

INTRODUCTION

The purpose of this treatise is to introduce string players to a wide array of sources that can be helpful in developing healthy playing habits and preventing injury. More and more musicians are discovering that playing their instruments can cause pain or even serious injury. A recent study revealed that seventy-five percent of orchestra musicians reported having at least one performance-related medical problem.¹ Janet Horvath, Associate Principal Cellist of the Minnesota Orchestra and Director of the “Playing (less) Hurt” Conference Series, lists several reasons for this trend. Orchestra schedules are more demanding than they were thirty years ago, repertoire is more difficult, pieces that were considered unplayable at their premiere are now part of the standard repertoire, and composers have incorporated more extended techniques into their works, resulting in musicians having to increase their own technical capabilities. Also, partly due to the recording industry, the standards of playing are higher and there is far more competition for jobs.² While these conditions apply to professional musicians, there is always a younger generation of students striving to meet these standards and hurting themselves as well.

Since pianist Gary Graffman revealed his debilitating hand injury in the early 1980s, many organizations have been formed that bring doctors and musicians together to remedy these special problems.³ Music medicine is a relatively new field that includes collaborations between psychologists, neurologists, orthopedists, surgeons, rheumatologists, and specialists in other branches of medicine including sports medicine and physical and occupational therapy. Additionally, massage therapy, chiropractic, Alexander Technique, Feldenkrais, and other movement programs have provided relief for many. While so many doctors and therapists have dedicated themselves to finding remedies for musicians’ injuries, there is still a gap between those who understand the science behind pain, and those who understand the mechanics of

¹Louise Montello, and Edgar Coons, *Musicians’ Wellness, Inc.* [www.musicianswellness.org].

²Janet Horvath, “Work Hardening: How to Safely Return to Work after Injury,” *International Musician* 101:2 (February 2001): 8.

³Gary Graffman, “Doctor, Can You Lend an Ear?” *Medical Problems of Performing Artists* 1:1 (March 1986): 3.

playing. Perhaps the best medicine is for musicians to become more involved in their own healing process. Doctors can help alleviate pain, but only musicians themselves can change the factors that cause the pain.

String players, especially violinists and violists, are prone to injury due to the unnatural positions required for playing the instruments. Although there are basic principles for positioning the instrument during playing and there are adjustable components such as chin rests, shoulder pads and end-pins, the players themselves are so varied that general positioning guidelines do not apply to everyone. In order for a string player to be truly comfortable and pain free, he must learn how to adapt the instrument to his own size and shape. Too often players conform their bodies to the instrument, which is a major cause of injury. Becoming aware of one's body not only requires a sense of neck height, shoulder width and arm length, but some players may also require a more intimate knowledge of which muscles are used in playing, and an analysis of how much tension is used for the work being performed. This process is unique to each individual. Some players may have enough strength to handle the awkward positions, while others may need to spend more time analyzing their posture and technique. The important issue is that string players, due to the difficult playing positions, are prone to injury. If one is seriously injured, he should seek professional medical treatment. However, by taking responsibility for one's own health and examining his/her technique and posture, he/she may learn how to play in a manner most efficient for their body, thereby remaining pain free.

Aims and Limitations

This treatise is intended for use by university string players and their teachers. Often freshman music students encounter more playing hours than previously and find themselves uncomfortable, hurting or injured for the first time. Therefore, this guide may serve as a starting place for these students to begin their study of healthy playing. Also, this treatise may be used by string teachers in order to direct their students to specific areas of study that may serve the student's needs. Designed as a resource guide, it not only includes books and journal articles on musicians' injuries, but also includes a list of helpful websites, instructional videos and current workshops on musicians' injuries. Because much of the information in this paper is recently published research and new research is being conducted at a rapid rate, it is impossible to be

completely current. However, it is also hoped that this treatise will encourage others to continue further compilation of helpful materials.

Because the intended audience is university string players, many of the sources listed are obtainable through university libraries or interlibrary loan, including textbooks and journal articles. Other sources listed are available only through the publisher, such as the American String Teachers Association, and will be noted in the annotation.

For organizational purposes, the bibliography is divided by format into books and articles. In order to easily indicate where a source may be obtained, the books are divided into self-help books, which are often found in commercial bookstores, and textbooks, including dissertations, which are usually only available at libraries, through interlibrary loan, or through Dissertation Abstracts International. The self-help books are further organized by subject, including (1) comprehensive guides, (2) bodywork, (3) mental practice, and (4) relaxation techniques. The textbooks are grouped into (1) anatomy and kinesiology, (2) music medicine, (3) dissertations, and (4) relaxation techniques.

The articles are arranged in two categories, those from medical journals, and those from music journals. The medical journal articles are organized by topic, including (1) focal dystonia and occupational cramp, (2) hand, thumb and upper-extremity problems, (3) jaw problems, (4) nerve entrapment and thoracic outlet syndrome, (5) overuse, repetitive stress injuries (RSI), and tendinitis (tendonitis), (6) prevention, and (7) quantitative measurement. The music journals are divided into (1) focal dystonia, (2) introductory and overview articles, (3) overuse, and (4) prevention and preventive technique.

It is recognized that the area of performance anxiety is closely related to these subject areas, and that when working on aspects of mental and physical training, performance anxiety may also be alleviated. The reverse is also true, that in order to overcome performance anxiety one may need to examine facets of one's physical tension and mental focus. Clearly the topics overlap. However, the scope of the literature on the subject of performance anxiety is quite broad and would require a paper of its own.

The bibliography is selective and, therefore will not include every source in each topic area. For instance, in the area of sports medicine there is a very large body of literature. The sources selected are recently published, and are applicable to string playing. Also, this paper will

focus on literature published since 1980, when the field of music medicine was organized, and the sources will be limited to those published or translated into English.

Methods

The compilation of these sources began when the author was faced with pain and injury related to playing the viola. After several frustrating visits to various medical specialists, she decided to explore what information was available for musicians. Finding this information lacking, she began investigating other disciplines that could reveal some applicable information. This led to the development of a personal library from which many of the sources are drawn.

There are several comprehensive guides to musicians' injuries. The bibliographies of these books served as starting places for other sources and also other disciplines that are helpful to musicians, such as movement education, sports medicine, kinesiology, and anatomy. From this list, subject searches were performed on Amazon.com, First Search, and the library catalogues of the Allen Music Library, Strozier Library, and Dirac Science Library at Florida State University. Other sources were obtained through browsing at bookstores, music catalogues, websites, and discussions with colleagues, therapists and teachers.

In preparation of the bibliography and the annotations, the work by Blanche Prichard McCrum and Helen Dudenbostel Jones, *Bibliographical Procedures and Style, A Manual for Bibliographers in the Library of Congress*, was consulted. The purpose of the annotations is not to summarize, but to provide the premise of the sources and content information, as well as to reveal significant information that is particularly useful to string players. It is the goal of this paper to motivate the reader to be involved in the evaluation process.

BOOKS

Self-Help Books

Self-help books seem to have flooded the market recently, with do-it-yourself guides available for practically everything. While this self-starting attitude is good, readers should beware of books that claim to be easy and quick, especially those claiming to be cure-alls. The process of healing oneself is complex. It requires much time and experimentation with many different methods, often entails elements from highly varied sources, and is unique to each individual.

Comprehensive Guides

These books are written by people with knowledge in both music and medicine, or are collaborations between people of different disciplines. They are a good starting place for someone new to the experience, as they cover a wide range of information in anatomy and physiology, ergonomics, musicians' injuries, treatments, prevention, conditioning, and mental practice. For this reason they are also staples of the veteran, and can be referred to repeatedly. Many of these books may be obtained at commercial bookstores.

Andrews, Elizabeth. *Healthy Practice for Musicians*. London: Rhinegold, 1997.

The author has combined her expertise as a freelance musician and chiropractor in this book addressed to string players. Though verbose at times, it does include information not easily found in other sources, such as skin, eye, and dental problems as well as growth processes, diet, and touring issues. She also discusses many emotional factors that affect musicians' well-being and provides a thorough explanation of applied kinesiology for musicians. It includes warm-up, cool-down, stretching, exercising, and rehabilitation advice. Each chapter contains extensive reference lists including music medicine organizations.

Horvath, Janet. *Playing (less) Hurt: An Injury Prevention Guide for Musicians*. Kearney, Nebraska: Morris Publishing, 2002.

Horvath became acquainted with playing injuries as a student under Janos Starker at Indiana University. Later she acquired the position of Associate Principal Cellist of the Minnesota Orchestra, and this book is the culmination of twenty years of research and lecturing in the field of performing arts medicine. This practical and extremely informative book explains why injuries arise, who is at greatest risk and why, and how to achieve technical ease and pacing. She also explains what to guard against in order to avoid injury, and how to rehabilitate oneself should injury occur. “The elimination of pain is not an end in itself. True ease of expression allows you and your instrument to resonate freely, and when you achieve a state of physical serenity, your audience can feel it” (p. 12). Though written with much insight from the player’s perspective, she provides clear explanations from the medical perspective, and discusses the controversies over the most current research. A compilation of “backstage stretches” is presented, with simple cartoon drawings. To aid in remembering good injury prevention habits, Horvath has constructed several posters available through an order form at the back of the book, including the stretches, “do’s and don’ts,” low back tension relievers, and danger signals. This source contains an extensive resource list and an instrument-specific index.

Lieberman, Julie Lyonn. *You Are Your Instrument: The Definitive Musician’s Guide to Practice and Performance*. New York: Huiksi Music, 1991.

Lieberman, a violinist who specializes in improvisation and alternative styles, presents the idea that musicians need to take responsibility for their health and learn how the body works in order to prevent injury. She provides much insight into the routines and practice habits of musicians and discusses how we hurt ourselves by not thinking about how we play. The book contains information on the brain and how to use imagery and visualization in practice, how to learn to recognize tension and release it, followed by chapters on breathing and body awareness. It also contains exercises and stretches, information on what to do and where to go if one is injured, and extensive resource lists with different types of bodywork, physical therapies, and alternative healing remedies.

Appendices include references, resource organizations, an index, and video order form. (See Appendix D)

Norris, Richard. *The Musician's Survival Manual: A Guide to Preventing and Treating Injuries in Instrumentalists*. Saint Louis: M. M. B. Music, 1993.

Norris, an M. D., also has a strong background in music and dance, and presents information from a music medicine specialist point of view. The book concentrates on specific injuries, recognition, symptoms, prevention and treatment. Some of the most common injuries discussed are thoracic outlet syndrome, cubital tunnel syndrome, carpal tunnel syndrome, focal dystonia, and tendinitis. It also contains therapeutic exercises, advice on returning to play after an injury, and ergonomics. Appendices include a music medicine self-history form, performing arts medicine clinics, arts medicine organizations and publications. The source contains an extensive bibliography.

Paull, Barbara, and Christine Harrison. *The Athletic Musician: A Guide to Playing without Pain*. Maryland: Scarecrow Press, 1997.

This collaboration between Paull, a physiotherapist, and Harrison, a violinist, presents the concept that musicians should view themselves as athletes and treat their bodies with the same amount of care as an athlete. The book begins with Harrison's account of her injury and how it led her to treatment with Paull. Paull presents her advice from a physiotherapist's perspective, and Harrison also presents advice from a string player's point of view. The book contains information on anatomy for musicians, ergonomics, warm-up, stretching and exercising prescriptions, suggestions on how to practice mentally and efficiently, and advice on where to go if one is injured. It also contains a glossary, an appendix, and references.

Zaza, Christine. *Play it Safe: A Health Resource Manual for Musicians and Health Professionals*. Ontario: Canadian Network for Health in the Arts, 1998.

