INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

Bell & Howell Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600



Downloaded from SHAREOK. Persistent Handle URL: https://hdl.handle.net/11244/6042

UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

EDUCATIONAL PREREQUISITES FOR PIANO TEACHERS ASSISTING IN THE PREVENTION, DETECTION, AND MANAGEMENT OF PERFORMANCE-RELATED HEALTH DISORDERS

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

by

CHARLES TURON
Norman, Oklahoma
2000

UMI Number: 9988507

UMI®

UMI Microform 9988507
Copyright 2001 by Bell & Howell Information and Learning Company.
All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.

Bell & Howell Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

EDUCATIONAL PREREQUISITES FOR
PIANO TEACHERS ASSISTING IN THE
PREVENTION, DETECTION, AND MANAGEMENT OF
PERFORMANCE-RELATED HEALTH DISORDERS

A Dissertation APPROVED FOR THE
SCHOOL OF MUSIC

BY

Reid Alexander, Co-chair

Jane Magrath, Co-chair

Mark Anderson

June Lester

Michael Rogers

© Copyright by CHARLES THOMAS TURON 2000
All rights reserved

ACKNOWLEDGMENTS

This work would not have been possible without the help and encouragement of many individuals. First and foremost, I want to acknowledge my wife, Amy. Through many months of separation during summer classes tending a large family, as well as staying up through many late nights assisting in preparing copy, she has remained indomitable–a real testimony of faithfulness. May she receive as richly as she has given.

I also want to acknowledge my children. The devotion they have shown in those months of separation and, even more, in being willing to be uprooted and relocate during my year of residency, was a true act of love. To my parents, I want to express my gratitude for the enormous support they have given me through this process, as in every other endeavor I have undertaken. More loving parents cannot be found.

Drs. Jane Magrath and Reid Alexander have been model co-chairs and professors. Their assistance has been everything I could have asked for. Through the process of preparing this dissertation, they not only guided me to an acceptable conclusion, but provided a real education along the way. I thank them for their expertise, their patience, and their friendship.

Finally, I want to acknowledge the performing arts physicians who have dedicated much of their careers for the betterment of musicians. In many cases, I feel they are some of medicine's unsung heroes. They are doctors in the truest sense of the word.

TABLE OF CONTENTS

ACKNOWLEDGMENTS iv

LIST OF TABLES ix

ABSTRACT xi

CHAPTER I. INTRODUCTION 1
Statement of the Problem 6
Research Questions 7
Need for the Study 7
Rationale 9
Purpose 10
Method of Procedure 10
Feasibility of the Study 13
Delimitations 14
Outline of the Dissertation 15
Definition of Terms 16

CHAPTER II. REVIEW OF THE LITERATURE 20
Introduction 20
Historical Background 22
Research Efforts 30
Performance-related Health Disorders 32
Prevention and Music Education 42
Prevention Efforts in Piano Pedagogy 44
The Changing Role of Piano Teachers 57
Educational Prerequisites 67
Dissertations and Theses Consulted 73
Methodological Models 80
Summary 82

CHAPTER III. METHODOLOGY 83
Introduction 83
Phase One: Selecting the Target Population 83
Phase Two: The Questionnaire 85
Description of the Questionnaire 85
Piloting the Questionnaire 88
Administering the Questionnaire 89
Phase Three: The Interviews 90
Description of the Interview Questions 90

Selecting the Interview Candidates . . . 92
Administering the Interviews . . . 93
Analysis of the Data . . . 93

