with focal hand dystonia onto which are projected the dipole locations of digits 1–5 (D1–D5) resulting from contralateral stimulation. The large open symbols in the right hemisphere of subject OR indicate the mean location of dipoles for D1 and D5 in normal control subjects.

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Focal Hand Dystonia Neurological Changes

(Chen & Hallett 1998, Elbert et al. 1998, Hallett 1998, Bara-Jimenez et al. 2000, Charness 2004, Hallett 2004, Lin & Hallett 2009, Altenmuller & Jabusch 2010)

- Reduced inhibition and increased excitation at spinal cord, brainstem, and cortical levels, leading to excessive motor output with overflow into inappropriate muscles.
- This would explain co-contraction of agonist and antagonist muscles observed in FHD.
- Altered sensory perception and maladaptive cortical plasticity.
- Impaired sensorimotor integration.

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FHD – Management Strategies

(Lim et al., 2001; Jabusch et al., 2005; Jabusch & Altenmüller, 2006; Peterson et al., 2013; Dressler et al., 2015)

- Oral anticholinergic medication: Trihexyphenedyl (Artane). 33% of patients improved (n=69) (Jabusch et al., 2005).
- "Botox": Botulinum Toxin injections. 49% rate of improvement (n=71) (Jabusch et al., 2005; Dressler et al., 2015).
- Limitations: side-effects, dosage, leakage into adjacent muscles, patient's response.

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Focal Hand Dystonia Treatment Options

(Byl et al. 1996; Elbert et al. 1998)

If cortical digital fusion is the cause of dystonia:

– Intervention to break apart the fusion may be effective.

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FHD – Management Strategies

- Limb immobilisation (Priori et al., 2001);
- Learning-based sensory training (Byl et al., 2009);
- Sensory retraining – Braille reading (Zeuner et al., 2002);
- Proprioceptive retraining (Rosenkranz et al., 2009);
- Constraint-induced therapy (Candia et al., 2002);
- Motor Control Retraining – "Slow-Down Exercise" (Sakai, 2006).

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FHD – Brain Stimulation

(Buttkus et al., 2010; Dressler et al., 2015; Rosset-Llobet et al., 2015; Richardson et al., 2017)

- Non-invasive stimulation techniques: transcranial direct current stimulation (tDCS) and repetitive transcranial magnetic stimulation (rTMS) can increase inhibition of the sensorimotor cortex.
- rTMS + sensorimotor retraining (finger exercises) did not provide objective improvements.
- tDCS + sensorimotor retraining showed short-term improvements only (lasting 4 days after the intervention).

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FHD – tDCS Brain Stimulation

(Rosset-Llobet et al., 2015)

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AIMS – 1-year study

- Investigate the effects of a combined behavioural therapy over a 12-month period in 8 musicians affected by FHD:
  - Constraint-induced therapy.
  - Motor control retraining (Slow-Down Exercise).
- Subsidiary aim: reliability study of the outcome measure: FAM scales.

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Berque et al. (2010)

A Combination of Constraint-induced Therapy and Motor Control Retraining in the Treatment of Focal Hand Dystonia in Musicians

Patrice Berque, BSc (Hons), MCSP, Heather Gray, MSc, MCSP, Cassandra Harkness, BSc, MCSP, and Angus McFadyen, PhD

Focal hand dystonia (FHD) in musicians is a painless task-specific motor disorder characterized by an involuntary loss of control of individual finger movements. The aim of this study was to investigate the effects of an innovative behavioural therapy intervention, aimed at normalising movement patterns, in musicians affected by FHD. **Methods:** Eight musicians volunteered to take part in this retraining protocol. Intensive constraint-induced therapy and motor control retraining at slow speed were the interventions. Video recordings of the subjects playing two pieces were used for data analysis. The Frequency of Abnormal Movements scale (FAM), the change in metronome speed achieved during motor control retraining, and two ordinal dystonia evaluation scales were chosen as outcome measures. It was hypothesised that there would be significant differences in the FAM scores and metronome speeds over a 12-month period. **Results:** For the main outcome measure, the FAM scale scores, the two-factor repeated measures ANOVA revealed a very significant decrease in the number of abnormal movements per second of instrumental playing over the 12-month period ($F = 6.32$, $df = 7$, $p < 0.003$). Tukey's post-hoc tests carried out for the FAM scores revealed that significant changes occurred after 8 months of therapy. **Discussion:** These results suggest that a combination of constraint-induced therapy and specific motor control retraining may be a successful strategy for the treatment of musicians' FHD. Furthermore, the results suggest that retraining strategies may need to be carried out for at least 8 months before statistically significant changes are noted. *Med Probl Perform Art* 2010; 25:150–155.