The author holds degrees in both piano and violin performance; chronic pain led her to her current career in research and prevention of playing-related health problems. "The information in this manual is based on research, and not on anecdotal experiences or personal opinion. The manual provides current scientific information on the risk factors,

treatment, and prevention of musicians' health problems" (back cover). It is divided into five sections, including "Common Health Problems Affecting Musicians," "The State of the Arts," "Risk Factors for Musculoskeletal Problems," "Prevention," and "Health Resources." She begins by discussing several myths about musicians' health, including prevalence, causes, and physiological information. Injuries are explained in anatomical terms with illustrations of affected areas. Other pertinent information includes a list of questions to ask when reading survey-type literature, and questions to ask when considering help from health professionals. Each chapter contains extensive bibliographies. It also includes directories of performing arts medicine organizations, clinics and doctors who specialize in the field, as well as alternative therapists, such as audiologists, biofeedback therapists, massage therapists, kinesiologists, movement therapists, and physical and occupational therapists, etc.

Bodywork

Control of one's body is a challenge that all musicians face, regardless of the presence of pain or injury. However, learning to move freely and recognizing faulty postures are also integral parts of recovering from injury. Many movement education programs exist, with the teachings of F. Matthias Alexander and Moshe Feldenkrais being the most famous. Because most of the books listed here (exceptions will be noted) can be found at commercial bookstores, the intended audience is most often the layman or novice. Therefore, students should not be intimidated by the anatomy books and should be inspired to explore subjects new to them.

Alcantara, Pedro de. *Indirect Procedures: A Musician's Guide to the Alexander Technique*. Oxford: Clarendon Press, 1997.

The author, cellist and Alexander teacher, presents his application of this body awareness program for musicians. It contains musical examples and exercises. Although quite verbose and philosophical, this may better serve as a supplement to study or an introduction to the method, not as a practical guide. This book includes appendices, a bibliography and an index.

Alexander, F. Matthias. *The Essential Writings of F. Matthias Alexander*. Selected and introduced by Edward Maisel. Great Britain: Thames and Hudson, 1974.

Though many people have published interpretations of Alexander's teachings, it is often interesting to read the primary source of an established method. This book is a compilation of Alexander's writings, including *Man's Supreme Inheritance* (1910), *Constructive Conscious Control of the Individual* (1923), *The Use of the Self* (1932), and *The Universal Constant in Living* (1941). It also contains prefaces to the original publications, biographical notes, and references.

Alon, Ruthy. *Mindful Spontaneity, Moving in Tune with Nature: Lessons in the Feldenkrais Method*. Australia: Prism Press, 1990.

There are many students and interpreters of the Alexander Technique, as there are disciples of Moshe Feldenkrais. While studying movement from a book is difficult, this book may serve to inspire one to seek out a teacher of this technique, supplement one's study with a teacher, or encourage creative awareness of one's movement. Some chapters include "Functional Honesty," "Organic Learning—Learning Through Options," "Family Therapy for the Community of the Vertebrae." Some of the topics she discusses are "Your back at the foreground of your movement ecology," "Creative exploration versus following instructions," and "Awareness—the grammar of your lost spontaneity." Simple drawings help explain exercises. The source includes a bibliography.

Anderson, Bob. *Stretching*. Revised edition. California: Shelter Publications, 2000.

This is a very informative and practical book. Anderson begins by presenting the benefits of stretching, and who, when, why and how to stretch. The stretches are illustrated by his wife, Jean Anderson, and are presented in a very simple style, highlighting the area being stretched. The revised edition contains stretches grouped according to body part, then according to daily activities such as getting up in the morning, gardening and airplane stretches. The second half of the book is dedicated to sport-specific stretches and includes a wide variety of activities and routines. A chapter on caring for the back is especially useful for string players. The book is a valuable resource in the practice room. It also includes a bibliography and an index.

Butler, Sharon. *Conquering Carpal Tunnel Syndrome and Other Repetitive Strain Injuries*. Oakland: New Harbinger Press, 1996.

Very informative and applicable, this book teaches how and why soft tissues develop repetitive strain injuries, how stretching works to improve function and comfort, and how to create a prevention-based exercise program according to profession. She also discusses Hellerwork, an educational system of body alignment. This book includes references and a list of clinics.

Calais-Germain, Blandine. *Anatomy of Movement*. Seattle: Eastland Press, 1993.

This author began as a dancer and later studied physiotherapy, where she “quickly realized that dancers could benefit greatly from a better understanding of their ‘inner’ bodies. She devised a novel teaching method to serve this purpose: the simultaneous representation of physical structures and their possible movements, designed to facilitate actual execution by the dancer” (p. xi). In this way it is different from many anatomy books because the muscle and its actions are revealed together, making it more immediately practical for string players to analyze their motion. Illustrations are clear, revealing only one muscle at a time instead of all layers, and explanations are in simple language. Actions of the scapula, shoulders and arms are given more attention than most anatomy books.

Conable, Barbara. *What Every Musician Needs to Know About the Body: The Practical Application of Body Mapping and the Alexander Technique to Making Music*. Portland: Andover Press, 1998.

William Conable, professor of cello at Ohio State University, developed a technique called body mapping to learn how to use one’s body efficiently. Barbara Conable then applied the concept of body mapping to the Alexander Technique and produced this primer that takes the reader through the principles of retraining the body to move efficiently. The illustrations and text are extremely simplified. Spiral bound, it is useful as a practical guide and can be taken to the practice room. (See Appendix E for ordering information.)

Egoscue, Pete, and Roger Gittines. *The Egoscue Method of Health through Motion*. New York: Harper Collins Books, 1993.

Anatomical functionalist Egoscue presents the premise that pain is caused by lack of motion and that we can treat our own afflictions through proper movement. “We must learn to recognize that the pain we feel, the stiffness, the lack of energy, the poor balance, the erratic concentration, or the inability to hit the long ball or the short putt aren’t caused by the passing years, a second rate golf club, or a bad day at the office: These are symptoms of dysfunction brought on by lack of motion” (p. xviii). He explains how the human body is designed to function, then details common dysfunctions in society and presents simple exercises for both relieving pain and restoring proper function. There is much applicable information in this book and it includes sources and an index.

Egoscue, Pete. *Pain Free: A Revolutionary Method for Stopping Chronic Pain*. New York: Bantam Books, 1998.

This expands on the premise of his first book, *The Egoscue Method of Health through Motion*. The chapters are organized according to region of the body, explaining common pain symptoms and exercises for each. He explains that syndromes like carpal tunnel and tendinitis are symptoms of improper shoulder function. This source includes notes and an index.

Feldenkrais, Moshe. *Awareness through Movement: Easy-to-do Health Exercises to Improve Your Posture, Vision, Imagination, and Personal Awareness*. San Francisco: Harper, 1977.

Like Alexander Technique and other body awareness methods, this is quite difficult to learn from a book without the aid of a teacher. The book is very interesting and a bit philosophical; it provides unique ways of thinking about self-image, consciousness, properties of movement and function. It is organized into two sections, “Understanding While Doing” and “Doing to Understand.”

Kapit, Wynn, and Lawrence M. Elson. *The Anatomy Coloring Book, 2nd ed.* New York: Addison-Wesley, 1993.

This source is a reference and learning guide for a wide audience, from medical professionals to individuals who wish to understand the “structure and function of their physical being” (p. vii). The body is outlined in black with instructions on which organs to color, resulting in a more active learning process than simply reading. This source includes an appendix, a glossary with a pronunciation guide, a bibliography and an index.

Lusk, Julie T. *Desktop Yoga.* New York: Perigee, 1998.

This book has much to offer string players since, like computer users, string players often have to sit for long periods of time while working. Many of the exercises can be done in a chair, even during rehearsals, while others are applicable during rehearsal or practice breaks. There are suggestions on sitting posture as well as various types of breathing exercises. The sequences for getting energized, calming down, boosting creativity and reducing frustration can be used by any musician. It also includes a chapter on repetitive strain injuries, treatments and prevention. The bibliography includes books, videos and periodicals.

Macdonald, Glynn. *The Complete Illustrated Guide to Alexander Technique: A Practical Program for Health, Poise, and Fitness.* England: Element Books, 1998.

This interpretation of Alexander Technique is presented in a large book with glossy pictures of people in motion. It begins with a biography of Alexander, scientific verification and evolution of the technique, then discusses the use of the self in anatomical and physiological terms. The author applies the technique to sports and performing arts. The book contains a glossary, references and further reading, useful addresses and an index.

Nelson, Samuel. “Playing with the Entire Self: The Feldenkrais Method and Musicians.” *Seminars in Neurology* 9:2 (June 1989): 97-104.

Though this is an article, it belongs in this section because it is an example of practical application of a body awareness method. The author, a Feldenkrais practitioner, gives an overview of what the method entails, including a brief biography of Feldenkrais. He then

describes how classes are conducted, then gives a long discussion of how and why the method works. A large part of the article reveals application to string playing, including a case study of a violinist he treated. He explains how the method strengthens kinesthetic awareness without the instrument, and then with the instrument. The article ends with a sample lesson that is useful in freeing the neck, shoulders, rib cage, and pelvis, with benefits for the entire back.

Rolland, John. *Inside Motion: An Ideokinetic Basis for Movement Education*. Revised ed. Rolland String Research Associates, 1987.

“Traditional systems of movement education tend to focus their training exclusively on the action of the body and ignore the possibilities for developing thought, feeling, and imagination through movement” (p. 4). “Ideokinesis is the educational method used to repattern the neuromuscular system. It is a process in which kinesthetic imagery is used to stimulate specific muscular responses” (p. 8). The author presents some basic concepts of mechanical balance and relates them to how the human body is built. Very simple diagrams of anatomy and clear explanations of muscle function are easy to apply to everyday posture and playing motions. This source includes references.

Stark, Steven. *The Stark Reality of Stretching*. B. C.: Stark Reality Corp., 1999.

As a sports medicine specialist, Stark presents misconceptions about stretching and defines correct stretching technique. This book provides a scientific background to understanding how muscle imbalances and incorrect technique contribute to injury. Chapters include information on muscle function and properties of muscles, warm-up exercises and muscle specific stretches. While this book unfortunately only covers stretches for the lower body, it presents valuable information in a clear, practical manner that applies to string playing. It also includes a glossary and bibliography.

Weiss, Susan L. *The Anatomy Book for Musicians: A Guide to Understanding Performance Related Muscle Pain*. Glenview, IL: Muscle Dynamics, 1996.

This book contains the simplest presentation of anatomy for musicians in this bibliography. The author is a massage therapist who treats musicians. The information is very surface-level, listing the actions of a single muscle in laymen’s terms in telegraphic

style. She also lists symptoms of overuse, such as headache or limited movement; causes, such as clenching; and self-help tips, such as wearing warm clothing in order to keep muscles warm. Though it is not very scientific, this book would be a good first look at anatomy and muscle actions.

Winberg, Jack, and Merle F. Salus. *Stretching for Strings*. Bloomington: American String Teacher, 1990.

A collaboration between Winberg, an amateur cellist and music medicine specialist, and Salus, a teacher and aerobics instructor, this is a practical guide to stretching that can be taken to the practice room. The stretches are instrument-specific. It includes an introduction to medical problems of musicians, warm-up exercises, problem areas, a teacher's guide, bibliography, glossary, and list of music medicine clinics. (Available only from ASTA, see Appendix C)

Mental Practice

Any source that promotes thoughtful practicing is helpful in preventing injury because playing time is reduced and practice becomes more efficient. While some of these books deal directly with mental practice techniques, some provide a more philosophical outlook on a practicing musician. Others are helpful in gaining perspective and evaluating how one practices.

