

Occupational Health Problems of Musicians

SUMMARY

Musicians, as well as other performing artists, may have their careers interrupted by, interfered with, or terminated by occupational health problems involving the neuro-musculoskeletal system. Adverse working conditions, organization, and activity may affect the health of musicians in all age groups and at all levels of performing ability. Instrument-specific health problems are related to excessive force, static loading, repetitive movement, and duration of musical performance. Important risk factors are 1) change in technique or instrument; 2) intense preparation for a performance; 3) preparation of a new and difficult repertoire; and 4) prolonged periods of performance without rest. Treatment protocols and health promotion or disease prevention programs are being developed in collaboration with the performing arts community. (*Can Fam Physician* 1989; 35:2341-2348.)

Key words: disease prevention, health promotion, hearing loss, musicians, neck disorders, occupational medicine, occupational therapy

RÉSUMÉ

Il arrive que la carrière des musiciens et des gens du milieu artistique soit interrompue, perturbée ou se termine à cause de problèmes de santé impliquant le système neuro-musculosquelettique. Les conditions et l'organisation de travail de même que les activités néfastes peuvent affecter la santé des musiciens dans tous les groupes d'âge et à tous les niveaux de performance. Les problèmes de santé des instrumentistes sont causés par la force excessive qui leur est imposée, la charge statique, les mouvements répétitifs et l'heure des représentations. Les facteurs de risque les plus importants sont: 1) un changement au niveau de la technique ou de l'instrument; 2) une préparation intensive pour une représentation; 3) l'apprentissage d'un répertoire nouveau et difficile; et 4) les sessions de musique prolongées sans répit. Le développement de protocoles thérapeutiques et de programmes visant à promouvoir la santé ou prévenir la maladie est déjà amorcé en collaboration avec la communauté artistique.

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THE UNIQUE and highly skilled neuro-musculoskeletal nature of musicians' work, finely controlled repetitive motions, and unnatural sustained postures required for extended periods of practice and performance can result in specific types of health problems during musicians' careers. Although musicians are a highly visible occupational group, surprisingly little has been published about their health problems.

Medical communities in Canada, the United States, and Australia have shown increasing interest in this occupational group. The past decade has witnessed the birth of arts medicine as a new specialty area. Health professionals have begun to develop assessment and treatment protocols and

prevention programs for the unique occupational health problems of musicians.

By far, most of the literature to date has focused on types of physical problems encountered by musicians. The earliest literature is based on single case studies. Henson and Urich¹ discuss Schumann's hand injury. Bird and Wright² discuss traumatic synovitis in a classical guitar player. More recently, cross-sectional surveys have examined the extent and types of problems. Systematic investigations have been conducted only since 1983. In a study of 100 musicians by Hochberg and co-workers,³ the most important occupation-related hand problems were inflammatory disorders of the tendon (36%), motor control disorders (27%), and peripheral nerve entrapments (15%).

Lederman and Calabrese⁴ conducted a pilot survey of the extent and

type of physical problems encountered by musicians. They found that common diagnoses included overuse syndromes, tenosynovitis, tendinitis, nerve entrapments, carpal tunnel syndrome, and cervical disc disease. String players complained of stiffness, tension, soreness, spasms, or numbness in fingers, hands, wrists, neck, jaw, and back.⁵ A follow-up study of 52 instrumental musicians with upper extremity disorders found that 51% suffered from various musculoskeletal disorders and 36% from peripheral nerve disorders.⁶ Fry⁷ outlined the diagnosis and management of these disorders.

Fishbein and associates⁸ published the results of a cross-sectional questionnaire survey of members of the International Conference of Symphony and Opera Musicians (ICSOM) in 1986. Fifty-five per cent (2212) of all 4025 ICSOM musicians participated in the study. The prevalence of medical problems was very high. Eighty-two per cent of respondents reported experiencing a medical problem, and 76% listed at least one problem as severe in its effects on their performance. Female musicians were more likely to report at least one medical problem than male musicians (89% vs. 78%) and at least one severe problem (84% vs. 72%).⁸

An Australian study of seven music schools found the prevalence of upper-extremity overuse syndrome to be between 13% and 21%. Factors that may contribute to overuse syndrome were listed as 1) genetic vulnerability, which cannot be altered; 2) the student's technique, which may be influenced by teaching an application that is more "energy efficient"; and 3) the time and intensity of practice, which can be controlled by the student and arts organization.⁹ More recently, Lockwood has comprehensively reviewed common medical problems from a historical and medical viewpoint.¹⁰

The purpose of this article is to describe the experience of the Canadian Centre for Health in the Arts, a clinic established in 1986 to address the health needs of Canadian musicians.