CHAPTER IV. PRESENTATION OF THE DATA . . . 97
Introduction . . . 97
Description of the Performing Arts Physicians . . . 99
Curricular Content . . . 104
Terminology . . . 106
Concepts and Principles of Anatomy and Physiology . . . 107
Common Performance-related Health Disorders . . . 108
Preventive Measures . . . 108
Medical Referral . . . 110
Rehabilitation . . . 111
Summary of Curricular Content . . . 112
Educational Context . . . 116
Trainers . . . 117
Instructional Format . . . 119
Comments . . . 121
Educational Contexts for Teaching Piano Teachers Selected Health
Science Topics . . . 124
Educational Context . . . 124
Supplement to Health Science Course . . . 125
Seminar/Workshop . . . 127
Supplement to Music Education Course . . . 127
Other . . . 128
Discussion of Hypothetical Contexts . . . 129
Tests of Independence . . . 132
Interviews . . . 137
Introduction . . . 137
Description of the Interviewees . . . 137
Interview with Alice G. Brandfonbrener. M.D . . . 138
Biography . . . 138
Required Curricula . . . 139
Risks in Training Piano Teachers . . . 139
Piano Teachers and Self-care Versus Medical Consultation . . . 139
Trainers with Medical and Musical Background . . . 140
Interview with Michael E. Charness, M.D. . . . 141
Biography . . . 141
Required Curricula . . . 141
Risks in Training Piano Teachers . . . 142
Piano Teachers and Self-care Versus Medical Consultation . . . 142
Trainers with Medical and Musical Background . . . 142

Additional Comments . . . 143
Interview with Rebecca R. Clearman, M.D. . . . 143
Biography . . . 143
Required Curricula . . . 144
Risks in Training Piano Teachers . . . 144
Piano Teachers and Self-care Versus Medical Consultation . . . 145
Trainers with Medical and Musical Background . . . 145
Additional Comments . . . 146
Interview with Frank R. Wilson, M.D. . . . 146
Biography . . . 146
Required Curricula . . . 147
Risks in Training Piano Teachers . . . 148
Piano Teachers and Self-care Versus Medical Consultation . . . 149
Trainers with Medical and Musical Background . . . 150
Additional Comments . . . 150
Analysis of the Interviews . . . 151
Themes and Comments . . . 153
Discussion . . . 157

CHAPTER V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS . . . 160
Summary . . . 160
Discussion . . . 163
Conclusions . . . 172
Recommendations . . . 176
Further Research . . . 179