Adolphe, Bruce. *The Mind's Ear: Exercises for Improving the Musical Imagination for Performers, Listeners and Composers*. Saint Louis: M. M. B. Music, 1991.

This enlightening book was formulated in a Juilliard classroom and includes exercises for individuals and groups. Exercises "range from amusing suggestions and games to rather challenging musical endeavors" (Foreward). The sections of the book are "Exercises in Silence (Hearing in Your Head)," "Exercises Involving Groups (No Instruments Needed)," "Exercises Using Musical Instruments (Solo Instruments), (Groups of Instruments)," and "Exercises that Involve Writing Music." Some of the clever exercises are called "Mozart has something to tell you," "If Stanislavsky were your violin teacher," "Play the Moonlight Sonata for laughs." Others entail determining one's own tempo, imagining a concert where a trumpet player can be heard practicing backstage, and

performing a solo work as if it were a soliloquy by Shakespeare. This source is particularly useful for developing one's inner ear and listening skills.

Boyk, James. *To Hear Ourselves as Others Hear Us: Tape Recording as a Tool in Music Practicing and Teaching*. Saint Louis: M. M. B. Music, 1996.

The author presents this material to all levels of musicians, students and teachers. He discusses how to use tape recording as a tool for teaching ourselves, how to use it in teaching others, and as a way to take breaks and gain some perspective on our work, with exercises for each topic. The second half of the book discusses the technical aspect of recording, including information on equipment and set up. This source contains several appendices.

Bruser, Madeline. *The Art of Practicing: A Guide to Making Music from the Heart*. New York: Bell Tower, 1997.

“The Art of Practicing is a step-by-step approach that integrates movement principles with meditative discipline, which consists of focusing on sounds, sensations, emotions, and thoughts in the present moment. It cultivates a clear and relaxed mind, an open heart, free and natural movement, and vivid, joyful listening” (p. 4). Bruser discusses the common struggle with practicing, followed by techniques including “preparatory steps, physical techniques, psychological techniques, and sensory and intellectual techniques. Part Three discusses performing as a natural outcome of healthy practicing” (p. 4). This book includes a bibliography and resources for musicians.

Freytmuth, Malva. *Mental Practice and Imagery for Musicians: A Practical Guide for Optimizing Practice Time, Enhancing Performance, and Preventing Injury*. Boulder: Integrated Musician's Press, 1999.

After struggling through her own debilitating injuries, the author began studying sports psychology and kinesiology and applied the principles to music. The first chapter presents information on rudimentary principles of mental practice, including sensory feedback and mental projection. The second chapter presents basic training of mental practice skills, including developing the five senses in practicing. She also discusses why

and how mental practice works, relaxation techniques, and how to use imagery to help recover from injury. This book includes appendices, a bibliography and an index.

Green, Barry, with Timothy Gallwey. *The Inner Game of Music*. New York: Doubleday, 1986.

Gallwey, author of *The Inner Game of Tennis*, collaborated with Green to present the concepts of “natural learning,” used in sports, to musicians. “The point of the Inner Game of sports or music is always the same—to reduce mental interferences that inhibit the full expression of human potential. What this book offers is a way to acknowledge and overcome these obstacles in order to bring a new quality to the experience and learning of music” (p. vii).

Lampel, Hans. *Turning Notes into Music: An Introduction to Musical Interpretation*. London: Scarecrow Press, 1996.

This is a resource for instilling thoughtful practice; it separates basic elements of interpretation and discusses them individually with musical examples to illustrate points. Topics include dynamics, musical rhetoric, tempo, articulation, accents, phraseology, teaching interpretation, and the use of imagination and imagery. Thoughtful practice prevents injury because playing time is reduced as a result of more efficient practicing. This source includes a bibliography and an index.

Ristad, Eloise. *A Soprano on Her Head*. Utah: Real People Press, 1982.

Ristad presents unconventional approaches to unlocking creativity and overcoming frustrations and psychological blocks in practicing. She discusses ways of confronting our own “judges” and inner conflicts, finding new solutions to old problems, how to gain a different perspective when in a rut, and dealing with performance anxiety; all of these problems can lead to physical tension if disregarded.

Relaxation Techniques

In order to be effective, relaxation techniques must be practiced regularly, especially when physical tension is the cause of an injury. Many people have to begin by simply recognizing and becoming aware of the tension that they carry with them before they have the control to release it. These sources represent just a few of the many relaxation techniques available, but a personal search is required to find the style that fits each person. It must be noted that bodywork often serves as relaxation practice as well.

Jacobson, Edmund. *You Must Relax*. New York: McGraw-Hill, 1970.

This book is an updated version of Jacobson's groundbreaking text *Progressive Relaxation* (See Textbooks). It reveals how stress in everyday life can affect many health disorders such as heart problems, ulcers, digestive problems, and sleeping disorders, as well as physical tension. He gives scientific background on relaxation and specific techniques for different kinds of relaxation, such as relaxing while lying down, relaxing while active, and relaxing the mind. It includes a list of other publications by Dr. Jacobson and an index.

Loehr, James, and Jeffrey Migdow. *Take a Deep Breath*. New York: Villard Books, 1986.

This is an informative book on a subject many take for granted. It discusses the physiology of breathing and factors affecting health. The authors present different types of breathing to enhance performance, and types of breathing in sports and other daily activities. They also list many different breathing techniques and include case histories. The book contains an index.

Textbooks

Because the intended audience for this bibliography is the university music student, many sources are included that are difficult to find at commercial bookstores but are readily available at university libraries or through interlibrary loan. While this list serves as a starting place, it will instigate more browsing of bookshelves where one would not normally look. Also, these books usually contain extensive bibliographies, which all lead to more information.

Anatomy and Kinesiology

Though many music students may be intimidated by anatomy and kinesiology, the study of movement, the purpose of including sources in textbook format is that textbooks are designed for progressive learning and they contain definitions, clear explanations and many diagrams to facilitate comprehension. Even though textbooks are full of jargon and detailed information, it is not necessary to commit all the Latin names to memory, or even fully understand the concepts. Much can be gained from looking at pictures, which can help develop a clear image of the body and enhance awareness.

Daniels, Lucille, and Catherine Worthingham. *Therapeutic Exercise for Body Alignment and Function*. Philadelphia: W. B. Saunders Company, 1977.

This textbook was designed for study and use by physical therapists, physical educators and physicians in helping patients maintain proper body function. However, its pictures and diagrams may also provide the string player with the tools necessary to evaluate his/her own posture. Other subjects covered that pertain to string playing include evaluation of limited motion, and mechanics of balance and lifting. As opposed to many anatomy texts, the diagrams are simplified by showing only one muscle or muscle group at a time for clarification. The source includes extensive references and an index.

Gorman, David. *The Body Moveable, Blueprints of the Human Musculoskeletal System: Its Structure, Mechanics, Locomotor and Postural Functions*. Ontario, Canada: Ampersand Press, 1981.

This is a unique book on anatomy; it is completely hand-written and illustrated. The book's dedication, "To whoever invented the screw, which is a very good way of going around in circles but still getting somewhere," perhaps reveals a bit of the author's personality, his fascination with the subject, and his intention to produce a reference book, which "can be appreciated in spite of its detail by making only short excursions into the deep parts, just dipping a foot in now and again and splashing around" (Introduction). For the string player studying anatomy books, it is not necessary to memorize anything, only to observe. However, the author states that while the jargon is at first intimidating, it does help to describe the components of the body and how they relate to each other, as the body is an inter-related whole. It includes an extensive glossary.

Gray, Henry. *Anatomy: Descriptive and Surgical, 15th ed.* New York: Barnes and Noble Books, 1995.

“From its simplest and most basic parts to its most important and most complicated systems, almost anything you want to know about the human body can be found in *Gray’s Anatomy*, the seminal book on the way the human body works. A landmark in scientific writing, *Gray’s Anatomy* has been an important source of reference for students of medicine and medical history for more than one hundred years. The classic engravings by H. V. Carter are masterpieces of accuracy and proportion, and are the perfect compliment to Henry Gray’s lucid and urbane prose” (jacket cover).

Houglum, Peggy A. *Therapeutic Exercise for Athletic Injuries.* Champaign: Human Kinetics Publishers, 2001.

With over one thousand pages, this textbook presents a wealth of information that athletic trainers study and have at their fingertips. If only string players could have trainers with this much knowledge of how the body works, pain would certainly be a rare occurrence. For now, there is much that musicians can apply to their own training from this book. The author explains in the Preface that until now, athletic rehabilitation textbooks concentrated on how to execute rehabilitation techniques, but without explaining the physiology behind the injury. Though there is much detail on specific sports injuries, the physical motion analysis can be applied. Other information that is useful to musicians includes factors of healing and physics, physiology of posture and body mechanics, therapeutic exercises for specific injuries, including aquatic therapeutic exercise. An entire chapter devoted to tendinitis, its terminology, tendon structure, etiology, the study of the cause of disease, and various treatments is especially informative for string players. This source includes a glossary, a bibliography and an index.

Koutedakis, Yiannis, and N. C. Craig Sharp. *The Fit and Healthy Dancer.* Chichester England: John Wiley and Sons, 1999.

“This collaboration between Yiannis Koutedakis, with his great knowledge of both Dance and Fitness, and N. C. Craig Sharp, so highly respected as one of the foremost authorities on Sport [*sic*], has resulted in an enlightening book which, for the first time looks at dancers not only as performing artists but also as performing athletes” (Foreward by Sir

Peter Wright, xvii). This textbook is divided into three parts. The first part examines nutrition and energy consumption. The second part entails several categories, including “Non-artistic Components of Dance Performance,” “Muscle and its Physiology,” “The Main Physical Fitness Components and Dance” and “Fitness and Training.” The third part addresses issues such as overtraining, burnout and other dance-specific topics. This book presents very recent research, contains extensive reading lists at the end of each chapter and also includes references and a glossary.

Sevey Fitt, Sally. *Dance Kinesiology*. New York: Schirmer Books, 1988.

Kinesiology as applied to dancers is unique. While the effectiveness of sports kinesiology can be measured in objective terms such as time, distance, or scores, the application of kinesiology in dance is more subjective. In this way dance kinesiology is more applicable to musicians. Other applicable elements include discussions of shoulder pain, conditioning exercises, movement study, injury prevention, and information on nutrition. This book also contains references and an index.

Starkey, Chad. *Therapeutic Modalities*. Philadelphia: F. A. Davis, 1999.

Students of athletic training learn several modalities, or methods of therapy. Much can be applied to string players including what happens to the body when it is stressed or injured, entailing a description of the inflammation process. Also discussed is the physiology and psychology of pain and different treatments. Many of the treatments can be applied at home, such as heat, ice and paraffin baths. Few sources discuss the types of treatments encountered in a therapist’s office, such as electrical stimulation and ultrasound. This source helps the patient understand how and why the treatment works, and includes other factors that might help recovery. It contains extensive reference lists, appendices, a list of medical shorthand, and a glossary.

Weineck, Jürgen. *Functional Anatomy in Sports*. Translated by Thomas J. DeKornfeld. Chicago: Year Book Medical Publishers, 1986.

Frustrated with medical texts containing difficult jargon, the author created a text especially for use in athletic training that would “enable the layman, unfamiliar with

anatomy, to gain a general view of the various muscle groups that are necessary for achieving success in each individual sport” (p. v). A systematic explanation of tissues, muscles and joints comprises the first part of the text, followed by a detailed analysis of movements in specific sports. At the end is a list of exercises for simple locomotor processes. The last section can be especially useful to the string player who wishes to examine the proper functions of the muscles used in playing. The book contains a bibliography and an index.