Musicians in Canada

The importance of the arts and culture sector to the Canadian economy is now being recognized. According to a Statistics Canada report from

1982-1983, the arts and culture sector accounted for 2% to 3% of the gross domestic product, or approximately \$8 billion. This portion is equivalent to that of metals and mines, that of electric power, that of gas, and that of other utilities industries. In Canada, approximately 32 000 professional musicians earn money from their music. About 58% (10 240 musicians) of these musicians work full-time in music-related fields. More than half of these musicians live in Ontario.

The median income of full-time musicians in 1982 was \$18 000, of which \$15 000 came from music-related employment. The vast majority of Canadian full-time musicians are self-employed and are ineligible for Unemployment Insurance Commission or Workers Compensation Board benefits or for company medical, dental, and disability plans.

In a survey conducted by the Organization of Canadian Symphony Musicians of its 1127 full-time symphony orchestra musicians, the average number of weeks of employment was 36 at the weekly minimum of \$570. Only two of the 17 orchestras surveyed participated in a medical or disability plan. It is likely, however, that 60% to 65% of these musicians will face career-threatening injuries during their working lifetime and will require appropriate medical diagnosis and treatment. The actual economic

impact of these injuries is unknown, but it is suspected to be quite high. The psychosocial burden to the musicians and their families could be intense and prolonged without adequate support and appropriate intervention. Very few of the music education institutions across Canada have begun to examine their role in the prevention of performance-related health problems.

Typical Case History

A 38-year-old professional violinist in a Canadian symphony orchestra, who had played since age five, experienced occasional tingling in the fingers of her left hand. The posture assumed while playing the viola requires the holding of the instrument between the left shoulder and jaw or chin and contributed to her condition (Figure 1). If she stopped playing for about one day and paid attention to good posture, her symptoms would subside.

In October of 1984, she was in a car accident and suffered a whiplash injury with immediate paresthesia of her left hand in the ulnar nerve distribution. There were no significant findings during X-ray examination. She was told by a doctor not to worry and that her condition would improve. Although her hand felt numb and weak, fine motor co-ordination did not appear to be affected. Between October 1984 and January

Figure 1
Static Loading of Neck and Shoulder To Support Instrument



1985, the patient saw her doctor every second week and received physiotherapy for the whiplash injury. Over this period, her hand did not improve, and she was told by her doctor, "You are too in tune with your body, so that when the slightest thing doesn't feel right you focus on it too much."

In January 1985, she recommenced playing with the symphony although her hand had not improved. After resting, the symptoms disappeared, but on tilting her head to the left in the required playing posture, symptoms recurred acutely, with numbness and tingling in the left hand and a "cold feeling" along the medial side of the left arm.

In April 1985, she visited a physician who suggested that she "switch hands" or "play the French horn, for after all, you are a musician, aren't you?" She was told that her condition was fine and that there was nothing to worry about. Electromyography, however, showed problems at the C7-8 and slowing around the elbow. These findings were reported to be insignificant.

At this point, she became thoroughly discouraged by the medical attention she was receiving and "gave up on it," thinking that perhaps it was really "all in her head." By July 1985, however, her symptoms had worsened and her playing had deteriorated to the point that she feared losing her job with the orchestra. There was pronounced weakness in her ring and little fingers with some hypothenar atrophy. She experienced numbness, coldness, and some tingling. The tingling was especially bothersome when she was fatigued, and she was unsure whether the tingle was from the string vibrating or from something else. She began noticing a dull ache in her left elbow.

The patient was forced to use fingerings that avoided the ring and little fingers; when she did use these fingers, she had to visually monitor what they were doing. Shifting up the neck of the instrument with the left hand became extremely difficult because she relied on the sensation in the ulnar border of her hand to tell her where her hand was positioned. Agility in rapid passages was adversely affected by the abnormal sensation.

