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**Review Article**

## **PLAYING-RELATED MUSCULOSKELETAL DISORDERS IN WOODWIND, BRASS AND PERCUSSION PLAYERS: A REVIEW**

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### **ABSTRACT**

Performing Arts Medicine is a broad field that includes the study of medical conditions and injuries incurred by dancers, instrument musicians and vocalists. Musicians' playing-related health problems have focused more and more the interest of scientists, researchers, physicians, physiotherapists and, in generally, of health care professionals during the last decades. The most relevant Performing Arts Medicine's literature of approximately the past twenty years has been summarized. Special attention has been given to studies concerning playing-related musculoskeletal conditions of musicians. Overuse syndrome is the most reported diagnosis among instrumental musicians suffering from playing-related musculoskeletal disorders (PRMDs), despite the fact that epidemiologic rates of PRMDs among woodwind, brass and percussion musicians seem to variate widely. An unambiguous definition of specific PRMDs seems to be more and more necessary, and would permit subsequent studies not to be excluded in the data collection of further systematic reviews. In conclusion, in order to change musicians at-risk behaviours a significant mind-changing is necessary and prevention should be considered as a living matter. Health care professional should also represent an important stream to make aware musicians about PRMDs and pain management.

**Key words:** *Music, musculoskeletal disorders, orchestra player*

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## INTRODUCTION

The relationship between occupations and musculoskeletal injuries was documented centuries ago in *De Morbis Artificum Diatriba*, where Bernardino Ramazzini (1633-1714) wrote about several complaints he had seen in his medical practice, and that thought to be associated with work (Franco & Franco, 2001).

From age to age this issue turned into the modern industrial medicine as we know it, linking itself together with other branches such as preventive medicine, occupational hygiene, occupational health education and surveillance, and also reaching out to many everyday-life facets.

Among these, Performing Arts Medicine is a broad field that includes the study of medical conditions and injuries incurred by dancers, instrument musicians and vocalists (Bejjani et al., 1996).

Musicians' playing-related health problems belong to this variegated group of studies, and during the last decades have focused more and more the interest of scientists, researchers, physicians, physiotherapists and, in general, of health care professionals: "as playing is the work of musicians, playing-related musculoskeletal disorders (PRMDs) is an appropriate music-specific derivative of work-related musculoskeletal disorder" (Bragge et al., 2006).

The most common musculoskeletal condition reported by Authors in Performing Arts Medicine literature is surely the so-called 'overuse syndrome'. This term is used to define chronic pain "for which no diagnosis can be made and which has been ascribed to occupational over-use" (Palmer & Cooper, 2006). Since there is evidence of association between continuous overuse of joint and osteoarthritis (Cote, 2001), musicians are an at-risk category, although few Authors report this kind of injury among instrumentalists. Muscle-tendon unit is particularly subjected to overload during playing, and these are among the first tissues that may show painful symptoms.

Muscle and tendon complaints among musicians include painful muscle syndromes and inflammatory disorders of tendons and tendon sheaths. On the other hand, peripheral nerves may be compressed or entrapped in several areas, especially in the upper-limbs, and leading to painful nervous syndromes and inflammatory processes. Entrapment neuropathies are one of the main subject of study among musicians' ailments.

According to recent statistics, nowadays approximately 250000 musicians and singers are employed in the European Union (Laing, 1996), 196000 in the USA (US Department of Labor, 2007) and 11400 in Australia (Australian Government, 2001), playing as soloist or members of groups and orchestras, working as freelancer or within music associations and academies, often combining music performance with music teaching careers.

The aim of this work is to define the results achieved to date in the study of playing-related musculoskeletal disorders (PRMDs) among woodwind, brass and percussion musicians. Furthermore it wants to give to health care professionals, and in particular to physiotherapists, an updated reference for the management and the rehabilitation of these ailments.

## METHODS

The most relevant Performing Arts Medicine's literature of approximately the past twenty years has been summarized. Special attention has been given to studies concerning playing-related musculoskeletal conditions of musicians. Additional researches in contiguous fields, such as Occupational Medicine and ergonomics, have been particularly useful for the compilation of this work. A literature search was conducted in October, November and December 2008 for studies concerning playing-related musculoskeletal disorders among musicians.