Music Medicine Textbooks

The intended audience for these textbooks is often physicians. However, the mission of the field of music medicine is to share information across disciplines, and though the material may contain medical jargon and specific details, musicians can only gain from the information that is disseminated. These sources may also serve as a supplement to therapy so that the patient has a better understanding of the problem and the treatment. Robert Sataloff, MD, DMA, Alice Brandfonbrener, MD and Richard Lederman, MD, are pioneers in the field. Each directs performing arts clinic in Philadelphia, Chicago, and Cleveland, respectively. Brandfonbrener is also the editor of the journal *Medical Problems of Performing Artists*. While their book was one of the first of its kind, it was published at least eight years before the other sources listed, it provides an interesting comparison with more recent material and a view of the changes in the field.

Duvall, Katherine, and David Hinkamp, eds. “Health Hazards in the Arts.” *Occupational Medicine: State of the Art Reviews* 16:4 (October-December 2001): 619-631.

Richard A. Hoppmann, an MD, authored the chapter on music medicine and reviews instrumental musicians’ hazards in the past two decades. Background information reveals the beginnings of arts medicine, followed by a discussion of common injuries. A section on medical history explains how doctors examine causal factors of injury, including the instruments played, practice habits, technique, repertoire, and symptoms. General principles of treatment suggested are rest, examining one’s technique, medication, physical/occupational therapy, relaxation/body awareness, surgery, emotional support, and instrument modification, with prevention the ultimate goal. The source includes

references and lists of organizations.

Sataloff, Robert T., Alice G. Brandfonbrener, Richard J. Lederman, eds. *Textbook of Performing Arts Medicine*. New York: Raven Press, 1990.

The editors are some of the pioneers in the field of music medicine. The first textbook of its kind, its goal is to represent all disciplines necessary to treat the special needs of performing artists. Unlike music medicine books, this book encompasses all areas of the performing arts, including dance. It also has a chapter on legal issues related to treating performing artists.

Tubiana, Raoul, and Peter C. Amadio, eds. *Medical Problems of the Instrumentalist Musician*. London: Martin Dunitz, 2000.

This encyclopedic book encompasses the first two decades of research in the field of performing arts medicine. Each chapter is written by specialists in the area and is unique in that the intended audience includes physicians, therapists and musicians. A chapter on violin technique by Donald Weilerstein and Christopher Neal with illustrations by Peter Salaff discusses specifics of tension-producing faults and effortless technique. Extensive reference lists are at the end of each chapter.

Winspur, Ian, and Christopher B. Wynn Parry, eds. *The Musician's Hand: A Clinical Guide*. London: Martin Dunitz, 1998.

“This book is a practical clinical guide to the special considerations of which surgeons, doctors, and therapists should be aware when planning and implementing treatment for patients who are musicians. Music teachers and musicians as well as therapists will profit from the material on prevention and correct technique” (back cover). Essays on string technique are of particular interest, especially “Technique and ease in violin playing,” written by Simon Fischer, author of *Basics: 300 Practice Routines and Exercises for the Violin*, and “Cello,” written by Christopher B. Wynn Parry with Bernard Gregor-Smith, cellist of the Lindsay String Quartet, Manchester.

Dissertations

Like textbooks, dissertations can contain jargon and complicated details; however, they are often accompanied by much explanation. Dissertations are valuable because they are highly specialized and often reveal information on the research process not found in other books.

Barrowcliffe, Kelly D. "The Knowledge of Playing-Related Injuries among University Music Teachers." Dissertation, University of Western Ontario, 1999.

In this study, data were collected through questionnaires sent to university music teachers. Fifty-eight percent responded, then descriptive and inferential analyses were conducted to determine what knowledge teachers have of playing-related injuries. It was found that although many of the respondents had experienced injuries, knowledge of the type and cause was not widely known and more education is needed.

Hsu, Yu-Pin. "An Analysis of Contributing Factors to Repetitive Strain Injury (RSI) among Pianists." Dissertation, Columbia University, 1997.

This study of pianists' injuries was included due to the high rate of similarity and occurrence with string players' injuries, as well as for its insight into the process of conducting research on musicians' injuries. The author was allowed to sit in on patient examinations and discuss with the doctors videotaped motion analysis of the patients' playing. Many tables, graphs and questionnaires are presented that would be useful to an individual needing initial guidance in analyzing his/her technique.

Palac, Judith Ann. "An Analysis of Contemporary Pedagogical Literature on Violin Bowing Technique According to Principles of Human Movement." Dissertation, University of Texas at Austin, 1987.

"The goal of this study is to examine twentieth-century pedagogies of violin bowing technique in light of recent principles of human movement. This is done for the purpose of helping to provide teachers with well-founded guidelines for the formation of their own approaches to violin bowing technique, and for the evaluation of approaches they encounter. Information on the subject of human movement from the disciplines of kinesiology, neurophysiology, and motor behavior and learning is presented according to

the movement analysis model developed by Joseph R. Higgins. The study concludes that principles of violin bowing technique developed strictly through scientific study outside the context of a true teaching or performance situation may not be applicable in practice. However, pedagogues with a background in human movement were more likely to develop principles of bowing technique compatible with those of human movement than were those with no such background, from which one may conclude that such knowledge benefits the violin teacher. Several guidelines for teachers, based on the concept that bowing is a holistic action of the entire body performed under changing environmental conditions, are presented” (DAI Abstract). The dissertation includes a table in which the authors’ bow grip and arm position recommendations are listed along with a kinesthetic analysis of bowing motions. It also includes an extensive bibliography of string pedagogical materials.

Ross, Susan E. “Electromyographic and Videographic Analysis of Two Left Upper Extremity Support Methods in Violin or Viola Players.” Dissertation, University of Northern Colorado, 1998.

This study of the biomechanics of playing is unique in that it was conducted by a specialist in kinesiology and physical education. While sports and physical therapists have been using EMG analysis to test muscle function for some time, this tool has not yet been used extensively on musicians and provides more concrete data than what was previously available. The author found many studies that revealed the high incidence of subacromial impingement, a type of shoulder tendinitis, in violin and viola players. She tested two methods of support, a floor-based arm support and a left scapula taping technique, to determine whether the prevalence of overuse injuries could be reduced. The author found significant differences between the methods of support and suggests applications for the study.

Zaza, Christine. “Musicians’ Playing-Related Musculoskeletal Disorders: An Examination of Physical, Psychological, and Behavioural Factors.” Dissertation, University of Waterloo, 1995.

This study combined qualitative and quantitative research methods to examine playing-related musculoskeletal disorders. The author gives an extensive review of

literature in performing arts medicine and occupational medicine, then describes the methods and analysis for the study. Two hundred eighty-one subjects participated in self-report questionnaires and examinations that are discussed along with future recommendations for research. Zaza later published a self-help guide, *Play it Safe*.

Relaxation Techniques

These sources represent texts used by professionals, but again, the music student can learn much from them. Jacobson's Progressive Relaxation Technique is widely used and is an excellent method for systematically learning to recognize and release tension. Though the method is presented in many other sources, the original is listed here.

Jacobson, Edmund. *Progressive Relaxation: A Physiological and Clinical Investigation of Muscular States and Their Significance in Psychology and Medical Practice*. Chicago: University of Chicago Press, 1938.

This is a groundbreaking text that led to the development of much further research in the area of physical tension and health. "There has been a long-felt need on the part of the medical and surgical profession for a method of study and management of the nervous element that appears in a large variety of diseases. Less clearly realized has been the want of an approach to problems of fatigue, debility and lowered resistance occurring in patients who are not properly called neurotic but whose energy output in muscular terms might be properly economized in the interests of their general state of health" (p. ix). This book is intended as a medical reference and is therefore technical and detailed. It includes a bibliography and several indexes.

Payne, Rosemary A. *Relaxation Techniques: A Practical Handbook for the Health Care Professional*. London: Harcourt Publishers, 2000.

The author points out that there is much literature in the popular press on relaxation methods and that many people besides healthcare professionals are teaching relaxation techniques, such as occupational and physical therapists, speech and language therapists, social workers, coaches and sports therapists. This book is designed not only for the healthcare professional, but also for students and laymen who want to understand causes and effects of stress, and how to alleviate stress in

different situations. The techniques presented can be taught by a professional or self taught by an individual. The author also stresses the effectiveness of practicing these techniques. Contents include chapters on physical methods of relaxation as well as psychological approaches. This source includes an appendix, references, a bibliography and an index.

ARTICLES

The articles are organized by subject, which is often a specific ailment or syndrome. For the novice who may not be familiar with these subjects, it will serve as an introduction. However, for some it may help to further understand the source and cause of pain, and how to determine what kind of treatment they might wish to explore. It may also supplement the treatment they are already receiving and perhaps answer some questions that are not answered in the doctor's office.

Medical Journals

Like the music medicine textbooks, these articles are often intended to disseminate knowledge across disciplines with other physicians. However, the more musicians know about their own maladies and treatments, the less pain they will encounter. Also, journals contain the most recent published research, providing insight not only into the latest scientific knowledge, but also into controversial issues (See "Music Journals, Focal Dystonia," Conable and Estrin). Often people put much faith in science. However, even science is not one hundred percent concrete and with research being conducted at such rapid rates, many different experiments may be published at the same time but with varying results. Like reading a self-help book, medical research must be read with some caution, as an article may be published tomorrow with a different conclusion.

Focal Dystonia, Occupational Cramp

Lederman, Richard J. "Focal Dystonia in Instrumentalists: Clinical Features." *Medical Problems of Performing Artists* 6:4 (December 1991): 132-136.

Focal dystonia is one of the most controversial ailments in medicine today because it is not completely understood and is often misdiagnosed. This article focuses on the controversies and attempts to clarify some of the characteristics and symptoms so that diagnosis may be more clear. The article includes references.

_____. "Occupational Cramp in Instrumental Musicians." *Medical Problems of Performing Artists* 3:2 (June 1988): 45-51.

Occupational cramp is often used interchangeably with "focal dystonia." This article provides ample background information, revealing how diagnosis has changed through history and what areas still need further research. The author presents information on the difficulties of diagnosing musicians' injuries, including the relationship between musician and instrument, and the psychological aspects of musical training. He discusses how musicians practice and learn music, along with biomechanical results from the process. Lederman states that teaching styles and instrument positioning may also contribute to injury. Rehabilitation is discussed with an emphasis on a multidisciplinary approach, entailing comprehensive conditioning that focuses on postural muscles. The source includes references.

Hand, Thumb, and Upper-Extremity Problems

An, Kai-Nan, and Fadi J. Bejjani. "Analysis of Upper-Extremity Performance in Athletes and Musicians." *Hand Clinics* 6:3 (August 1990): 393-403.

This detailed and informative article is based on the premise that "Biomechanical research can enable us to estimate the capacities of the body and the load environment encountered by the tendon, muscle, bone, and joint during various types of sport and musical activities" (p. 393). Sports and music research is not often combined in one article, which provides a unique perspective comparing the two tasks side by side. Different methods of measuring joint motion and strength are described. Test results are presented in comparative graphs revealing how this information will be used to better prescribe prevention and treatment methods. This article includes references.

Blum, Jochen, and Jürgen Ahlers. "Ergonomic Considerations in Violists' Left Shoulder Pain." *Medical Problems of Performing Artists* 9:1 (March 1994): 25-29.

This article addresses the problem violists face when choosing an instrument, i.e. finding one that is big enough to produce a good tone quality while not compromising physical comfort. The authors interviewed three hundred eleven violists and compared their musculoskeletal complaints with the size of their instruments. Some issues discussed include tendon disorders and increased load on the upper extremity with

large violas. Prevention and treatment are mentioned briefly, but alternatives to playing large violas are discussed at length. The article also includes a list of makers who have attempted to invent a more ergonomically designed instrument.