WORKS CITED . . . 182

APPENDIXES

A. COVER LETTER ACCOMPANYING THE QUESTIONNAIRE . . . 189

B. SUPPORT LETTER ACCOMPANYING THE QUESTIONNAIRE . . . 191

C. QUESTIONNAIRE TO PERFORMING ARTS PHYSICIAN . . . 193

D. ACADEMIC PREPARATION FOR THIS STUDY . . . 206

E. PILOT SUBJECTS FOR THE QUESTIONNAIRE . . . 209

F. RESPONDENTS TO THE QUESTIONNAIRE . . . 211

G. TRANSCRIPTIONS OF TELEPHONE INTERVIEWS . . . 215

H. FIVE ESSENTIAL CURRICULA 230

I. CATEGORIES OF INSTRUCTION 236

LIST OF TABLES

Table Page

1. Possible Risk Factors for Musicians' Performance-related Health Disorders by Category 41

2. Physicians by Specialty 100

3. Physicians by Age 102

4. Physicians: Years of Experience 102

5. Physicians: Percentage of Patients Who Are Pianists 103

6. Physicians: Number of Pianists Treated Annually 104

7. Curricular Content by Level of Importance 105

8. Terminology by Level of Importance 106

9. Anatomy/Physiology by Level of Importance 107

10. Performance-related Health Disorders by Level of Importance 109

11. Preventive Measures by Level of Importance 110

12. Medical Referral by Level of Importance 111

13. Rehabilitation by Level of Importance 112

14. Mean Scores, 1.0–1.49 113

15. Mean Scores, 1.5–1.99 114

16. Mean Scores, 2.0–2.49 115

17. Mean Scores, 2.5–2.99 116

18. Mean Scores, 3.0–5.0 116

19. Optimal Trainer 118

20. Instructional Format 120

21. Educational Contexts for Piano Teacher Training: Most Frequent Choice 126

22. Curricula Recommended as a Supplement to a Health Science Course 126

23. Curricula Recommended as a Seminar/Workshop 127

24. Curricula Recommended as a Supplement to a Music Education Course 128

25. Curricula Recommended as a New Course, a Supplement to a Music Education Course, or a Seminar/Workshop 128

26. Test of Independence: Play Piano and Double-crush Syndrome 134

27. Test of Independence: Years Experience and Double-crush Syndrome 135

28. Test of Independence: Play Piano and Surgical Treatments 136

29. Test of Independence: Years Experience and Surgical Treatments 136

30. Interview Questions One, Two, and Three 152

31. Terminology: Categories of Instruction 237

32. Concepts and Principles of Anatomy and Physiology 238

33. Common Performance-related Health Disorders 240

34. Preventive Measures 243

35. Rehabilitation 245

36. Medical Referral 246

ABSTRACT

by Charles Turon

Advisers: Dr. Reid Alexander, Chair, Piano Pedagogy
Dr. Jane Magrath, Chair, Piano
The University of Oklahoma

Research in performing arts medicine supports the concept of piano teachers actively collaborating with physicians and therapists to minimize physiological risks associated with playing the piano. Traditional piano pedagogy curricula do not include training in health sciences which specifically prepares piano teachers to help prevent, detect, or manage performance-related health disorders. The main purpose of this study was to determine this core body of knowledge relating to performance-related health disorders essential for every piano teacher assisting in prevention efforts. Three subsidiary purposes were to identify performing arts physicians who treat pianists, to ascertain whether they agree that piano teachers should be trained to assist in prevention education, and to explore optimal instructional formats for the delivery of such training.

Forty-four performing arts specialists experienced in treating pianists received a questionnaire regarding training from the health sciences they consider to be important supplements to piano teachers' education. They were also asked who is best qualified to train piano teachers in these topics and the most appropriate instructional context for implementing the training. Thirty-six physicians responded, for a response rate of 81.6 percent. The four respondents with the most experience treating pianists were chosen for follow-up telephone interviews.

Analysis of the data revealed a strong consensus that piano teacher training should

include instruction in health-related topics. Chi-square analysis showed that there was no significant respondent bias due to gender or other demographic characteristics. Five categories of instruction were found to be more essential than any of the others: postural alignment, pacing of practice sessions, recognition of early warning signs, general physical conditioning, and education in risk factors. The formats the specialists recommended most often included a supplement to existing health science or music education courses or seminar/workshops; the trainers they recommended most often were health science teachers and interdisciplinary specialists.

The major conclusion of this study is that it is possible to isolate a core curriculum essential for piano teachers assisting in the prevention, detection, and management of performance-related health disorders. Recommendations are given regarding modifying the content of current piano pedagogy curricula to include these essential topics.

CHAPTER I

INTRODUCTION

Over the last twenty years it has become increasingly clear that a large percentage of pianists develop medical ailments associated with playing their instrument. Epidemiological studies targeting a variety of populations–students, amateurs, and professionals of various ages–have consistently found that a large number of musicians develop significant performance-related physiological problems, affecting approximately 43 percent of classically-trained professionals and 17 percent of children.[1] An estimated 40 to 60 percent of these musicians are keyboard players.[2]

Such statistics contradict the conventional wisdom of the past, which held that pianists experiencing performance-related health disorders (PRHD's) were "very much a

---

[1]Christine Zaza, *Play it Safe: A Health Resource Manual for Musicians and Health Professionals* (London, ON: Canadian Network for Health in the Arts, 1998), 37–39.

[2]Alice G. Brandfonbrener, "The Etiologies of Medical Problems in Performing Artists," in *Performing Arts Medicine*, 2nd ed., ed. Robert Thayer Sataloff, Alice G. Brandfonbrener, and Richard J. Lederman (San Diego, CA: Singular Publishing Group, Inc., 1998), 26.

minority."[3] Skepticism concerning the legitimacy of the escalating reports of such problems led to allegations of "mass hysteria" in Australia in the 1980s.[4] Although it is impossible to determine the levels of injury among past musicians with precision, historical studies have established that pianists of previous generations commonly developed the same maladies as their modern counterparts.[5] The seeming increase in the number of afflicted musicians may be the result of more extensive publicizing of PRHD's, which in turn has encouraged more musicians to report physical difficulties to medical professionals. Regardless of whether more pianists develop PRHD's now than in the past or whether they are merely more aware of physical problems, contemporary health care professionals recognize that musicians as a whole have medical needs which genuinely warrant specialized attention.