When vibrating on notes, she had to view her hand as it performed the required movements. Intonation was

adversely affected because she was unable to judge the minute shifts in pressure on the fingertips required to correct it (Figure 2). Her attention therefore shifted away from the music (i.e., communicating to the audience through the instrument) to what her left hand was doing. Her mental and physical energies became totally absorbed in making the hand go through the necessary actions. What she had trained so hard to make automatic became a daily struggle.

As a last resort, she attended a sports medicine clinic in July 1985, where she received physiotherapy that focused on body realignment. She described feeling as though she was being forced into a "normal" mould, which she perceived to be inconsistent with playing her instrument. Benefits were very temporary.

In late November 1985, she was finally referred to a psychiatrist who recommended an ulnar nerve transposition at the elbow after completing nerve conduction and electromyographic studies. Even though the nerve conduction was at the lower limits of normal on the left side, it was considerably slower than the right side. She had the recommended surgery in December 1985 and by January 1986 was told by her surgeon that she could return to a full schedule the next day. No specific program was organized to deal with the psychosocial and socio-economic impli-

cations of the injury, prevention of recurrence, or gradual return to playing her instrument. One year after surgery, her hand symptoms had improved to a point at which her playing was at an acceptable level again, and she could handle a full work schedule.

This example illustrates the profound effect of an occupational health problem on a professional musician. Members of the performing arts population apparently encounter great difficulty in getting their health needs adequately met. Many have seen numerous doctors or paramedical professionals before coming to our clinic. Hence, what at first appears to be a relatively innocuous problem becomes chronic and is often of career-threatening proportions by the time they visit our clinic. The impact of the injury is magnified by 1) the tremendous neuro-musculoskeletal requirements of musical performance; 2) the unusual competition for jobs in the music industry; and 3) the lack of financial security for the injured musician and his or her family. The arts community has begun to recognize the need to address the occupational health problems of its members.

Development of the Clinic

The first Musicians' Medical Clinic in Canada was established in Hamilton in 1986 at the request of the Or-

Figure 2
Dynamic Loading of Arm To Play Viola



ganization of Canadian Symphony Musicians. The clinic has been flooded with inquiries from musicians across Canada who have career-threatening health problems. Approximately 400 musicians playing 23 different musical instruments have been assessed and treated in the clinic to date. Initially the clinic operated one half-day per week, but it has expanded to 2.5 days per week. Instrumentalists of all ages and levels of ability, from beginners to prominent international artists, have sought medical help at the clinic (Table 1). The average age was 32 years; nearly all patients were older than 16 and younger than 45. Fifty-five per cent of the patients were female.

The clinic was staffed by a multidisciplinary team consisting of a physician with a background in piano performance, composition, engineering, clinical epidemiology, and occupational medicine and an occupational therapist with a background in flute performance. Intake information was collected by the clinic co-ordinator, who was an active performing musician in the community. A detailed intake questionnaire helped to standardize the data collection procedure. Often consultants in physical medicine and rehabilitation, orthopedic surgery, neurology, and audiology helped design the assessment and treatment program. Heavy emphasis was placed on observation of the patients' performance technique and behaviour in order to understand the relationships between fine movement, support, and body posture and the musical instrument and repertoire. This information was used to identify the underlying mechanisms that result in physical or emotional dysfunction. Systematic collection of this data revealed patterns of occupational health problems for each instrumental group.

Table 1
Occupational Status
of Musicians Attending Clinic

Status	No.	%
Professional	148	38
Student	138	36
Amateur	70	18
Teacher	30	8
Total	386	100

Mechanisms of Health Problems

String Instrumentalists

Health problems in musicians who play string instruments often are caused by the manner in which the instrument is held (Table 2). For example, the disorders specific to the violin and viola vary according to the side of the body affected.