LITERATURE REVIEW

untary loss of control and coordination of individual finger movements.[1–4] It is a disorder associated with a sudden or insidious deterioration of sensorimotor skills which, in most cases, only occurs in the context of instrument playing.[3,5] Involuntary spasms, cramping sensations, abnormal hand posture, finger curling, loss of coordination during specific fingerings, fingers sticking on the keys of the instrument, irregularities in rhythm and tempi are common findings.[1,3,6–8] It most often involves digits 3, 4, and 5 (D3 to D5) of the hand,[2,4,7,8] and is thought to be related to the intense and prolonged practice of rapid, alternating, and highly precise finger movement patterns.[3,9,10] The condition can be disabling enough to curtail a professional career.[7,8,11,12]

Prevalence Amongst Musicians

FTSD has been estimated to affect between 5% and 14% of musicians consulting performing arts clinics in the US.[8,9,11,13] This would give an estimated prevalence of 0.2% to 0.5% in the population of professional musicians.[3,4,10] Focal hand dystonia (FHD) occurs much more frequently in males than females. One study[11,13] revealed that 73% of instrumentalists affected were men, two others reported 80%[14] and 83%[7]. Symptoms usually begin in the third or fourth decade.[4,11,14,15]

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AIMS – 4-year follow-up

- Investigate the long-term effects of a combined behavioural therapy in musicians affected by FHD, 3 years after completion of the initial 12-month study = 4-year follow-up: 4 out of the initial 8 musicians.
  - Constraint-induced therapy.
  - Motor control retraining (Slow-Down Exercise).
- Subsidiary aim: reliability study of the outcome measures: ADDS, TCS scales.

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Berque et al. (2013)

A Combination of Constraint-Induced Therapy and Motor Control Retraining in the Treatment of Focal Hand Dystonia in Musicians

A Long-term Follow-up Study

Patrice Berque, BSc (Hons), MCSP, Heather Gray, Prof D, MSc, MCSP, and Angus McFadyen, PhD

Focal hand dystonia (FHD) in musicians is a painless, task-specific motor disorder characterized by involuntary loss of control of individual finger movements. The aim of this study was to investigate the long-terms effects of a combined behavioral therapy intervention aimed at normalizing finger movement patterns. **Methods:** Eight musicians with FHD had taken part in the 1-year study involving intensive constraint-induced therapy and motor control retraining at slow speed as the interventions. Four of these subjects volunteered to take part in this 4-year follow-up. A quasi-experimental, repeated measures design was used, with 9 testing sessions over 4 years. Video recordings of the subjects playing two pieces were used for data analysis. The Frequency of Abnormal Movements scale (FAM) was the main outcome measure. It was hypothesized that there would be significant differences in FAM scores achieved over the 4-year period. **Results:** The results from the ANOVA revealed a significant decrease, by approximately 80%, in the number of abnormal movements for both pieces over the 4-year period ($F = 7.65$, $df = 8$, $p \leq 0.02$). Tukey's post-hoc test revealed that significant improvements occurred after 6 months of therapy (p-values between $p \leq 0.001$ and $p \leq 0.04$). Although the results were not significant between month 12 and follow-up at year 4, the trend revealed that the progress achieved during the first year of intensive retraining was maintained at year 4. **Conclusions:** A 1-year period of intensive task-specific retraining may be a successful strategy with long-term, lasting effects for the treatment of musician's FHD. Results suggest that retraining strategies may need to be carried out for at least 6 months before statistically significant changes are noted. *Med Probl Perform Art* 2013; 28(2):33–46.