In order to better meet the unique needs of musicians and other performers, a number of concerned physicians have helped form the new specialty of performing arts medicine, with clinics, textbooks, journals, professional associations, and conferences exclusively devoted to their medical problems. Research into the scientific aspects of music-making has expanded rapidly since the inception of the specialty in 1977. Investigators from various disciplines–anatomists, physiologists, ergonomists,

---

[3]Thomas Mastroianni and Richard Norris, "Performers, Teachers, and Medical Practitioners: Working Together to Promote Wellness," *American Music Teacher* 42 (April/May 1993): 26.

[4]Jonas Sen, "Playing the Piano, Playing . . . with Fire?" [http://rvik.ism ennt.is/jssen/mus med.html], 1995.

[5]Hunter J. H. Fry, "Overuse Syndrome in Musicians–100 Years Ago: A Historical Review," *The Medical Journal of Australia* 145 (December 1/15, 1986): 624.

kinesiologists, and others–have joined efforts in expanding our base of knowledge about the physical aspects of playing the piano. The increased publication of literature in the field reflects this newly focused attention: over 350 articles were written in English on music medicine during the 1980s alone, as opposed to less than 100 articles from the late 1800s through 1980.[6] Although research efforts are ongoing and a number of important questions remain unanswered, one consistent finding has direct relevance for the piano teacher: the majority of the performance-related disorders which pianists develop are preventable, and the key to prevention is education.

Because the prevention of PRHD's partly involves modifying how pianists practice and perform at the piano, these researchers have identified piano teachers as a key group–perhaps *the* key group–to enlist in prevention education. Teachers are "the most appropriate group for implementing prevention."[7] It is the music teacher who has "the central role of affecting a musician's career and guiding it to be pain-free."[8] Spangler refers to knowledge of preventive measures as the "responsibility" of the teacher as well

---

[6]Christine Helen Zaza, "Musicians' Playing-Related Musculoskeletal Disorders: An Examination of Physical, Psychological, and Behavioural Factors" (Ph.D. diss., University of Waterloo, ON, Canada, 1995), 1.

[7]Christine Zaza, "Prevention of Musicians' Playing-Related Health Problems: Rationale and Recommendations for Action," *Medical Problems of Performing Artists* 8 (December 1993): 120.

[8]Nicholas F. Quarrier, "Survey of Music Teachers: Perceptions about Music-related Injuries," *Medical Problems of Performing Artists* 10 (September 1995): 110.

as the instrumentalist.[9] Pascarelli likewise regards the need to guide musicians toward injury-free performance as not only the responsibility of medical doctors "but, most important [*sic*] . . . every music educator, student, institute, and school."[10] In a study devoted to the changing role of the piano teacher in conjunction with performing arts specialists, Wristen concludes "Teachers must not take lightly the responsibility of equipping students with the proper tools to pursue higher levels of injury-free musical experiences."[11] Reference to the teacher's involvement in health issues as not only desirable, but a "responsibility," strongly implies that these matters demand the consideration of all piano teachers.

A number of prominent educational organizations have echoed the recommendations of performing arts specialists in calling for piano teachers' active involvement in health issues. The Council of Arts Accrediting Associations issued a briefing paper in 1991, declaring that "Arts units are encouraged to develop means of working with health maintenance issues through direct education, counseling, and referral services."[12] Both

---

[9]Andrea Spangler, "Common Upper Extremity and Jaw Injuries of Instrumental Musicians: Treatment and Prevention Techniques," (B.M. thesis, University of Northern Colorado, 1996), 20.

[10]Emil Pascarelli, interview in Yu-Pin Hsu, "An Analysis of Contributing Factors to Repetitive Strain Injury (RSI) Among Pianists," (Ed. D. diss., Columbia University, 1997), 127.