Left Side. The instrument is held between the left shoulder and jaw. The left shoulder is often elevated for long periods with the left chin and jaw bearing down on the instrument

to allow the left hand to move freely over the finger board. This state of static contraction promotes myofascial neck pain, dysfunction of the temporomandibular joint, and thoracic outlet syndrome. Also, the tendency to look at the fingers causes increased neck tension on the left side and can contribute to these problems. The wrist and forearm muscles then are used more than any other muscles for producing the notes and vibrato. Often the wrist is flexed as the fingers curl to apply pressure to the strings. This is the classic position to induce carpal tunnel syndrome and may promote flexor carpi ulnaris tendinitis

Table 2
Health Problems of Musicians Playing String Instruments

Instrument	Disorders
Violin ^a	Fibroligamentous neck pain Thoracic outlet syndrome on left Ulnar nerve entrapment on left Rotator cuff tendinitis on right Dysfunction of temporomandibular joint Extensor carpi radialis tendinitis on right Flexor carpi ulnaris tendinitis on left
Viola ^b	Same as for violin
Cello ^c	Fibroligamentous neck pain Ulnar nerve entrapment on left Rotator cuff tendinitis on right Extensor carpi radialis tendinitis on right Flexor carpi ulnaris tendinitis on left Intrinsic muscle strain on left
String bass ^d	Same as for cello
Guitar ^e	Triceps tendinitis on right Focal dystonia of right index and middle fingers and thumb Thoracic outlet syndrome on left Carpal tunnel syndrome on left Flexor carpi ulnaris tendinitis on left Intrinsic muscle strain on left First dorsal interosseous strain on left
Harp ^f	Fibroligamentous neck pain Flexor and extensor tenosynovitis of right and left thumb Extensor carpi radialis tendinitis on left Medial epicondylitis on left Flexor hallucis longus tenosynovitis of right great toe

a. 63 patients had a total of 39 right-sided injuries and 71 left-sided injuries.

b. 23 patients had a total of 23 right-sided injuries and 19 left-sided injuries.

c. 25 patients had a total of 12 right-sided injuries and 26 left-sided injuries.

d. 17 patients had a total of 8 right-sided injuries and 15 left-sided injuries.

e. 42 patients had a total of 30 right-sided injuries and 47 left-sided injuries.

f. 7 patients had a total of 3 right-sided injuries and 11 left-sided injuries.

and ulnar nerve entrapment at the elbow and wrist.

Right Side. The right hand holds the bow, which is drawn across the strings to make the sound. The sustained state of abduction and flexion of the right shoulder can result in rotator cuff tendinitis if tension is not released. Some large orchestral works lasting well over one hour require prolonged periods of tremolo, in which the neck, shoulder-girdle complex, and wrist flexors and extensors are held in a state of isometric contraction as the bow is moved up and down a few centimetres very rapidly. The quick back and forth movements of the wrist required for sustained tremolo can result in overuse injury of the extensor carpi radialis and flexor carpi ulnaris muscle-tendon units.

Occasionally the ulnar nerve can be compressed in Guyon's canal. Passages requiring rapid changes over the four strings of the instrument may strain the rotator cuff, deltoid, and pectoralis muscles.

Keyboard Instrumentalists

Playing a keyboard instrument (e.g., the piano) requires a similar posture to that required for typing. Often the slight forward and downward orientation of the head to look at the keys, hands, and music causes static contraction of the upper trapezius, leading to myofascial neck and back pain. Shoulders are often held in constant flexion and abduction with sustained activation of the pectoral muscles (rounded shoulders). This posture, combined with the head tilted forward and inappropriate breathing patterns, can provoke thoracic outlet symptoms from chronic compression of the neurovascular bundle as it passes between the scalenes and under the insertions of the pectoral muscles.

When the fingers are used independently in a curled attitude with the metacarpophalangeal joints in a neutral position or even in extension, medial and lateral epicondylitis may occur. When radial and ulnar deviation of the wrist is substituted for the more physiologically sound movement of wrist rotation (supination-pronation), the result can be strain or tendinitis of the wrist flexors and extensors. A common technique for piano playing uses the "thumb under"

method to ascend the keyboard, placing excessive strain on the thumb extensors and binding the finger extensors across the dorsum of the hand. This can result in de Quervain's disease and strain of the extensor digitorum muscle.

Playing loud repeated octaves and large chords that require a wide stretch between the thumb and little finger puts excessive strain on the wrist joint capsule and can result in a dorsal wrist ganglion. Occasionally, the posterior interosseous nerve can become compressed as it passes through the supinator muscle. Focal dystonia of the thumb and finger flexors and the interosseous and lumbrical muscles has been observed.