Brandfonbrener, Alice. "The Epidemiology and Prevention of Hand and Wrist Injuries in Performing Artists." *Hand Clinics* 6:3 (August 1990): 365-377.

Long and detailed, this article systematically discusses hand and wrist injuries among players of a variety of instruments. Different types of injuries are listed and their causes, risk factors, and treatment are examined. Surveys are presented that detail percentages of risk factors and occurrences of injuries in specific populations and instrumental groups, such as gender and instrument type. The author stresses that while standard medical procedures are required to perform adequate diagnosis, a rudimentary knowledge of how the instrument is played is necessary. The article includes an extensive bibliography.

Manchester, Ralph A. "The Incidence of Hand Problems in Music Students." *Medical Problems of Performing Artists* 3:1 (March 1988): 15-18.

During this four year study, one hundred thirty-two students were examined for one hundred eighty-three playing-related hand problems. Comparison of incidence rates, symptoms, site of injury, age and gender are included. Conclusions reveal that five to eleven percent of performance majors at a university developed injuries each year during a four year period and that further study is required to determine effective prevention and treatment.

Meador, Ron. "The Treatment of Shoulder Pain and Dysfunction in a Professional Viola Player: Implications of the Latissimus Dorsi and Teres Major Muscles." *Journal of Orthopaedic and Sports Physical Therapy* 11:2 (August 1989): 52-55.

The goal of this case study was to remind physicians that when treating patients with shoulder problems, specifically rotator cuff injuries, the latissimus dorsi and teres major muscles are often overlooked. These muscles are not part of the rotator cuff, but help to stabilize the shoulder joint. Shoulder problems occur often in string playing and the principles are applicable to many. This article would be a good supplement to anyone

receiving therapy for shoulder problems, or anyone wishing to know what the process of treatment is like.

Nolan, William B., and Richard G. Eaton. "Thumb Problems of Professional Musicians." *Medical Problems of Performing Artists* 4:1 (March 1989): 20-24.

The authors establish many keys to effective diagnosis, such as observing the patient while playing and considering instrument-specific conditions. Elements of the examination are explained along with types of diagnostic tests. It includes anatomy and mechanics of the thumb, as well as case examples.

Rehak, David C. "Pronator Syndrome." *Clinics in Sports Medicine* 20:3 (July 2001): 531-540.

This article defines pronator syndrome as one of several overuse injuries that have symptoms similar to carpal tunnel syndrome. The author discusses the anatomy of the elbow, where the injury occurs, activity-related causes of the syndrome, symptoms, physical examination, electrodiagnostic studies, differential diagnosis and treatment. Nonoperative treatment includes rest, immobilization, anti-inflammatory medication, physical therapy, and changes in equipment and posture, much the same as carpal tunnel syndrome. However, he stresses that correct diagnosis of pronator syndrome ensures more successful treatment.

Tubiana, Raoul, and Philippe Chamagne. "Functional Anatomy of the Hand." *Medical Problems of Performing Artists* 3:3 (September 1989): 83-87.

This article is very informative, but requires some patience on the part of the novice music/anatomy student. The authors do not attempt to simplify the medical jargon, but with careful attention, much can be gained from understanding how the hand works. This article, the first of a series of three, introduces the anatomy of the hand and wrist and the muscles and movements they can perform. X-rays and diagrams enhance the explanations.

Tubiana, Raoul. "Movements of the Fingers." *Medical Problems of Performing Artists* 3:4 (December 1988): 123-128.

Second in a series of three articles on the topic, this one focuses on the movements of the fingers, especially the thumb. Applications in music are presented throughout. This article ends with a discussion of the hand and the central nervous system.

Tubiana, Raoul, Philippe Chamagne, and Roberta Brockman. "Fundamental Positions for Instrumental Musicians." *Medical Problems of Performing Artists* 4:2 (June 1989): 73-76.

For this third article in the series, the authors observed more than two hundred musicians at the Ecole Normale de Musique of Paris in order to determine what constitutes physiologically healthy postures in musicians. Though Tubiana spent the first two articles describing the anatomy of the hand, the authors stress here that pain in the hands or fingers may be caused by poor posture elsewhere in the body. Good posture is discussed in general terms, but optimal habits for a pianist, violinist and guitarist are described in detail.

Jaw Problems

Blum, Jochen, and Gunter Ritter. "Violinists and Violists with Masses under the Left Side Angle of the Jaw Known as 'Fiddler's Neck.'" *Medical Problems of Performing Artists* 5:4 (December 1990): 155-160.

Prior to his medical studies, Dr. Blum worked as a violin maker in Italy. In this study, three hundred thirteen violinists and violists from West German orchestras were questioned about how often they suffer from fiddler's neck, what treatments they have tried, and their hygienic conditions. The questionnaires were followed by a doctor's examination. The article presents the results in comparative graphs, discusses causes, predispositions and treatments, and also presents special cases.

Bryant, G. W. T. "Myofascial Pain Dysfunction and Viola Playing." *British Dental Journal* 166:9 (May 1989): 335-336.

This article presents two case studies of violists who have pain in several places around the neck and jaw area as well as TMJ symptoms. It discusses treatments, including changing instrument set-up and using customized chin rests. It includes references.

Hirsch, Judith A., W. D. McCall, Jr., and B. Bishop. "Jaw Dysfunction in Violin and Viola Players." *Journal of the American Dental Association* 104:6 (June 1982): 838-843.

This study compares violinists and violists with symptoms of TMJ in an attempt to find causes and treatment. The authors discuss playing time, technique and various types of chinrests. The article includes references.

Nerve Entrapment, Thoracic Outlet Syndrome

Charness, Michael E., Nicholas M. Barbaro, Richard K. Olney, Gareth J. Parry. "Occupational Cubital Tunnel Syndrome in Instrumental Musicians." *Neurology* 37:3 (March 1987): 115.

This article is a doctors' review of clinical cases of cubital tunnel syndrome in thirteen instrumentalists, including pianists and string players. It describes symptoms, including pain in the elbow, numbness, decreased grip strength, and performance impairments, including decreased speed, control and evenness, faulty intonation and little or no improvement with practice. The article also discusses conditions affecting symptoms, different therapies and their outcomes.

Charness, Michael E., Gareth J. Parry, Robert E. Markison, Harold Rosegay, Nicholas M. Barbaro. "Entrapment Neuropathies in Musicians." *Neurology* 37:3 (April 1985): 74.

This clinical review describes the difficulty in diagnosing and treating entrapment neuropathies. In this case, there was no pain or sensory loss and EMG was valuable in the diagnosis. The authors present the results of surgery and conclude that due to the high level of manual dexterity required, even mild cases can cause severe loss of function and damage.

Lederman, Richard J. "Nerve Entrapment Syndromes in Instrumental Musicians." *Medical Problems of Performing Artists* 1:2 (June 1986): 45-48.

The author details specific physiology, clinical features, and therapeutic approaches to different types of maladies that fall under the category of entrapment syndromes. Two case studies reveal symptoms and results of practice schedules. The study states that unnatural playing positions and repetitive motion increase risk of entrapment syndromes,

that virtually any nerve may become compressed, and that accurate diagnosis involves observation of the patient playing their instrument. The article includes references.

_____. “Thoracic Outlet Syndromes: Review of the Controversies and a Report of 17 Instrumental Musicians.” *Medical Problems of Performing Artists* 2:3 (September 1987): 87-91.

The author describes diagnosis of TOS and many other musician ailments, revealing the overlap of symptoms and subsequent difficulty in correct diagnosis. He also discusses controversial treatments including surgical complications. This is a useful article if one has been diagnosed with TOS and is contemplating treatment. This source includes references.

Novak, Christine B. “Conservative Management of Thoracic Outlet Syndrome in the Musician.” *Medical Problems of Performing Artists* 8:1 (March 1993): 16-21.

Novak describes the anatomy and physiology of the nerves that become compressed with many hours of violin or viola playing. She also describes the postural faults that often accompany this syndrome. She states that conservative treatment requires involvement, education and participation from the patient in reducing the aggravating factors and in performing exercises to rehabilitate weak postural muscles. This article includes references.

Overuse, Repetitive Strain Syndrome (RSI), and Tendonitis (Tendinitis)

Brandfonbrener, Alice. “Incidence of Overuse Syndrome in the Symphony Orchestra.” *Medical Problems of Performing Artists* 1:2 (June 1986): 51-55.

Musicians from eight symphony orchestras were examined and classified into groups according to “age, sex, division of music making, length of symptoms, structures or area where the symptoms arose, and the severity of injury” (p. 51). Many tables are included, as well as an explanation of injuries by instrument, and a grading scale of severity. The author found overuse syndrome to be prevalent in over fifty percent of the orchestras surveyed, and concluded that syndromes are preventable, “because prevention of overuse is the control of use,” (p. 55) and education should be stressed from the beginning, especially in music schools. This source contains references.

Fry, Hunter J. H. "What's in a Name? The Musician's Anthology of Misuse." *Medical Problems of Performing Artists* 1:1 (March 1986): 36-38.

Fry, a plastic surgeon, pioneer and leader in music medicine, clarifies common diagnoses in order to improve communication in this interdisciplinary field, and to avoid adverse affects of treatment resulting from insufficient terminology. He reveals subtle differences in various types of tendinitis and tenosynovitis, carpal tunnel syndrome, hysteria, and misuse. The author states that often terms like tendinitis and carpal tunnel are overused and have come to describe general symptoms, instead of specific problems. He also discusses the overuse of "misuse" and the difficulty in teaching "correct" technique because of the many factors that influence one's ease of playing. He argues that the techniques of pianists Iturbi, Horowitz and Ashkenazy are quite contrasting, "yet what is clearly common to these three musicians is the absence of uncoordinated and excessive muscular activity, and an avoidance of the extreme ranges of motions in the joints which produce excessive muscular activity and excessive loading of joint ligaments" (p. 36).

. "Overuse Syndrome, Alias Tenosynovitis/Tendinitis: The Terminological Hoax." *Plastic and Reconstructive Surgery* 78:3 (September 1986): 414-417.

The author discusses the tendency to place all overuse injuries into one category, though there are many different types of overuse injury. He clarifies the difference between these many types, stressing that correct diagnosis is imperative in treatment, especially when considering surgery. The article includes references.

Fulcher, S. Marcus, Thomas R. Kiefhaber, and Peter J. Stern. "Upper-Extremity Tendinitis and Overuse Syndromes in the Athlete." *Clinics in Sports Medicine* 17:3 (July 1998): 433-448.

This study examines overuse syndromes in greater detail than most music medicine studies. The authors begin by defining overuse as "a level of repetitive microtrauma sufficient to overwhelm the tissue's ability to adapt" (p. 433). A physiological explanation of tendon overload is presented and is attributed to increasing the load too quickly, poor technique, or faulty equipment. A detailed description of the inflammatory response allows for more immediate intervention and treatment.

Gilbert, Mark D., Heather Tick, and Dwayne VanEerd. “‘RSI’: What Is It, and What Are We Doing About It?” *Canadian Journal of Rehabilitation* 10:1 (1997): 51-63.

This article represents research from the discipline of occupational therapy, or workplace injuries. Therefore, unlike the articles from the sports medicine and clinical medicine fields, this one does not delve deeply into anatomy, physiology, complex jargon or diagrams. Instead, the focus of this article is on history, epidemiology, review of the research, and how the authors treat patients in their Toronto clinic. Some topics include occupations at risk, antecedent, precipitating and perpetuating risk factors, treatment options, and an assessment of aggravating factors at the workplace. This article includes references.