[11]Brenda Wristen, "Overuse Injuries and Syndromes in Keyboard Players: The Roles of Performing Arts Specialists and Piano Teachers," (M.M. thesis, Texas Tech University, 1995), 82.

[12]"Briefing Paper: An Overview of Health Issues for Performing and Visual Arts Students," Council of Arts Accrediting Associations, March 1991, 2.

the National Piano Pedagogy Conference (NPPC) and the now-defunct National Conference on Piano Pedagogy (NCPP) formed standing committees on preventing medical problems in response to the awareness of PRHD's among pianists and the potential pedagogical implications. One of the final acts of the NCPP's committee before the conference disbanded in 1994 was to publish ten principles of wellness piano teachers should observe in order to promote the long-term health of their students. These include the need to "understand the function of the human body in relation to the instrument for achieving optimum comfort," to "be aware of risk factors which may lead to medical problems," and to "implement, at the university level, courses in pedagogy" which would address physiological issues pertaining to piano study.[13] The contributions of these groups underscore the interdisciplinary nature of performing arts medicine.

Both educational and medical experts recognize that traditional music training does not fully equip piano teachers to prevent, detect, or manage physical problems which their students may incur. Any serious attempt to engage piano teachers in pertinent aspects of health education must first address the issue of properly informing, educating, and training those who will ultimately be educating students. A "comprehensive program of injury prevention should include educational programs for music instructors at all levels . . ."[14] A "new generation" of teachers must "understand biomechanics,

---

[13]*The National Conference on Piano Pedagogy: Proceedings and Reference, 1994-1995* (Los Angeles: The National Conference on Piano Pedagogy, 1995), 194-199.

[14]Alice G. Brandfonbrener, "Prevention Strategies: Will They Help or Harm?" *Medical Problems of Performing Artists* 8 (December 1993): 115.

anatomy, ergonomics, and psychology in order to prevent injury."[15] Although "education concerning music-related injuries is steadily increasing," all piano teachers should "increase their awareness of how injuries develop and how they may be prevented."[16] Instruction in anatomy, biomechanics, and other scientific areas related to the physiological needs of pianists has not been included as part of the standard curriculum for the piano pedagogy student.[17] Determining exactly what this education should and should not include is a prerequisite for the development of an educational program appropriate for current and future piano teachers.

Statement of the Problem

Epidemiological studies have established that a significant number of musicians develop health problems related to playing their instruments; pianists constitute a large portion of these musicians. Piano teachers have been identified as a group which can and should assist in the prevention, detection, and management of performance-related health disorders. Preparing piano teachers for this role necessitates supplementing the education of piano teachers with training outside the traditional piano pedagogy curriculum. At this time no consensus among performing arts physicians experienced in treating pianists has been published which comprehensively delineates those portions of health science training that would adequately prepare the piano teacher to assist in the

---

[15]Hsu, 40.

[16]Wristen, 80, 1.

[17]Quarrier, 106.

prevention, detection, and management of performance-related health disorders among piano students.

Research Questions

This study addresses the following four questions related to delineating the content of prevention education for piano teachers.

1. Who are the physicians currently associated with performing arts clinics and programs in the United States who regularly treat pianists?

2. Do these physicians agree that piano teachers should be trained to assist in the prevention, detection, and management of performance-related health disorders?

3. What is the essential training necessary to prepare teachers for this role without being overly intricate or detailed? (This is the most crucial of the four questions; it attempts to identify a core body of health science information important to include in piano teacher training.)

4. What is the most appropriate instructional context for this training?

Need for the Study

Performing arts specialists and associated health care professionals are virtually unanimous in urging music educators to obtain prevention education; however, views as to what that education should include are diverse and sometimes contradictory. There is to date no source that comprehensively delineates the information and training in health-related issues which all piano teachers should possess.