Wind Instrumentalists

The posture required to play the traditional French model open-hole flute requires sustained adduction and flexion of the left shoulder, sustained abduction of the right shoulder, and sustained flexion of both elbows (Figure 3). The head is usually rotated toward the left with a slight tilt to the right. The head and neck often project forward. The left wrist is often in extreme radial deviation and extended in excess of 45°. The body of the flute is supported on the radial aspect of the left index metacarpophalangeal joint and the pad of the right thumb. The right little finger provides the counterbalance. Fre-

quently the right wrist is dropped so that the fingers are curled, which promotes excessive strain on the wrist and finger extensors (Table 3).

This sustained posture can predispose an individual to myofascial neck pain, back pain, and tendinitis of the rotator cuff and extensor carpi radialis muscles. When the requirements for controlled air flow, finely coordinated finger movements, and the stress of performance are added, thoracic outlet syndrome and ulnar neuropathies can result.

Percussionists

The use of sticks, mallets, and bare hands to strike various percussion instruments results in rapid deceleration of the fingers and wrists at the moment of impact. This impulse is transmitted up the hand-arm unit and can result in repeated trauma to the muscle-tendon units and inflammation of the tendon sheaths. Many modern percussion styles used in hard rock and in some forms of jazz require tremendous force in the strokes and posturing of the performer that involve extreme flexion of the wrist. In 20 percussionists treated at our clinic, most health problems were bilateral (lateral and medial epicondylitis, extensor and flexor carpi radialis and ulnaris tendinitis, de Quervain's disease, flexor tenosynovitis, and hearing loss), although there were more injuries to the right side than to the

Figure 3
Static Loading To Support Flute



left side. In addition, some of these percussionists developed carpal tunnel syndrome, and one developed and tendinitis of the Achilles tendon.

Risk Factors

Factors that place a musician at risk for developing occupational neuro-musculoskeletal injuries can be divided into intrinsic and extrinsic risk factors. Intrinsic risk factors are characteristics over which the individual has little or no control: for example, age, sex, size, strength, or flexibility. Extrinsic factors are variables over which the individual is able to exert some measure of control, which include frequency of repetitive movements, intensity of playing (force), length of time playing without a rest, efficiency of movement (technique), ergonomics, posture, and difficulty of the music being played (repertoire). A sudden change in any one or in a combination of these factors can lead to injury. The treatment, education, and prevention protocols of the clinic for musicians focus specifically on these extrinsic factors.

Important points in the clinical evaluation of risk factors are: 1) change in technique or instrument; 2) intense preparation for a performance; 3) preparation of new and difficult repertoire; and 4) prolonged periods of performance without rest. These changes may lead to an interaction of increased force, static loading, repetition, and time resulting in increased stress to the muscle-tendon unit, peripheral nerves, and ligaments. These factors may also increase friction, and regional inflammation may begin at points of extreme joint angle and restricted passage (Figure 4). The affected tissue structure will heal with localized areas of scarring, causing loss of flexibility and resistance to further mechanical breakdown. Treatment and prevention therefore must be directed toward changing these underlying risk factors as well as controlling the effects of regional inflammation.

Treatment and Prevention Programs

A customized education, treatment, rehabilitation, and preventive program called the "pianissimo-crescendo program" is designed for each patient and is administered, usually

in a group, each week. The process parallels that of the problem-based tutorial pioneered by the medical program at McMaster University. The staff serve as facilitators and resource persons, and patients are encouraged to adopt a problem-solving approach in seeking solutions to their health problems. The program is organized in instrument-specific groups to make population and perfor-

mance-related factors more homogeneous.