Focal task-specific dystonia (FTSD) affecting musicians' hands (also termed focal hand dystonia, FHD) is a task-specific, painless motor disorder characterized by an involuntary loss of control and coordination of individual finger movements, accompanied by abnormal co-contractions of agonist and antagonist muscles.[1–4] In most cases, it only occurs in the context of instrument playing, more often involves digits 3, 4, and 5 (D3 to D5) of the hand, and is thought to be related to the intense and prolonged practice of highly skilled movement patterns. The hand that performs the most complex movement patterns on the instrument is usually affected-the right hand of pianists, the right hand of guitarists, the left hand of flautists, and the left hand of string players.[5–7]

FTSD has been reported to affect 0.2% to 0.5% of professional musicians, and males are much more affected than females.[4,8,10–12] The condition can be disabling enough to curtail a professional career.[7,9,11,13]

LITERATURE REVIEW

Neurophysiology of Focal Dystonia

Extensive research on the neurophysiology of FTSD has been

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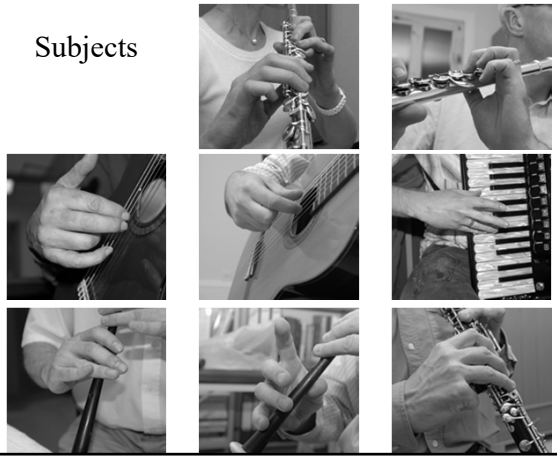
Subjects



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Subjects

Instrument	Dystonia	Side	Onset	Compliance
Guitar 1	D3, D4, D5	R	2006	**95%**
Guitar 2	D3, D4, D5	R	1982	**76%**
Flute 1	D4, D5	L	2002 (D5) 2006 (D4)	**95%**
Flute 2	D4, D5	R	2004	**95%**
Piper 1	D5	R	2005	**77%**
Piper 2	D3, D4	R	1995	**40%**
Oboe	D4, D5	R	2006	**88%**
Accordeon	D3, Wrist, D2, D4	R	2005	**N/A**

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Outcome Measures

- 2 test pieces: easy and medium difficulty;
- Frequency of Abnormal Movements (FAM) scale (Spector & Brandfonbrener, 2005).
- 2 ordinal Dystonia Evaluation Scales (DES): Tubiana & Chamagne Scale (TCS), Arm Dystonia Disability Scale (ADDS).
- Change in metronome speed achieved during Slow-Down Exercise (Sakai, 2006).

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Tubiana & Chamagne Scale

(Tubiana, 2000)

TCS	Stage Definition
Stage 0	Unable to play
Stage 1	Plays several notes but stops because of blockage or lack of facility
Stage 2	Plays short sequences without rapidity and with unsteady fingering
Stage 3	Plays easy pieces but is unable to perform more technically challenging pieces
Stage 4	Plays almost normally but difficult passages are avoided for fear of motor problems
Stage 5	Returns to concert performances

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Arm Dystonia Disability Scale

(Fahn, 1989)

ADDS	Stage Definition
Stage 0	No dystonia
Stage 1	Mild difficulty playing
Stage 2	Moderate difficulty playing
Stage 3	Marked difficulty playing

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Hypothesis

Significant differences in Frequency of Abnormal Movement Scale scores and metronome speeds would be achieved between testing sessions over time for both pieces.

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Piper – Day 1

(Berque, 2009)

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Constraint-Induced Therapy

(Berque et al., 2010)

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Constraint Induced Therapy

(Berque et al., 2010)

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Home Protocol

- Week 1: constraint-induced therapy only. 2 hours per day;
- Constraint-induced: ½ hour to 1 hour per day;
- Slow-Down Exercise: ½ hour per day;
- Free playing: ½ hour per day for motivation and compliance.