MEDLINE (PubMed) and PEDro database were searched using 23 search terms, covering all results until 2008. Besides Google Scholar engine was searched for the same key words, giving links to additional scientific database such as NIOSH, Science Direct, Medical Problem of Performing Artists Online Archives etc. The reference lists of all relevant papers were also been investigated and searched, adding further results to those found with the database research.

The search terms included were: epidemiology; risk factors; prevention; rehabilitation; treatment; ergonomics; instrumental musician; instrument-specific; instrument-related; musculoskeletal; disorder; pain; overuse syndrome; osteoarthritis; fibromyalgia; myofascial pain; tendonitis; tenosynovitis; trigger finger; de Quervain's; carpal tunnel syndrome; entrapment neuropathies; thoracic outlet syndrome.

Each study was evaluated for inclusion/exclusion in this work at three separate stages. First was evaluated the title relevance, therefore the abstract and finally the whole study itself. Results which didn't pass the first stage, or both the first two stages, weren't included and examined. Results which pass both the first two stages have been fully examined when possible. Studies fully examined were included just according to their relevance and remarkable contribution with the treated issue, above an arbitrarily chosen quality criteria. Eligible studies were those investigating or discussing epidemiology, physiopathology, prevention and treatment of PRMDs among musicians.

## RESULTS

### *Woodwind players*

The most affected areas among single and double reed instrumentalists are hand, wrist and forearms. Common diagnosis include muscle strains problems, especially distal to the elbow, with intrinsic muscles and extrinsic flexors involved (Dawson, 2002).

In their 1987 study Newmark & Hochberg found that "all wind players had inflammation in the right hand (usually the thumb), which supports the weight of these instruments" (Newmark & Hochberg, 1987).

"Clarinettists' overuse typical affects firstly and most profoundly the first web space muscles of the right hand and the ligaments at the base of the thumb and radial side of the wrist, the former in sustained muscular contraction the latter suffering sustained loading from the weight of the clarinet borne on the right thumb" (Fry, 1987).

"Loading the right thumb with a Bb clarinet (800 grams) or an oboe (600 grams) affects earliest and most profoundly the first web space muscles [...] [and] the ligaments of the carpo-metacarpal joint at the base of the thumb [...]. Less commonly, the left hand and arm of the clarinetist or oboist may be involved with overuse" (Fry, 1986).

Flute players are more common to present inflammatory conditions, such as de Quervain's tenosynovitis at the wrist and trigger digits, although they may be affected by muscle strains problems too (Dawson, 2002). Generally has been reported right-side predominance of symptoms among wind instrument players (Manchester & Flieder, 1991).

#### *Brass players*

Brass players are usually associated with low rates of PRMDs. Nonetheless they may be affected by specific musculoskeletal problems directly related with their instrumental practice, such as lip muscle injury.

An example of such an injury is rupture of the orbicularis oris, also known as 'Satchmo's syndrome'. Trumpet players are most vulnerable because of the high pressures required to play the trumpet, but players of other brass instruments such as the French horn or trombone are also affected. This injury results in a decline in the strength and agility of the lip musculature with weakness during pouting and an inability to maintain high notes (Liu & Hayden, 2002).

Moreover, disorders of temporomandibular joints (TMDs) appear to be significant among brass players (Taddey, 1992). TMDs seem to be more common in trombone, trumpet and tuba players, with symptoms activated and accentuated during musical practice and performance (Taddey, 1992).

#### *Percussion players*

Percussion players "suffer painful lesions from the neck and scapula area to the intrinsic muscles of the hands and associated joint ligaments" (Fry, 1986).

A 1994 study reported that students who played percussions have been found to be 6.3 times more likely to have hand pain than non-percussionists students (Roach et al., 1994).

Apart from hand complaints, these musicians commonly suffer from back pain, especially at dorsal level, and elbow pain (Joubrel et al., 2001).

## **DISCUSSION**

In this study musician's secondary health problems, including focal dystonia, skin disorders, respiratory disorders, hearing and eyesight problems and psychological aspects, haven't been treated with exception of those cases in which it was necessary during the analysis of PRMDs in musicians.