Gross, Michael T. “Chronic Tendinitis: Pathomechanics of Injury, Factors Affecting the Healing Response, and Treatment.” *Journal of Sports Physical Therapy* 16:6 (December 1992): 248-261.

This is a lengthy and highly informative article designed to “provide the clinician with a comprehensive background for treatment of chronic tendinitis. The composition and structure of tendons are detailed, providing an explanation of the mechanical function of tendons under various loading conditions and the various mechanisms of tendinitis injury. The natural course of tendon healing, clinical assessment of tendinitis, and suggested treatments for chronic tendinitis are discussed” (p. 248). Though addressed to the clinician, the musician can gain much from knowing how tendons work since they are easily injured in string playing. This source includes diagrams, case studies, and an extensive reference list.

Lederman, Richard J., and Leonard H. Calabrese. “Overuse Syndromes in Instrumentalists.” *Medical Problems of Performing Artists* 1:1 (March 1986): 8-11.

This is a very informative article describing overuse syndromes in detail. It is divided into these categories: bone, joint and bursal syndromes, disorders of the musculotendinous unit, primary muscular pain or cramp, nerve entrapment, and occupational palsies. It lists predispositions as intrinsic factors, such as body build, and extrinsic factors, such as environmental conditions, and rehearsal schedules. The

authors discuss managing injuries and when to seek therapy. They also stress that prevention is the key to overuse injuries, noting that technique must be molded to the individual, and that general conditioning has not been sufficiently emphasized for musicians as it has for athletes and dancers. It contains an extensive reference list.

Prevention

Ackermann, Bronwen, Roger Adams, and Elfreda Marshall. "Strength or Endurance Training for Undergraduate Music Majors at a University?" *Medical Problems of Performing Artists* 17:1 (March 2002): 33-41.

Because of the involvement of both small and large muscle groups required in musical performance, there is still much debate as to whether musicians should exercise and how. Music students volunteered for two different experimental exercise programs to determine what type of conditioning is better for musicians. Questionnaires as well as muscle testing were used to gather data. It was shown that endurance training is better than strength training in reducing physical exertion while playing.

Brandfonbrener, Alice. "Orchestral Injury Prevention Intervention Study." *Medical Problems of Performing Artists* 12:1 (March 1997): 9-14.

In this study, volunteers from three orchestras participated in an exercise program that was preceded by brief lectures on anatomy, physiology, psychology and postural conditioning. However, the attrition rate was high, so the premise of the study was negated. More information is needed to determine why the attrition rate was high, but the study will still be used in designing other prevention programs.

Cailliet, Rene. "Abnormalities of the Sitting Postures of Musicians." *Medical Problems of Performing Artists* 5:4 (December 1990): 131-135.

This article shows diagrams of faulty sitting postures common among musicians and discusses the related anatomical reactions which lead to pain. The author also reveals healthy postures and ergonomic aids. The source includes references.

Solow, Jeffrey. "Physically Efficient String Playing." *Seminars in Neurology* 9:2 (June 1989): 119-121.

The author, a cellist, explains that it is necessary for string players to examine the physicality of their playing in order to be most efficient and expressive. He focuses on cello technique and suggests using the scientific method, or forming hypotheses and testing them, to analyze playing motions. He also recommends developing an awareness of potential and kinetic energy, using the force of gravity instead of muscular force, and exploring many different kinds of balance.

Spahn, Claudia, Horst Hildebrandt, and Karin Seidenglanz. "Effectiveness of a Prophylactic Course to Prevent Playing-Related Health Problems of Music Students." *Medical Problems of Performing Artists* 16:1 (March 2001): 24-31.

This study measured whether a course offered at the Zürich Conservatory had a "positive effect on the psychological and physical health of music students, and on their work as musicians in training" (p. 24). The course included lectures on physiology of music, performing arts medicine, practical exercises and other prevention topics. The study showed positive results, but further randomized testing is needed to confirm results.

Spahn, Claudia, Bernhard Richter, and Ina Zschocke. "Health Attitudes, Preventative Behavior, and Playing-Related Health Problems Among Music Students." *Medical Problems of Performing Artists* 17:1 (March 2002): 22-28.

A survey was conducted at the Freiburg Music Conservatory to determine how much students know about their own health issues. Among many issues examined, it was found that the students who performed body awareness activities did so as a part of therapy, and not as a preventive measure. "It must be concluded that there is minimal consciousness regarding questions of health problems, so that few music students have taken preventive measures up to the present time. Therefore, preventive courses should be offered in order to inculcate health consciousness that would enhance the music students' motivation for proactive health-promoting behavior" (p. 28).

Spaulding, Crispin. "Before Pathology: Prevention for Performing Artists." *Medical Problems of Performing Artists* 3:4 (December 1988): 135-139.

Dr. Spaulding is Professor of Physiology and Prevention at Trøndelag Music Conservatory in Norway. This article describes the philosophy, methodology and goals of an injury prevention course he designed. A very informative article; it should inspire more courses like it.

Zaza, Christine. "Research-Based Prevention for Musicians." *Medical Problems of Performing Artists* 9:1 (March 1994): 3-6.

This article outlines areas in need of further research in order to establish more scientific definitions of prevention. These elements include musical warm-up, breaks, pacing, variety of content, cognitive rehearsal, body movement awareness, posture, breathing, instrument adaptations, exercise, anatomy of playing an instrument, stress and anxiety management. The author states that only through research can players become educated and modify their behavior. It includes an extensive reference list.

Quantitative Measurement

Bejjani, F. J., Lawrence Ferrara, and Lazaros Pavlidis. "A Comparative Electromyographic and Acoustic Analysis of Violin Vibrato in Healthy Professional Violinists." *Medical Problems of Performing Artists* 4:4 (December 1989): 168-175.

"This study is part of ongoing research by the authors to set objective and reproducible parameters of musculoskeletal functioning during the performance of a musical task. Fourteen healthy violinists were studied with regard to muscle use during four vibrato tasks by use of sound signals. The results were then statistically analyzed in terms of qualitative assessment of the signals, vibrato motion, and vibrato rate, time parameters, sequence of muscle firing, and correlation of muscle with sound energy" (p. 168).

Kihira, Masayasu, Jaiyoung Ryu, JungSoo Han, and Bruce Rowen. "Wrist Motion Analysis in Violinists." *Medical Problems of Performing Artists* 10:3 (September 1995): 79-85.

Four orthopedists conducted this study by attaching a biaxial and flexible wrist electrogoniometer to six violinists while they played pre-selected excerpts.

This device measures wrist flexion/extension, or the amount of forward and backwards movement, and radioulnar deviation, or side to side movement. The article contains pictures of the electrogoniometer and how it is attached to the player, as well as graphs and tables showing raw data. The authors concluded that “the most frequently used wrist angle in both wrists exceeded the normal functional wrist motion as defined by Palmer et al” (p. 85).

Levy, Charles E., Wynne A. Lee, Alice Brandfonbrener, Joel Press, and Alexis Engel Levy. “Electromyographic Analysis of Muscular Activity in the Upper Extremity Generated by Supporting a Violin with and without a Shoulder Rest.” *Medical Problems of Performing Artists* 7:4 (December 1992): 103-109.

This interdisciplinary team consisted of doctors in rehabilitation, physical therapy, and psychology. EMG signals were recorded on violinists’ left biceps brachii, anterior deltoid, trapezius, and right sternocleidomastoid while they played short musical excerpts with and without shoulder rests. The authors found that both the trapezius and the sternocleidomastoid show decreased EMG signals when the rests were used, indicating that the shoulder rest does lessen muscular tension. Controversy over shoulder rest usage is discussed along with detailed descriptions of the experiment, including graphs and tables as well as the musical examples and where shifting occurred.

Naill, Richard, and Jill McNitt-Gray. “Surface EMG as a Method for Observing the Muscle Activation Patterns Associated with Strategies of String Depression Used by Cellists.” *Medical Problems of Performing Artists* 8:1 (March 1993): 7-13.

This study measured two pedagogic strategies of thumb placement on the neck in order to establish a normal rate of muscle function and better understand the biomechanics of playing. Included is an examination of other EMG observational studies as well as a complete description of the methodology used in the experiment.

Philipson, Lennart, Rolf Sörbye, Pål Larsson, and Stojan Kaladjev. “Muscular Load Levels in Performing Musicians as Monitored by Quantitative Electromyography.” *Medical Problems of Performing Artists* 5:2 (June 1990): 79-82.

“Nine professional violinists were investigated during performance by means of quantitative electromyography (EMG) of the trapezius, deltoideus, biceps and triceps

bilaterally. Five of the subjects suffered from performance-related pain in the neck and shoulder region; four of the subjects did not show any pain problems. . . . Because the AREMG level is a measure of exerted muscle force it was concluded that the group of musicians that had developed neck and shoulder pain used, in some muscles, significantly more muscle force for the task than did the group without pain” (p. 79).

Thiem, Barbara, David Greene, Spiros Prassas, and Michael Thaut. “Left Arm Muscle Activation and Movement Patterns in Cellists Employing a Playing Technique Using Rhythmic Cueing.” *Medical Problems of Performing Artists* 9:3 (September 1994): 89-96.

This was an interdisciplinary study conducted by Thiem, of the Department of Music, Theater and Dance; Greene, of the Department of Occupational Therapy; Prassas, of the Department of Exercise and Sport Science; and Thaut, the Director of Biomedical Research in Music at Colorado State University. The study group was taught a method of playing which used rhythm as a system of physical stress and release. The subjects practiced the technique for two weeks and were observed playing with surface electromyographical electrodes attached to the skin which measured muscle activation. Statistical analysis is given, along with graphs showing the results indicating that rhythmic cueing does improve facilitation. Though it is an interesting study, little application information is presented.

Tulchinsky, Ellen, and Lisa Riolo. “A Biomechanical Motion Analysis of the Violinist’s Bow Arm.” *Medical Problems of Performing Artists* 9:4 (December 1994): 119-124.

In order to study how violinists injure themselves, a standard from which to judge faulty motions needs to be established. This study analyzed bow arms of injury-free violinists and revealed a database of normal motion patterns. The Peak 2D Video/Computer Motion Measurement system, with a 3 noncollinear point tracking method to determine angles, velocities, acceleration, range of motion, and extremity displacement was used to collect the data. This study included analysis in only one plane; the author states that further research is needed to examine bowing in a three dimensional plane and EMG analysis is needed to determine muscle function.

Music Journals

There are two types of articles listed in this section. The first are articles by music medicine specialists for musicians, so they may be presented in a simpler fashion than those published in medical journals. The second are articles by string pedagogues who have had success treating their own injured students and have published their findings. While these articles are slightly less scientific and based on anecdotal evidence, they are extremely useful in helping string players to begin examining their own playing and thinking about how the body is used. The insight provided by other string players could not be presented by any doctor, unless he/she himself/herself was also a string player and had experienced long hours of rehearsals, demanding conductors and cold rooms.

Focal Dystonia

Braunstein, Mark. "Fighting Back: One String Player's Battle against Focal Dystonia." *American String Teacher* 45:4 (Fall 1995): 47-49.

A professional violist gives a narrative of his plight with a common ailment among string players. He details numerous failed treatments and the psychological struggle as well as successful strategies. He gives illuminating suggestions and offers other alternative and holistic treatments.

Conable, Barbara. "How to Resolve Dystonias: A Movement Perspective." *International Musician* 100:7 (July 2002): 10-11.

Conable, an Alexander Technique educator, outlines a body awareness method of treating focal dystonia. She discusses ways of cultivating fluid motion and ease in playing, and ways to re-train the body. Though the article is very applicable to movement training, and she refers to two other specialists in physical therapy who are also researching dystonia, this article has come under serious attack for its lack of scientific evidence and represents some of the controversy in the field. (Rebuttal listed below.)