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Piper – Month 19

(Berque, 2011)

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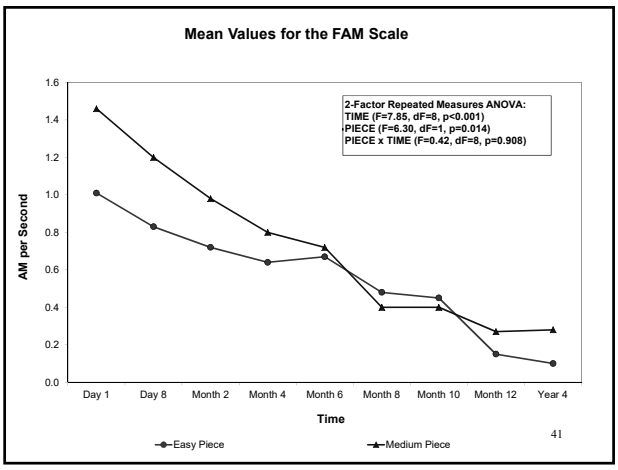

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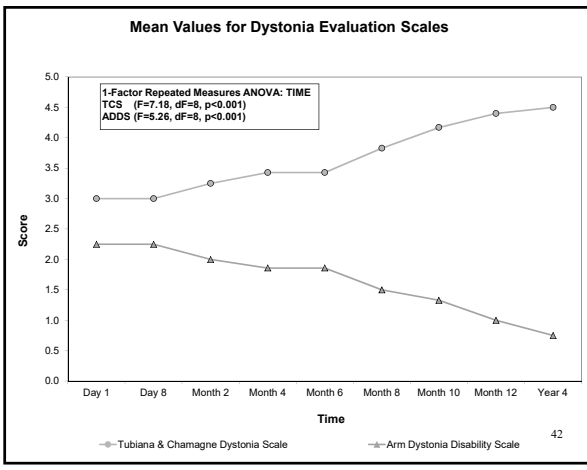

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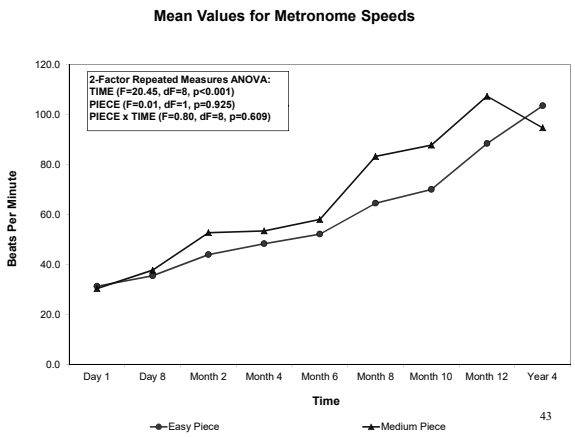

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Practice Profile

(Berque et al., 2013 – adapted from Ackermann & Driscoll, 2010)

Question	S. 1	S. 2	S. 3	S. 4
On average, how many days per week did you practise your specific exercises?	5	4	4	6
On average, how many practice sessions would you normally do per day for your specific exercises?	1	1	1	2
How long have your average practice sessions been for your specific exercises: - Less than 15 minutes? - Between 15 minutes and half an hour? - Between half an hour and one hour?	√	√	√	√

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Clinical Recommendations

- A 1-year retraining protocol may lead to long-term benefits for musicians with FHD;
- Progress maintained with only 15 to 30 minutes of daily specific practice;
- Intensive retraining to be carried out for more than 6 months;
- The FAM scale is a useful and valid clinical tool;
- The ordinal scales showed good to very good intra- and inter- reliability.

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"If I don't practise for one day, I know it; if I don't practise for two days, the critics know it; if I don't practise for three days, the audience knows it"

Ignacy Jan Paderewski.

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Impact of PRMPs on Players

(Caldron et al., 1986)

Musicians reported their loss of facility in playing in terms of:

- Loss of speed,
- Loss of control of major motions,
- Loss of control of fine motions,
- Loss of power (forte),
- Loss of finger span,
- Other.

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Predisposing Factors of PRMPs Intrinsic and Non-modifiable Factors

(Zaza, 1993; Chan & Ackermann, 2014)

- Instrument played.
- Repertoire.
- Playing conditions: temperature, length of rehearsals and concerts.
- Gender.
- Age.
- Anthropometrics: size, ROM, hand span, flexibility, muscle strength.
- Joint laxity.
- Underlying disease and genetics.

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Predisposing Factors of PRMPs Modifiable Factors (Zaza, 1993; Chan & Ackermann, 2014)

- Instrumental technique,
- Instrument size,
- Teacher / pedagogical style,
- Repertoire,
- Overload and increase in playing load,
- Practice habits,
- Ergonomics and posture: holding the instrument,
- Lack of physical conditioning.