Following the line of almost all previous Performing Arts Medicine's studies, this work accounts as 'instrumentalist musician' the commonly known conservatory-or-music-school-educated musician who plays a classical instrument (brass, woodwind and percussion), whether professionally or not. Have been not analysed studies conducted

among musicians playing modern instruments such as electric-instruments or drums, although some general issues could be common for this group of instrumentalists too.

Overuse syndrome is the most reported diagnosis among instrumental musicians suffering from PRMDs. Muscles that are overused has exhausted their endurance capacity. Muscles that are fatigued become less efficient and less responsive; thus a demanding activity requires more force. This results in more fatigue and tension, like a vicious circle. Round and round you go, with increasing pain and diminishing results (Horvath, 2002).

Nonetheless the characteristics of this painful syndrome and its aetiology are still argument of discussion in Performing Art Medicine, as well as in Occupational Medicine. There is not objective consensus about the clinical features of overuse, its diagnostic criteria, and consequently its treatment (Bejjani et al., 1996). Moreover in many cases the term overuse syndrome or repetitive strain injury may have been used improperly by Authors as a container for many specific pathologies and musculoskeletal complaints.

No account of the upper limb would be complete without consideration of non-specific upper limb pain and so-called 'repetitive strain injury' (RSI) or 'cumulative trauma disorder' (CTD). [...] Terms like this are unhelpful and contentious in the sense that they are ambiguous in their coverage. Moreover, they assume a cause as well as a diagnosis (whereas some of the conditions casually lumped under these headings may also have well-recognised non-occupational causes). [...] However, whether these disorders arise from repetitive work, and whether there is a condition of non-specific arm pain which presently defies clinical diagnosis and which arises from repetitive work, are points at issue [...] Given the lack of a clear definition and validated and accepted diagnostic criteria, it may be imagined that interpretation of the literature requires more than the usual degree of caution (Palmer & Cooper, 2006).

On the other hand, epidemiologic rates of PRMDs among woodwind, brass and percussion musicians seem to variate widely. It is supposed that such extensive epidemiologic rates among populations of instrumentalists are due to several methodological problems, first of all the absence of gold standard criteria for diagnosing musculoskeletal disorders and the lack of definition of observed outcomes in these researches (Zaza, 1998).

As a matter of fact almost all previous studies that form most of the current knowledge about music-related problems, including experimental researches and literature reviews, analyse musician's population by direct examinations (case reports) or giving them questionnaires (surveys of performers) (Dawson, 2002).

In previous review studies it has been noticed how many researches and experimental studies in Performing Arts Medicine lack of necessary statistical and methodological conditions to give evidence-based results. For example, during the compilation of an exhaustive review article about musicians' diseases, Bejjani et al. couldn't find any research performed in a true blinded, random-case controlled fashion until 1996 (Bejjani et al., 1996).

Moreover surveys generally consisted of reporting performer's subjective descriptions of physical symptoms and their locations, and did not include specific diagnoses made by health care professionals (Dawson, 2002). The result is that these studies often don't have a unified definition of 'musculoskeletal disorder' (that is a very variegated whole of injuries), and, above all, arbitrarily consider to include or exclude non-playing related injuries and mild aches.

Methodological problems also reflected in the analysis of instrument-specific epidemiologic rates of PRMDs (Zaza & Farewell, 1997). Information on the work-related musculoskeletal disorders of industry and office workers [...] is easily accessible to health care professionals. However, information on musician's occupational health problems is difficult to locate, even though, since 1980, over 6000 musicians in several countries have participated in surveys and other research studies (Zaza, 1998).

Consistent with the findings of Morse et al., until 2000 only one study has been conducted examining instrument-specific injury rates over time of a broad range of instruments, though this study investigated only university-level performance mayors who sought medical treatment at a single university health service (Cayea & Manchester, 1998; Morse et al., 2000).

## CONCLUSION

An unambiguous definition of specific PRMDs seems to be more and more necessary, and would permit subsequent studies not to be excluded in the data collection of further systematic reviews. Moreover it would give a useful tool for diagnose of such physical disorders.

Finally, like many others categories, musicians are inclined to keep their habits, also if they know they are wrong. In order to change musicians at-risk behaviours a significant mind-changing is necessary and prevention should be considered as a living matter. Health care professional should also represent an important stream to make aware musicians about PRMDs and pain management.

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