Estrin, Glen, and Steven Frucht. "Dystonia: Separating Fact from Fancy." *International Musician* 100:8 (August 2002): 2.

This is an editorial article fiercely attacking Barbara Conable's July 2002 article

entitled “How to Resolve Dystonias: A Movement Perspective.” This is an example of some of the controversy that occurs in scientific research. The authors refer to their October 2001 article entitled “Focal Dystonia—A Neurological Disorder Affecting Musicians” for the correct information. However, even though Conable may have mislabeled this highly specific disorder, she is not given credit for the unique and useful information on movement, and both of these articles serve as a reminder that even in scientific research, information is highly debated and must not be treated as absolute.

_____. “Focal Dystonia—A Neurological Disorder Affecting Musicians.” *International Musician* 99:10 (October 2001): 15.

Authors are the founders of Musicians with Dystonia, an organization designed to raise awareness, provide support and research the condition. They stress the fact that though it is often diagnosed improperly, it is a neurological condition and must be diagnosed and treated by a specialist, specifically a neurologist with expertise in movement disorders. Symptoms, indications of the disorder, and existing treatments are described, along with contact information for the organization and specialists.

Introductory/Overview

Brandfonbrener, Alice. “The Medical Problems of Musicians.” *American Music Teacher* 37:5 (April/May 1988): 11-13, 24-25.

This is a very informative article covering most common musical maladies. The author describes different kinds of overuse injuries and what happens in the body when stress is applied. She outlines what music medicine specialists ask of musicians when diagnosing playing injuries, what types of injuries are commonly seen, what the current modes of treatment are, and what doctors are prescribing for prevention. She states that learning about anatomy, physiology and psychology are imperative for prevention, and that close attention must be paid to potential problems with beginning students and those in school programs.

Graffman, Gary. "Doctor, Can You Lend an Ear?" *Medical Problems of Performing Artists* 1:1 (March 1986): 3.

Many mark Graffman's revelation as the beginning of music medicine as an organized discipline. He was one of the first professional musicians to come forward with the fact that he had acquired an injury from playing the piano, and this article details his plight of going from doctor to doctor with no relief. Though the article was printed in 1986, musicians may still have similar experiences when seeking medical treatment for playing related injuries. Readers may benefit from Graffman's experience and perhaps be more prepared when going to a doctor for help.

Harper, Nancy. "The Definitive Solution is Surgery! Healing Alternatives for Musicians." *American Music Teacher* 44:5 (April 1995): 8-11.

As a pianist in a doctoral degree program faced with the decision as to whether or not to have surgery to treat carpal tunnel syndrome, the author opted for a less drastic treatment. Though she found complete relief with acupuncture, she continued to explore other alternative remedies to relate to other musicians, including acupressure, massage, Alexander Technique, Feldenkrais, osteopathic and chiropractic treatment, applied kinesiology, and Ortho-Bionomy, a system of "homeopathic body-work." Notes and an extensive bibliography are included.

Horvath, Janet. "Play it Healthy, Work Hardening: How to Safely Return to Work after an Injury." *International Musician* 99:2 (February 2001): 8-9.

This article explains the Work Hardening Program as applied by the Minnesota Orchestra. This is a program that allows orchestral musicians to seek treatment and undergo rehabilitation without loss of employment. The musician takes sick leave and is allowed to sit at the back of the section and participate only in what the musician can handle until he/she is strong enough to play full time.

Munson, Sammye. "Doctors are Examining Music Medicine." *International Musician* 83:6 (December 1984): 7, 22.

This is a short article presenting topics discussed at the first "Biology of Music Making" conference in Denver in 1984. A board of neurologists, dentists, physicians, and

psychologists spoke with musicians about injuries and types of therapy, establishing the beginning of music medicine as a specialty. It is interesting to compare to more recent literature and see how ideas about music medicine have changed since this first conference.

Rozek, Michael. "Musicians and Medicine: Is There a Doctor in the House?" *Symphony Magazine* 36:1 (March 1985): 9-12.

Doctors discuss their first encounters with musician patients, and reveal the need for musicians to be more aware of hazardous technique and other conditions affecting health, such as touring.

Overuse

Dickson, Joan. "The Misuse of Overuse." *Strings* 4:3 (November/December 1989): 50.

This cello teacher reveals the need for musicians to take more responsibility for injuries instead of relying on doctors, stating that "Overuse syndrome has become the fashionable ailment in the world of music" (p. 50). She believes that because there is little established treatment for overuse injuries other than rest, it removes the responsibility of the musician to analyze their technique. "The skills needed to play an instrument are extremely refined and delicate, seldom demanding strenuous effort, and when posture is good and the body well-balanced and free of unnecessary tensions, no physical harm should result" (p. 50).

Fry, Hunter J. H. "How to Treat Overuse Injury: Medicine for Your Practice." *Music Educators Journal* 72:9 (May 1986): 46-49.

A plastic surgeon who has written numerous articles regarding musicians' injuries, Fry examines causes of overuse injury and relates their occurrence to dance and sports. He presents a grading system for measuring the severity of injury and pain. The article also discusses the difference between repetitive versus sustained injuries, which is useful to string players because injuries may occur either from holding the instrument, or from the repetitive motions of playing. He states the best methods of treatment are rest and prevention. Some references are included.

. “Patterns of Overuse Seen in 658 Affected Instrumental Musicians.” *International Journal of Music Education* 11 (1988): 3-16.

This performing arts specialist created a catalogue of his patients in order to determine what patterns of overuse were related to the physical demands of the particular instrument. Divided by instrument, sample rates are given along with a description of the symptoms. Tables and written explanations are provided for comparison. He concludes that injuries do correlate to the physical demands of the instrument, and that preventive strategies should be present at the most basic level of music education. References are included.

Prevention and Preventive Technique

Ansell, Steven. “Musical Maladies: A Discussion of Their Prevention and Care.” *Journal of the American Viola Society* 5:3 (Fall 1989): 27-27.

The author, a violist, explains the anatomy involved in string playing, especially that of the arm, including a detailed explanation of the tendons and how certain positions affect them. He stresses prevention, instructing how to perform specific stretches. He recommends treating bodies like athletes would, and if hurt, seeing a sports therapist. The article also delves into psychological aspects of being an injured player.

Auken, Richard Van, and Paul Larson. “Teaching Inner Hearing.” *American Music Teacher* 37:5 (April/May 1988): 17-18, 27.

The authors discuss different kinds of hearing and how what we listen to shapes the way we learn and play music. They describe studio scenarios in which the student is not really listening to what he is playing, but rather what the teacher tells him to do. The article also discusses facets of aural image and memory, and states that techniques of listening are not developed as well as they should be. The authors give recommendations on how to teach and practice inner hearing, and suggest that it induces more thoughtful music-making. The article includes references.

Castleman, Heidi. "Artistic Distinctions, Your Primary Instrument: You and Your Body." *Journal of the American Viola Society* 17:1 (Spring 2001): 25-29.

Castleman, a viola teacher, states that "Good posture and body balance are essential foundations for making music effortlessly" (p. 25). Some guidelines to this concept are presented in checklist format, such as "Align the body vertically. In a relaxed manner, stack the knees, hips, rib cage, shoulders and head vertically above the arches in the feet" (p. 25). Musical examples are included to help mind-body integration of these principles.

_____. "Five Common Causes of Physical Injury for Violists: Comments of a Master Teacher on Approach to the Instrument." *Medical Problems of Performing Artists* 17:3 (September 2002): 128-130.

Castleman lists her five common causes as "improper instrument fit, faulty practice habits, poor body support for the instrument, holding the instrument by squeezing the instrument rather than balancing (often caused by improper setup), and squeezing with the thumbs" (p. 128). She then describes each of the causes in more detail, and provides suggestions for improvement. Castleman attributes some ideas to Walter Trampler and Jeffrey Irvine.

Chick, Davoren. "Injury Prevention for Violists." *American String Teacher* 38:4 (Autumn 1988): 73-75.

A violist and medical student, Chick discusses different factors contributing to injury and recent medical research that aids recovery. She lists common afflictions and ways to avoid them, such as maintaining healthy practice habits and stressing prevention. This source includes references.

Dennis, Allan. "The Effect of Three Methods of Supporting the Double Bass on Muscle Tension." *Journal of Research in Music Education* 32:2 (Summer 1984): 95-103.

This study was conducted to measure whether the method of holding the double bass affected muscle tension. Forty students volunteered to perform the recitative from Beethoven's *Symphony No. 9* while electrodes attached to the muscles recorded tension levels on an electromyography machine. The author concluded that the method of holding the bass did not affect tension, however, other relevant information about muscle

tension was observed. For instance, the low back is the most significant source of tension for bass players. The article includes references.

Ehrlich, Don. "Preventing Injury." *Journal of the American Viola Society* 5:2 (Summer 1989): 3-7.

Ehrlich, a violist in the San Francisco Symphony, examines physical reasons as to why violists are more prone to injury than other instrumentalists. He stresses that string players must think like athletes in order to maintain physical health, and perform specific conditioning exercises as well as sustain a general fitness program. He instructs how to warm-up, stretch, and cool-down after playing, and recommends movement programs such as Alexander Technique and Feldenkrais. He suggests visiting a music medicine specialist, sports trainer, or physical therapist if injured.

_____. "Preventing Ulnar Problems." *Journal of the American Viola Society* 5:3 (Fall 1989): 27-31.

This is a detailed article covering a specific problem area. The author explains what the ulnar nerve is, where it traverses through the body, and the many ways in which it can become injured while playing and even while resting. He discloses pertinent information from a physical therapist about anatomy, specific exercises designed to counteract ulnar problems, and suggests strengthening the supporting upper back muscles.

Irvine, Jeffrey, and William R. LeVine. "The Use of Biofeedback to Reduce Left-Hand Tension for String Players." *American String Teacher* 31:3 (Summer 1981): 10-12.

Irvine, a viola teacher, discusses how excess tension can inhibit one's facility in fast passages, induce fast, nervous sounding vibrato, and contribute to poor intonation and shifting. The use of a biofeedback machine, a myograph, which measures electrical impulses present in muscles, helps the string player become aware of how much tension is being used when playing. The authors state these machines are easily accessible at various places on college campuses and discusses the best way to use them, including how to set up the machine and the electrodes, and how to use the machine in practice.

Irvine, Jeffrey. "Avoiding and Recovering from Left-Hand Injuries." *American String Teacher* 40:3 (Summer 1990): 59-61.

The article begins with reasons why violists are more prone to left-hand injury than other string players, then outlines basic injury prevention guidelines. These include warming-up, managing playing time, exercising, maintaining good posture and having a healthy attitude towards achievement. He then details suggestions for a healthy left hand including evaluating finger pressure, and the balance of the forearm and fingers. The article ends with guidelines for treating pain, including elements of viola technique as well as how to seek medical advice.

. "Avoiding and Recovering from Bow Arm and Upper Torso Injuries." *American String Teacher* 41:1 (Winter 1991): 65-67.

The author discusses common habits that cause tension in viola playing and exercises for changing tension-provoking habits. He suggests using bow speed for varying sound instead of pressure, changing setup in order to have better access to the tip of the bow, thinking about body alignment and posture, and taking Alexander Technique lessons. He attributes many ideas to Karen Tuttle.

Klickstein, Gerald. "Seven Habits for Healthy Performance: A Practical Approach to Injury Prevention." *American String Teacher* 53:2 (May 2003): 48-55.