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Predisposing Factors of PRMPs Psychosocial Factors (Chan & Ackermann, 2014)

- Music performance anxiety,
- General anxiety,
- Depression,
- Pressures from self, peers, educational institution, work organisation,
- Work and non-work related stress,
- Social phobia,
- Personality traits, i.e. somatisation, perfectionism.

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Perfomance Anxiety – Actions taken (n=377)

(Ackermann et al., 2014)

Actions taken	%
Increase practice	59
Deep breathing	50
Positive talk	46
Mock performance opportunities	45
Familiarise with venue	42
Beta blockers	31

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Risk Factors of PRMPs Predictors of Injury Systematic Review (Wu, 2007; Baadjou et al., 2016)

Gender	Female string player
Previous injury	Recurrent PRMP more likely
Psychosocial factors	Music performance anxiety, work-related stress
Instrument type	Upper strings more affected
Age	No consensus
Years of playing	No conclusions
Playing load	No conclusions
Warm-up and breaks	No conclusions

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Prevalence of PRMPs

(Zaza, 1998; Ranelli, 2008; Ranelli, 2011)

	School Children (Ranelli, 2008; 2011)	Adults (Zaza, 1998)
All included	56%	39 - 87%
Mild complaints excluded	30%	39 - 47%

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Prevalence Rates?

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

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

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Berque et al. (2014)

Manual Therapy

Original article

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

Patrice Berque, Heather Gray, Angus McFadyen

article info

abstract

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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

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www.musicianshealth.co.uk

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

User Guide

Patrice Berque MSc BSc (Hons) MMACP MCSP

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Prevalence of PRMPs
in Scottish Orchestras (BBC, RSNO, SCO)
(Berque et al., 2016)

Article

Playing-Related Musculoskeletal Problems Among Professional Orchestra Musicians in Scotland

A Prevalence Study Using a Validated Instrument, The Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians (MPIIQM)

Patrice Berque, MSc, BSc(Hons), MMACP, MCSP[1] Heather Gray, Prof D, MSc, BSc, MCSP[1] and Angus McFadyen, PhD[1]

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Participants' Characteristics
(Berque et al., 2016)

- N=183 professional orchestra musicians.
- Response rate = 55%, i.e. 101 questionnaires.
- Orchestra playing: 23.5 ± 11.1 (mean ± SD) years.
- Playing load: 24.5 ± 5.0 hrs. Other: 8.4 ± 4.9 hrs.
- **PRMP prevalence rates:**
  - **Lifetime: 77.2%, 1-year: 45.5%,**
  - **Point prevalence: 36.6% (n=37).**

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Prevalence of PRMPs
in Scottish Orchestras (BBC, RSNO, SCO)
(n=101) (Berque et al., 2016)

Anatomical site	%
Right forearm/elbow	14.9
Neck	13.9
Right shoulder/upper arm	12.9
Right wrist/hand	11.9
Left forearm/elbow	11.9

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Pipers (n=123)
(Barr et al, 2005)

	Demographics
Male	80%
3 to 8 years playing	31%
>20 years playing	29%
Practice: 5-15hrs/w	63%
Age started	26.4 yr
Degree of hearing loss	30%

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Pipers (n=123)
(Barr et al, 2005)

MSK complaints	Prevalence
Left arm	32%
Lower back	32%
Loss of finger coordination	21%
Neck pain / stiffness	19%

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Pipers (n=123)
(Barr et al, 2005)

Pain and Stiffness	Prevalence
Left hand	17%
Right hand	15%
Left shoulder	11%

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Percussionists (n=279)
(Sandell et al, 2009)

	Demographics
Male	85%
Mean Age	28 yrs
Professional playing	8 yrs
Membranophone percussions	60%
Practice, performance	3 hrs/day
Prevalence PRMP	74%

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Membranophone Percussionists (n=279)
(Sandell et al., 2009)

PRMP - prevalence	Left	Right
Hand	46.4%	44.6%
Lower back	38.7%	39.3%
Elbow / forearm	24.4%	29.8%
Neck pain / shoulder	16.1%	25.6%
Thoracic spine	16.1%	20.8%

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Vibration as risk factor
(Zaza et al., 2000)

- High force, high repetition, static load, vibration.
- Impact = rapid deceleration of wrists and fingers.
- Repeated trauma to the musculotendinous sheaths.
- Shoulder receives the force of playing = shock absorption.
- Vibration = vascular, MSK, neurological symptoms, including CTS.
- Polymer sticks better than wooden sticks.