The program includes assessment of performance criteria, patient educational information, monitoring of activity, notification of authorities if necessary, pertinent investigations, stretching and strengthening exercises, control of inflammation, mobilization exercises, schedule organization, counselling, recuperation,

Table 3
Health Problems of Vocalists and Musicians
Playing Wind Instruments

Instrument	Disorders
Vocalists	Vocal cord strain Facial and neck muscle strain
Flute ^a	Thoracic outlet syndrome on left and right Ulnar nerve entrapment on left Extensor carpi radialis tendinitis on left Fibroligamentous neck and back pain De Quervain's disease on left and right Focal dystonia of left ring and little fingers
Clarinet ^b	Carpal metacarpal joint strain on right De Quervain's disease on right Lateral epicondylitis on right and left Dysfunction of temporomandibular joint
Saxophone ^c	Fibroligamentous neck and back pain Extensor carpi radialis tendinitis on right and left Dysfunction of temporomandibular joint
Oboe ^d	Extensor carpi radialis tendinitis on right Lateral epicondylitis on right Ulnar nerve entrapment on right Posterior interosseous nerve entrapment on right Fibroligamentous neck and back pain
Bassoon	Fibroligamentous neck and back pain Dysfunction of temporomandibular joint and dental problems Strain of teres major and pectoralis major on right
Bagpipes	Focal dystonia of right ring and middle fingers
Trumpet	Maxillofacial and lip trauma Pharyngeal dilatation Hearing loss
French horn ^e	Dysfunction of temporomandibular joint Strain of extensor carpi radialis and dorsal wrist ligament on right Strain of orbicularis oris
Trombone ^f	Hearing loss Focal dystonia of lip Lateral epicondylitis on right Strain of orbicularis oris
Tuba ^g	Strain of orbicularis oris

- a. 26 musicians had 12 right-sided injuries and 15 left-sided injuries.
- b. 10 musicians had 10 right-sided injuries and 6 left-sided injuries.
- c. 6 musicians had 4 right-sided injuries and 8 left-sided injuries.
- d. 6 musicians had 11 right-sided injuries and no left-sided injuries.
- e. 6 musicians had 1 right-sided injury and 3 left-sided injuries.
- f. 10 musicians had 3 right-sided injuries and 2 left-sided injuries.
- g. 2 musicians had 1 right-sided injury and 1 left-sided injury.

ergonomic assessment, advice on sleep habits, arrangements for compensation, aerobic exercise, nutritional advice, disability assessment, and outcome evaluation.

Performance Criteria

At the beginning of the program

the patient selects five performance criteria with which to evaluate progress on a daily or weekly basis. These five criteria are selected in order of priority to focus the patient's attention on the multi-faceted intervention program. These criteria are rated on a seven-point scale where 1

is the best and 7 is the worst. It is crucial to select these criteria before the program begins to allow interventions to be designed and tailored to maximize performance.

Information

The patient is given an information package covering anatomy, pathophysiology, stretching, and any specific information about the clinical problem.

Activity

Each week the patient is asked to rate the frequency, intensity, and total time of work. This includes the cumulative amount of playing, whether rehearsing, practising, or performing. From week to week we prescribe what this workload ought to be, ranging from total abstinence to relative rest. As clinical progress is made, the total amount of activity is increased very gradually to a full workload.

Notification

If required, a statement of temporary disability to an employer, teacher, or institution is issued. The patient may request this whenever necessary, as treatment may last as long as six to 12 months.

Investigations

Necessary investigations, such as electromyography, X-ray examinations, audiometry, and bloodwork are organized for the patient at the time of consultation.

Stretching and Strengthening

Individual gradual stretching and strengthening programs are prescribed by our occupational therapist when indicated. These exercises facilitate the lengthening of scar tissue, increase the aerobic condition of the muscle, and enhance the force-length curve of the muscle-tendon unit.