Possible topics are numerous and potentially complex–they include basic

terminology, anatomy, physiology, biomechanics, ergonomics, postural training, recognition of risk factors, prevention techniques, knowledge of disorders and their warning signs, training in first aid for acute performance-related injury, and the ability to make appropriate medical referral. Opinions as to the extent of relevant information range from saying that teachers benefit from knowing by name the exact location and function of muscles involved in playing musical instruments[18] to regarding knowing the names of muscles as "inappropriate."[19] Dr. Brandfonbrener further maintains that piano pedagogy should incorporate into the curriculum "as much applicable information as possible from the biological sciences " in order to "assure healthier and more satisfying performances," but provides only limited details about those parts of the biological sciences which constitute "applicable information."[20]

Two criteria define the limits of the curricular content appropriate for piano pedagogy students and current piano teachers. First, the portions of health and biological sciences which are relevant for piano teachers must be separated from those aspects which have limited or no applicability. Secondly, that information which is necessary for teachers to fulfill their responsibilities must be differentiated from that which might be beneficial but not essential. Two opposing dangers exist. On one hand, if teachers are

---

[18]Susan Weiss, *The Anatomy Book for Musicians: A Guide to Understanding Performance Related Muscle Pain* (Glenview, IL: Muscle Dynamics, 1996), 1.

[19]Alice G. Brandfonbrener, "The Teacher Needs to Understand the Function of the Human Body in Relation to the Instrument for Achieving Optimum Comfort," in *The National Conference on Piano Pedagogy: Proceedings and Reference, 1994-1995* (Los Angeles: The National Conference on Piano Pedagogy, 1995): 194.

[20]Ibid.

not adequately informed, they risk continued injuries among students. On the other hand, exposure to too much information may become overwhelming and discourage teachers from continued participation in health-related matters. Distinguishing between central and peripheral information and training is a crucial step in defining the core body of health-related knowledge which every piano teacher should possess.

Rationale

Leaders in performing arts medicine agree that piano teachers should become actively involved in preventing PRHD's. Since such active participation necessitates a kind of education which music teachers do not normally receive, implementation of this mandate must begin with educating the educators. In order to know how this education should proceed, one must first identify the core body of relevant information–what it is that every piano teacher should know. Components of health science and performing arts medicine which are suitable for piano teachers, adequately supplementing traditional training without becoming excessively detailed or intricate, define that core body of knowledge.

Effective implementation of prevention education for piano teachers depends on identifying what teachers need to know. Once identified, this information would assist in making decisions regarding two major aspects of implementation: who would carry out teacher training and the optimal instructional format(s) for prevention education. Because performing arts medicine is multidisciplinary, instructors in prevention education could be drawn from a variety of fields, each area having a particular

emphasis. Writers suggest engaging piano pedagogy faculty, health science teachers, teams coupling music and medical educators, interdisciplinary specialists, or teachers "informing themselves" (self-education). The structural format of instruction could involve workshops, seminars, supplementation of existing pedagogy curriculum, adding existing course work from the health sciences not traditionally included in music education, or the creation of new courses. Determining a core body of essential knowledge from the health sciences will help identify who is best qualified to teach current and future piano teachers, will facilitate choosing the most appropriate instructional format(s), and will ensure that piano teachers receive the crucial components of prevention education regardless of which instructional format is chosen.

Purpose

The purpose of this study is to determine the information and training piano teachers must possess in order to help prevent, detect, and manage performance-related health disorders among piano students. Three secondary purposes of this study are to identify performing arts specialists in the United States who regularly treat pianists, to ascertain whether they agree that piano teachers should be trained in prevention education, and to determine the optimal instructional formats for that training.

Method of Procedure

This study was conducted in three phases. The purpose of the first phase was to identify performing arts physicians in the United States who treat pianists. These doctors became the target population for phase two, a self-administered questionnaire. To

qualify for the study, the physicians had to meet two criteria: (1) they must regularly treat musicians for performance-related health disorders, and (2) the musicians they treat must include pianists. Phase three consisted of telephone interviews with the four respondents who had the greatest amount of experience in treating pianists for PRHD's.