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Drummer's dystonia
(Lederman, 2004)

- Involuntary wrist flexion.
- Involuntary wrist supination.
- Tremor or jerking of the hand.
- Abnormal thumb movements.
- Decreased rhythmic control.

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Most Common Pathologies
(Caldron et al., 1986; Lockwood, 1989; Nagai & Eng, 1992; Elbert et al., 1998; Hoppmann, 1998; Kenny & Ackermann, 2009)

- Muscle-tendon unit overuse syndromes and tendinopathies: repetitive physical loading.
- Muscle imbalance: movement impairment syndromes.
- Nerve entrapment syndromes.
- Focal dystonia: movement disorder, painless loss of motor control, with loss of coordination of finger movement. Also affects facial muscles.
- Bone, joint, and bursal injuries.

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Overuse Syndrome: Definition

Defined, in relation to playing an instrument, as:

"A condition of pain and loss of function in muscle groups and joint ligaments as a consequence of excessive or unaccustomed use." (Fry 1986, Fry 2000)

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Overuse Syndrome: Symptoms
(Lederman & Calabrese 1986, Hoppmann 1998, Fry 2000)

- Pain in muscles and tendons (musculotendinous unit), ligaments.
  Pain is aggravated with activity, lessened by rest.
- Localised tenderness over the affected structures, swelling may be present.
- Loss of function, characterised by: loss of strength, loss of stamina, increased fatigue.

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Grading System for Severity of Injury
(Hoppmann, 1998)

Grade	Description
0	No Pain.
1	Pain while playing, or for a short period after playing.
2	Pain that persists for a longer period after playing.
3	Pain that progresses while playing and requires the practice session to be shortened, but resolves between sessions.
4	Pain that progresses while playing and does not totally resolve between sessions.
5	Continuous pain that markedly reduces or prevents playing.

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Overuse Syndrome: Conservative Treatment
(Fry 1986, Fry 1988, Lederman 2002)

- Strategies (Grades 1,2,3):
  - Reduction in playing time to 5/10-minute sessions,
  - Increase in length and number of breaks,
  - Control of posture and body awareness,
  - Reduce static loading with instrument adaptations (woodwinds),
  - Review of playing technique,
  - Vary content of a practice session,
  - Stop repertoire or exercises causing pain.

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R.E.S.T.

(Scott (1997), cited in Kenny & Ackermann, 2009)

Resume Exercise
below Soreness Threshold

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Overuse Syndrome: Relative Rest

(Fry, 1986; Fry, 1988; Lederman, 2002; Kenny & Ackermann, 2009)

- Strategies (Grades 4,5):
  - Relative rest for several weeks until pain-free and structures are non-tender,
  - Avoidance of pain-inducing activities,
  - Adequate medication,
  - Gradual return to playing (few minutes daily),
  - All other strategies mentioned in previous slide apply.
  - Retraining: movement retraining strategies and strengthening: scapular, shoulder, upper limb.

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Return to Play Schedule

(Norris, 1996)

Level	Play	Rest	Play	Rest	Play	Rest	Play	Rest	Play
1	5	60	5						
2	10	50	10						
3	15	40	15	60	5				
4	20	30	20	50	10				
5	30	20	25	40	15	45	5		
6	35	15	35	30	20	35	10		
7	40	10	40	20	25	25	15	50	10
8	50	10	45	15	30	15	25	40	15
9	50	10	50	10	40	10	35	30	20
10	50	10	50	10	50	10	45	20	30

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Prevention

(Kenny & Ackermann, 2009, Anderson et al., 2008;
Chan & Ackermann, 2014; Anderson et al., 2017)

- Early identification of injury (onsite triage),
- Posture analysis and correction (asymmetries),
- Retraining of movement patterns and technique,
- Strength and endurance: reduce perceived exertion or relative load.
- "Wheel of pain theory": pain reduction as a result of training → ↑ muscle activity due to reduced cortical inhibition → ↑ strength capacity → ↓ exposure during low load work tasks → ↓ pain.