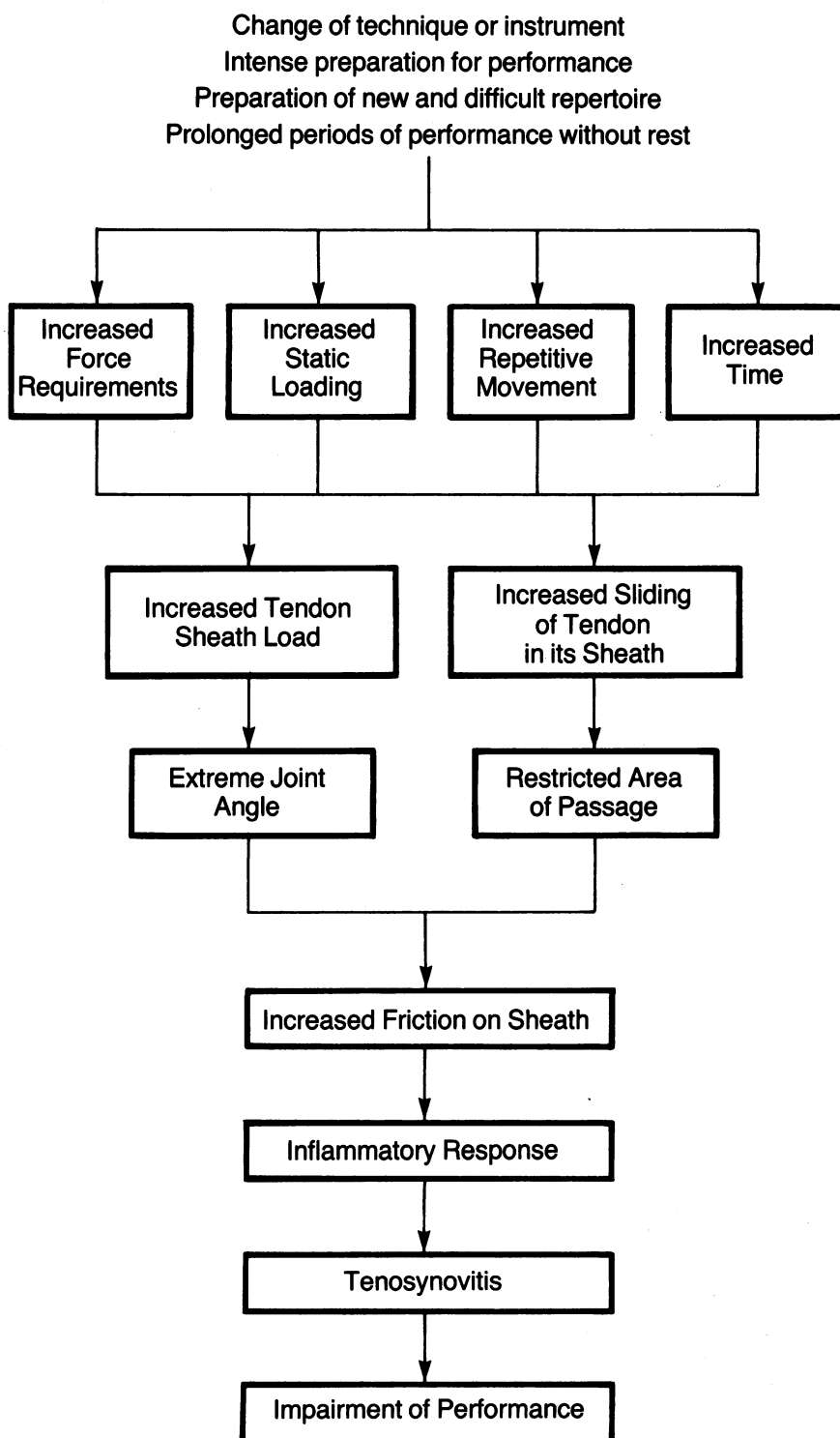
Inflammation

We recommend techniques to control regional inflammation in the acute phase, for example, ice, acetylsalicylic acid, ultrasound, or splinting. Management of chronic inflammation may involve non-steroidal anti-inflammatory medication and possibly local injection.

Mobilization

A set of exercises to mobilize the hand, arm, neck, and back are prescribed as the program progresses. It is crucial for the patient to learn to mobilize and use the larger proximal muscles in order to relieve the biome-

Figure 4
Pathogenesis of Activity-Induced Tenosynovitis



chanical stresses on the smaller distal muscles of the upper limb and achieve a balanced and efficient relationship of muscle groups.

Organization

We advise the patient to schedule playing, practising, and upcoming performances to allow appropriate treatment to take place in our program and to control the total workload.

Counselling

The effect of health problems on a performer can be profound. If required, we set up separate sessions for individual counselling for the musician and family. The reaction to injury is not unlike a grief reaction and can be approached similarly.

Recuperation

It is important to develop a set of active recuperative exercises for use between working sessions and to teach the patient to balance tensions while performing. These are learned as the patient progresses through the program.