Susan E. Harman, Library and Information Services Director of the Medical and Chirurgical Faculty of the Maryland State Medical Society, supplied a list of performing arts medicine clinics and programs by mail. The 1999 membership directory of the Performing Arts Medical Association and names of performing arts specialists compiled by Wristen[21] and Zaza[22] supplemented the list which Harman provided. Altogether, forty-four qualified physicians were identified, becoming the target population. The selection of the target population helped to answer research question one, identifying performing arts physicians active in the United States who have experience in treating pianists for PRHD's.

Before beginning phase two, a pilot questionnaire was mailed to six hand specialists familiar with treating musicians. All six pilot subjects completed and returned the questionnaire; their comments were used for revising the questionnaire and for determining how much time was needed to complete the survey. During the second phase, the forty-four performing arts physicians identified in phase one received the revised questionnaires (appendixes A, B, and C). The questionnaire sought opinions from these specialists regarding information and training within the field of the health

---

[21]Wristen, 114-120.

[22]Zaza, *Play it Safe*, 75-80.

sciences they consider to be an essential supplement to piano teachers' education. The questionnaire also solicited opinions as to who is best qualified to train piano teachers in these topics and what is the most appropriate format to implement this training.

After the completion of phase two, the data collected were analyzed to answer research questions two, three, and four (i.e., whether performing arts specialists agree that piano teachers should be trained in health-related matters, what should constitute such training, and the optimal format to carry out that training.) Statistical analysis of the questionnaire results employed various measures of central tendency and variableness in order to determine any consensus findings. Bivariate analysis comparing demographic characteristics of the respondents with their responses explored the data for possible respondent bias. Demographic information which the questionnaire obtained also enabled the selection of the four interviewees for phase three.

The third phase of the study consisted of in-depth interviews as a follow-up to the questionnaire. Interview questions were framed by comparing the analysis of findings from the questionnaire with research questions two, three, and four in order to identify remaining ambiguities. The four respondents from phase two having the most experience treating pianists were selected for interviews by telephone. These interviews provided an opportunity for elaboration and clarification of responses recorded in the questionnaire. They also allowed interviewees to offer information not elicited by the questionnaire. Upon the conclusion of the interviews, responses to these questions were analyzed in three ways: statistical analysis of yes/no questions for central tendency; statistical analysis of attitude questions using a Likert-type scale for central tendency, and

examination of the interviewees' comments for recurrent themes.

The analyses of the data gathered in phases two and three formed the basis of conclusions regarding training piano teachers in the prevention, detection, and management of PRHD's and for recommendations on implementing these findings. One particularly significant finding is the identification of five health science curricula essential for piano teacher training. Identifying these topics helped to answer the research question that is most central to this study, which seeks to determine the essential training necessary to prepare teachers to assist in the prevention, detection, and management of PRHD's without being overly intricate or detailed (research question three.) An appendix is provided which outlines various subsidiary topics related to these five curricula (appendix H).

Feasibility of the Study

Four factors contributed to the likelihood that enough of the subjects in the target population would respond to validate its findings.

1. Performing arts medicine is still a relatively new field. The rapid growth from the early 1980s to the present attests to a "pioneer" mentality of its participants.

2. The burgeoning of research provides evidence of this mentality.

3. The majority of these physicians frequently operate on a *pro-bono* basis.

4. Since the financial support for performing arts medicine is limited, in large part due to the nature of its clientele, the long-term viability of the field is uncertain. Several studies document the view that arts educators and educational institutions are important

contributors for continued growth.

Delimitations

The target population of this study was limited to performing arts medicine physicians active in the United States, thus representing individuals most familiar with both medical and musical aspects of pianists' disorders. Physicians not associated with performing arts clinics or practices were excluded from this study, as were other health care professionals such as physical and occupational therapists.

The purpose of this study was to investigate curricular content which may be an important part of piano teacher training. No attempt was made to evaluate the relative effectiveness of specific prevention strategies. The study did not directly explore the importance of what piano teachers should do to prevent and manage injury, but rather, sought information on what they should be taught.