This article simply and eloquently summarizes the basic injury prevention concepts that appear in most of the literature. Klickstein, a guitarist, presents the ideas in a way that appeals to the artistic side of music making instead of from a medical or athletic point of view, such as "Cultivate Technical Ease," and "Practice Mindfully." He refers to medical research and includes an extensive bibliography.

Kollar, Martha. "Bass-ic Training, or, How to Take Care of Your Body." *American String Teacher* 44:2 (Spring 1994): 63-64.

The author, a massage therapist and bassist, explains that musicians should treat their bodies as athletes do and condition properly to avoid injury. She details many physiological responses and how the body becomes injured. The article covers common problem areas for bassists, which muscles are used and how they become restricted. She

advocates warming up the entire body, not just fingers, and presents a stretching program with illustrations, clarifying common stretching concepts and correct technique.

La Course, Michelle. "A Violist's Body-Awareness Checklist." *American String Teacher* 44:3 (Summer 1994): 49-53.

La Course, a viola teacher, discusses how a checklist can help organize practice time and avoid the tendency to "play-through-and-try-to-notice-and-fix-things-along-the-way" (p. 49). She suggests supplementing body-awareness in practice with other body-awareness programs such as yoga, Alexander Technique, or Feldenkrais. She systematically describes breathing, stance and posture, followed by balance of the instrument, left arm and hand techniques, and right arm and hand techniques.

Lieberman, Julie Lyonn. "Healthier Music Making." *Band and Orchestra Product News* 4:10 (October 2001): 22-23.

This article illustrates how to warm up and cool down in order to prevent injury. The author also explains "ischemia," which describes how permanent tissue damage can occur due to restricted blood flow to excessively tight muscles. Suggested resources are included.

_____. "The Importance of Setup." *Strings* 14:8 (May/June 2000): 40-42.

Though short, this article is very informative and applicable. Lieberman lists several faults with various types of setup, with suggestions on how to alleviate them. She describes how to examine and determine one's optimal setup and healthy frame, and even gives a listing of places to obtain customized chin and shoulder rests. (See Appendix B)

Montello, Louise. "Tuning the Human Instrument: Mind-Body Rehabilitation for the Injured Musician, Part I." *International Musician* 99:7 (July 2001): 15.

This article outlines the procedures for evaluation and treatment as conducted by the music medicine specialists at Musician's Wellness, Inc. It also explains several treatment approaches, including support-groups, and discusses how performance anxiety contributes to injury. The author emphasizes breathing techniques, meditation and other coping strategies.

_____. "Tuning the Human Instrument: Mind-Body Rehabilitation for the Injured Musician, Part II." *International Musician* 99:8 (August 2001): 12.

Montello believes that "all performance-related injuries have psychological implications which must be addressed as part of an overall treatment plan" (p. 12). She describes a few of the techniques she uses to remind musicians of the mind-body connection, such as "61 Points," a Yoga technique designed to release emotional blocks, and similar art therapy techniques. After she has helped reestablish the mind-body techniques, she helps musicians learn how to breathe rhythmically with their playing and improvise as a way of regaining the enjoyment of music.

Norris, Richard. "Overuse Injuries: How String Players Can Recognize, Prevent, and Treat Them." *Strings* 4:3 (November/December 1989): 45-47.

This is an informative article that discusses predisposing factors of overuse injuries and presents some technical and mechanical errors common in string playing. It presents an injury grade, a scale of pain severity. The author explains nerve compression as well as overuse injuries and gives a few suggestions for treatment, stressing prevention.

Palac, Judy. "Prevention of Musical Injuries: How Research Can Help." *American String Teacher* 45:2 (Spring 1995): 69-72.

A professor of music education, the author discusses the prevalence of injuries and how research in music, medicine, and movement sciences is needed to support already published material in equipment, pedagogy, and technique. She states that research can be divided into two categories: direct research on string pedagogy and technique, and applications of existing research in the movement sciences to string playing. The author concludes that while research has shown that education in occupational medicine does reduce risk of injury, there is much yet to learn. The article includes a bibliography.

Ritscher, Karen. "The 'Holistic' Bow Arm." *American String Teacher* 43:2 (Spring 1993): 59-60.

Ritscher, a viola teacher, reveals the concept that students often pattern themselves after others, or what they have ingrained as "correct" technique, not allowing themselves to find the right balance of their own bodies. She offers methods for students to use in

cultivating their own kinesthetic awareness to create balance and a beautiful tone. The author presents common misunderstandings in bow arm technique, and clarifies concepts of arm weight and bowing direction. She also expounds on her discovery of the use of large rubber exercise/resistance bands in teaching these concepts through kinesthetic direction instead of verbal explanations, which are often confusing or misleading.

Sternbach, David J. "To Your Health, Warning: Your Practice Room Could be Hazardous to Your Health." *International Musician* 100:1 (January 2002): 15.

The author discusses how musicians injure themselves by not listening to their bodies when practicing, which becomes habitual, and is then reflected on the concert stage. He suggests seeing arts medicine specialists, physical therapists, and Alexander Technique or Feldenkrais teachers in order to develop heightened awareness of how the body works when practicing.

Thiem, Barbara, and David Greene. "That Famous Ounce: Avoiding Injury from Harmful Positions in Cello Performance." *American String Teacher* 43:1 (Winter 1993): 53-56.

This article is a collaboration between a cello professor and an occupational therapist. The article states that musicians should apply the results of research conducted to alleviate pains that machine operators and typists encounter. "We may resist the idea that we share problems with office or factory workers, but the simple truth is that like these workers, we are often engaged in repetitive physical motions that are potentially problematic" (p. 53). The article provides an overview of cello technique and what positions are more harmful to tendons, muscles and nerves. They suggest that "it is often helpful to ignore the instrument and examine the body movements of a player" (p. 56). It includes a selected bibliography.

APPENDIX A

ANNUAL PERFORMING ARTS MEDICINE SYMPOSIA

Ithaca Symposium “The Healthy Musician: Injury Prevention and Intervention. A Workshop for Health Care Providers.” Held annually in Ithaca, NY. Contact: Department of Continuing Education, Ithaca, NY, 14850, or email: cess@ithaca.edu, or nquarrie@ithaca.edu

Performing Arts Medicine Association “The Annual Symposium on Medical Problems of Musicians and Dancers.” Held annually in Aspen, CO. Contact: PAMA website (below)

APPENDIX B

ERGONOMIC PRODUCTS AND CUSTOM FITTINGS

American Ergonomics
100 Shoreline Highway
Building B, Suite 295
Mill Valley, CA 94941
Phone: 415-388-2300
(chairs and other products)

BackSaver
Phone: (800) 251-2225
(Back and chair cushions, ergonomic products)

Cliff Johnson
1050 Cedarview Dr.
Minneapolis, MN 55405
email: cliffthel@aol.com
(custom fittings)

Ergosource
2828 Hedberg Drive
Minnetonka, MN 55343
Phone: 800-969-4374
(Many ergonomic products, videos, and training materials)

Peter Purich
35 Belton Rd.
Pointe Claire
PQ H9S 4A2
Canada
(514)695-0295
(custom chin rests)

APPENDIX C

JOURNALS

Medical Problems of Performing Artists

(Official journal of the Performing Arts Medical Association, PAMA)

www.artsmed.org

Editor: Alice G. Brandfonbrener, M. D.

Published quarterly by Hanley and Belfus, Inc.

www.hanleyandbelfus.com

American String Teacher

American String Teachers Association with

National School Orchestra Association

Subscription through ASTA membership

www.astaweb.com

APPENDIX D

VIDEOS

Lieberman, Julie Lyonn. *The Instrumentalist's Guide to Fitness, Health and Musicianship*. Woodstock: Homespun Tapes, Ltd. 1991.

Available through Shar Products, or www.panix.com/~hmusic/music.html

Norris, Richard. *Therapeutic Exercises for Musicians*. Minneapolis: M.M.B. Music, Inc. 1990.

Available through M. M. B. Music, (800) 543-3771

APPENDIX E

WEBSITES AND ORGANIZATIONS

American Physical Therapy Association
1111 No. Fairfax St.
Alexandria, VA 22314
(888) 345-2782

American Society for the Alexander Technique
www.alexandertechnique.com

Alexander Technique International
www.ATI-net.com
www.learningmethods.com
Features an Alexander teacher working with a violinist

Andover Educators
Barbara Conable
Body mapping and Alexander Technique books and courses
www.bodymap.org

British Association for Performing Arts Medicine
18 Ogle St., London W1P 7LG
Phone: 0171-636-6860
www.cygnet.co.uk/BPAMT/

Canadian Network for Health in the Arts
Christine Zaza, Director
5 Kristina Crescent, London, Ontario, N6E 3V3
Phone: (519)668-1835
web.idirect.com/~cnha

International Arts Medicine Association
Sheila Moriber Katz, President
714 Old Lancaster Rd, Bryn Mawr, PA, 19010
Phone: (610) 525-3784
members.aol.com/iamorg/index.html
Feldenkrais

Anat Baniel Method
www.feldenkrais-intl.com

Feldenkrais Resources
Ruthy Alon
P.O. Box 2067
Berkeley, California 94702

Feldenkrais Method
www.healthy.net/feldenkrais

Musicians and Injuries
Extensive site including books, links, discussions, doctors
www.engr.unl.edu/ee/eeshop/music.html

Musicians' Wellness, Inc.
Dr. Louise Montello, Executive Director
4 Washington Square Village Suite 13J
New York, NY 10012
Phone/fax: (212) 473-8753
www.musicianswellness.org

National Institute of Occupational Safety and Health
Mail Stop C19
4676 Columbia Parkway
Cincinnati, OH 45226
Phone: 800-356-4674
www.cdc.gov/niosh

Performing Arts Medical Association, PAMA
Mary Fletcher, Executive Director
PO Box 61228
Denver, CO 80206
Phone/Fax: (303) 751-2770
www.artsmed.org

Performing Arts Medicine at Ithaca College
www.ithaca.edu/hshp/pt/.pt1/index/html

The RSI Clinic
web.idirect.com/~cldr/

Stretching Inc.
Bob and Jean Anderson
Catalogue, video, guides, tools for tension relief
www.stretching.com

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BIOGRAPHICAL SKETCH

Michelle Rush was born into a family of music educators. Her mother began teaching her the violin at age seven, and in high school she discovered the lovely, dark tone of the viola. After graduating from the High School for the Performing and Visual Arts in Houston, Texas, she earned a Bachelor of Music in Viola Performance, *Magna cum laude*, from the University of Houston, under the tutelage of Lawrence Wheeler. At Florida State University she received a graduate assistantship and studied with Dr. Pamela Ryan while completing the Master of Music and Doctor of Music degrees.

As a chamber musician her quartet won a performance in the “Best of Chamber Music” concert at the Round Top Festival Institute in Texas, and she also performed at Musicorda in Massachusetts. As a member of the Eppes Quartet she performed Ellen Taaffe Zwilich’s String Quartet No. 2 at the Century Club in New York City and was heard on WNYC.

She has a wide range of teaching experience, including private studio teaching, chamber music coaching and presenting injury prevention seminars. She has also taught at the Florida State University Summer Music Camps, at The Children’s String Workshop under Debbie Greenbaum and Roberta Guaspari in Holyoke, Massachusetts, and is the Tallahassee Symphony Youth Orchestra Viola Coach. With the Eppes Quartet she also assisted Ellen Taaffe Zwilich in teaching student composers how to write for the string quartet.

She is an active orchestral musician, is a member of the Tallahassee Symphony, and has performed with the Atlanta Baroque Orchestra. As a soloist she was the winner in the state level of the 2001 MTNA Collegiate Artist Competition and was alternate winner in the 2003 Florida State University Doctoral Concerto Competition.

She enjoys cooking and performing with her husband, Philip, who is also a violist.