Ergonomics

Specific ergonomic principles are discussed throughout the program. These are integrated into the technical and behavioural approach to the repertoire, the instrument, and the working environment. This process involves ongoing assessment of the biomechanical and psychomotor patterns that are used by the musician. Patients are given feedback to help them experiment and functionally modify their current technique. We encourage a problem-solving and interactive approach rather than a didactic and passive method of learning.

Sleep Habits

We advise patients about healthy sleep habits and suggest techniques to enhance sleep if required. Quality sleep is crucial for proper recuperation of the neuro-musculoskeletal system and may be impeded by poor work organization and stress.

Compensation

If the musician has a disability plan, we handle the administrative work. If no plan is available, we strongly recommend that some type of occupational disability program be set up.

Exercise

As the program progresses, we

stress the importance of daily aerobic exercise using the whole body. Specific warm-up and cool-down exercises are recommended. Musicians are encouraged to identify the exercises and body postures that will promote musculoskeletal balance in playing their instrument and will maintain optimal range of motion. Principles of healthy and safe exercise are reviewed.

Nutrition

We give specific advice on optimum nutrition for enhancing neuro-musculoskeletal performance and well-being.

Disability

If any permanent disability is anticipated, we assess it on behalf of the patient.

Outcome

At the end of the program, the patient's progress is evaluated based on the initial performance criteria.

Further Development

This program will be further refined with the collaboration of the Organization of Canadian Symphony Musicians, the National Youth Orchestra, and the Royal Conservatory of Music. Evaluation methods are currently being developed so that each component of the program can be assessed and improved.

The skills of the therapist-facilitator are crucial to the success of the program. Certain qualities are essential: empathy for the musician; experience in the role of performing artist; an understanding of the ergonomics of musical instruments; and the ability to enable and empower patients to change their behaviour and working conditions. Organizing the therapy into instrument-specific groups allows issues of common concern to be discussed. We encourage patients to discuss problems encountered during the week, their experiences with controlling workload and technique, ideas about solving technical difficulties, and selection of appropriate repertoire. An environment of mutual caring and support often develops between patients, which enhances the overall program.

Conclusion

Only recently have the performing arts community and the medical profession recognized the tremendous burden placed on musicians by these

occupational health problems. Solutions to these problems do not rest in the traditional medical model of diagnosis and treatment alone. Innovative intervention strategies need to be developed that emphasize education, enablement, and empowerment to control adverse working conditions, work activities, and work organization.

The health of performing artists is a precious resource threatened by a multitude of poorly understood conditions that require further investigation into their diagnosis, cause, treatment, and prevention. By gaining further knowledge and understanding of these health problems, Ontario and Canada will not only continue to develop the abilities of some of the world's finest artists but can also contribute to the prevention of illnesses that may interfere with, interrupt, or end their careers. ■

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References

1. Hensen RA, Ulrich H. Schumann's hand injury. *Br Med J* 1978; 8:900-3.
2. Bird HA, Wright V. Traumatic synovitis in a classical guitarist: a study in joint laxity. *Ann Rheum Dis* 1981; 40:161-3.
3. Hochberg H, Leffert R, Heller M, Merriman L. Hand difficulties among musicians. *JAMA* 1983; 249:1869-72.
4. Lederman RJ, Calabrese LH. Overuse syndromes in instrumentalists. *Med Probl Perf Art* 1986; 1(1):7-11.
5. Ziporyn T. Pianists' cramp to stage fright: the medical side of music making. *JAMA* 1984; 252:985-9.
6. Knishkowsky B, Lederman RJ. Instrumental musicians with upper extremity disorders: a follow up study. *Med Probl Perf Art* 1986; 1(3):85-9.
7. Fry HJH. Overuse syndrome in musicians: prevention and management. *Lancet* 1986; ii (8509):728-31.
8. Fishbein M, Middlestadt SE, Ottati V, Strauss S, Ellis A. Medical problems among ICSOM musicians: overview of a national survey. *Med Prob Perf Art* 1988; 3(1):1-8.
9. Fry HJH. Prevalence of overuse (injury) syndrome in Australian music schools. *Br J Ind Med* 1987; 44:35-40.
10. Lockwood AH. Medical problems of musicians. *N Engl J Med* 1987; 320:221-7.