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Exercise Recommendations

(ACSM, 2009; ACSM, 2011; Chan & Ackermann, 2014)

- Cardiorespiratory fitness: 150min/wk of moderate exercise or 75min/wk of vigorous exercise.
- Vigorous intensity: 77-85% HRmax; 65-90% VO2max; RPE: 14 (somewhat hard) - 17 (very hard).
- Muscular fitness:
  - Strength and hypertrophy: 2-4 sets of 8-12 repetitions. 2-3 minutes rest. 60-80% 1RM.
  - Endurance: 50% 1RM, 15-25 reps. 1-2 min. rest.
  - x3 / week.

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Exercise for Musicians?

(Anderson et al., 2008; Anderson et al., 2017)

- RCT – 2 groups of 12 and 11 musicians from Odensee Symphony Orchestra. 9-week programme / x3 per week.
- "SST: Specific Strengthening Training" shoulder and scapular exercises – intensive = 3x15 at 75% RM.
- "GFT: General Fitness Training" (aerobic exercise – legs only).
- 50% experienced a +ve impact on playing performance
- SST group: ↓ pain.
- GFT group: ↑ aerobic capacity.

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Exercise for Musicians?

(Chan et al., 2013a; Chan et al., 2013b; Chan et al., 2014)

- Exercises specifically targeted for professional musicians.
- Based on anatomical areas described in prevalence studies on PRMPs.
- Neck / Shoulders / Back / Abdominals / Hip.
- Class: 5mins warm-up + 30 mins exercises + 5 mins cool down and stretches.
- Muscle activation → Perturbations and challenge to balance / proprioception → Endurance and resistance in functional positions.

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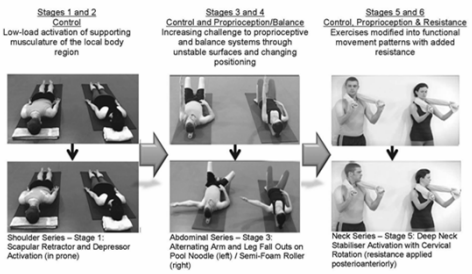
Exercise for Musicians?

(Chan et al., 2013a; Chan et al., 2013b; Chan et al., 2014)



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Exercise for Musicians? (n=30)

(Chan et al., 2013a; Chan et al., 2013b; Chan et al., 2014)

- 10-week exercise programme.
- Control group (n=23) with no intervention.
- Exercise group showed reduction in frequency and severity of PRMPs post-intervention (10 weeks) and at 6 months, and a reduction of RPE (perceived exertion) during practice, compared to controls.

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Prevention

(Fry 1986, Nagai & Eng 1992, Zaza 1994, Norris 1996, Zaza & Farewell 1997, Chan & Ackermann 2014)

- Musical "neuro-muscular" warm-up,
- Stretches can be used as a cool-down, but need to be appropriately performed,
- Inclusion of breaks every 20-30 minutes during practice sessions,
- Pacing: gradual increase of practice before concerts, recitals, competitions,
- Variety of content of the practice session: styles of music, types of exercises,
- Cognitive rehearsal: away from the instrument,
- Body awareness and control techniques: Alexander, Feldenkreis, Yoga,
- Stress and anxiety management.
- Nutrition and hydration: carbohydrates, water intake.

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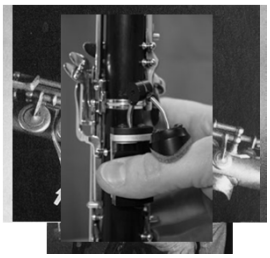
Ergonomics: Instrument Modifications

(Norris & Dommerholt, 1998)

Woodwind players:

- Orthoses for better hand positioning: right thumb and left index rests for the flute.
- Instrument supports: neck strap, end pin for English Horn, adjustable-height post for clarinet and flute, angled staple for oboe, vertical post for bassoon.
- Instrument modifications: angled-head flute, key extensions for the flute.



(Norris, 2000)

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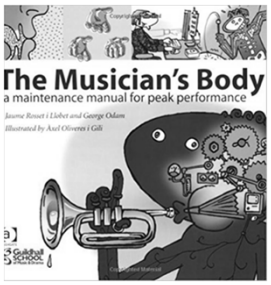
Advice & Prevention



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PDF: Click on "Health Education"

http://www.musicianshealth.co.uk/advice.html

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Useful Websites

http://www.musicianshealth.co.uk/links.html

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