All items in the test instruments related to supplemental education in the health sciences which may be relevant to piano teachers. Examination of the broader applications of the results to music educators other than piano teachers were beyond the scope of this study. No differentiation was made between applications for current piano teachers in the field and prospective piano teachers (e.g., piano pedagogy students). As the main purpose of the study was to identify the core knowledge a piano teacher should possess, there was no attempt to distinguish educational requirements among subgroups of teachers such as independent studio teachers as opposed to college, university, or conservatory faculty.

Sections of the test instruments dealing with medical disorders were limited to those either caused or exacerbated by performance at the piano. Disorders which do not stem from performance (e.g., rheumatoid arthritis) were explored only inasmuch as they interrelate with issues involving general prevention education requirements.

Although it is impossible to completely separate physical and psychological factors influencing musical performance, this study focused on the physiological processes involved in performance-related health disorders. While recognizing that playing the piano entails a complex intertwining of the mind and the body, the relationships of specific psychological factors to PRHD's were beyond the scope of this study.

Outline of the Dissertation

Chapter two presents a review of related literature. Documents from both medical and music education sources are included, in keeping with the multidisciplinary nature of performing arts medicine. The history of musicians' disorders and of performing arts medicine are chronicled through historical surveys. Progress in the field as reflected in published research is traced, demonstrating the exploration of the epidemiology, etiology, and prevention efforts regarding performance-related disorders among pianists. The chapter concludes with leaders' recommendations for the piano teacher's role in prevention education. The literature is drawn from textbooks, books intended for the general public, journal articles, reports of conference proceedings, and academic papers, including theses and dissertations.

Chapter three describes the methods used in selecting the target population, pilot-

testing the questionnaire, and administering the questionnaire and interviews. Chapter four presents the data collected from the administration of the questionnaire. This chapter includes a correlation of important components of health science training in hypothetical curricular contexts, grouping the categories of essential instruction derived from analyzing data collected by part one of the questionnaire according to the optimal format(s) derived from part two. Chapter five contains a summary, conclusions, and recommendations regarding the health science information the performing arts specialists believe is important for piano teachers. Recommendations are addressed to piano teachers, piano pedagogy administrators, educational institutions, music education organizations, and interdisciplinary participants in performing arts medicine. Suggestions for future research conclude this chapter.

Definition of Terms

The nature of any interdisciplinary study demands careful attention to nomenclature. This is especially true in the field of performing arts medicine. Successful communication between piano teachers, students, and health care professionals depends upon understanding language peculiar to each discipline. In addition to these general concerns having to do with communicating across interdisciplinary lines, a number of ongoing terminological debates exist within the medical community itself.

The following glossary defines anatomic and medical terms used in this paper or fundamental to the understanding of the paper's content. Included in this list are some of

the disorders which pianists commonly develop.[23]

Absolute rest–cessation of all activities involving an injured part of the body

Acute–having a short and relatively severe physical course

Brachial plexus–a bundle of nerves beginning in the posterior base of the neck and extending through the axilla (the armpit region)

Carpal tunnel syndrome (CTS)–a condition arising from pressure on the median nerve at the point at which it goes through the carpal tunnel of the wrist

Chronic–persisting over a long period of time

Cubital tunnel syndrome–entrapment or compression of the ulnar nerve at the elbow

Cumulative trauma disorder (CTD)–disorders of the nerves, muscles, tendons, and bones which are caused, precipitated by, or aggravated by repeated exertions or movements of the body

Epidemiology–the division of medical science concerned with defining and explaining the interrelationships of the host, agent, and environment in causing disease

Ergonomics–the science which is concerned with the problem of how to fit a job to man's anatomical, physiological, and psychological characteristics in such a way as to enhance human efficiency and well-being

Etiology—the cause of a disease or disorder as determined by medical diagnosis

---

[23]The following sources were consulted in developing this glossary: Morton L. Kasdan, ed., *Occupational Hand and Upper Extremity Injuries and Diseases* (Philadelphia: Hanley and Belfus, Inc., 1991); Richard Norris, *The Musician's Survival Manual: A Guide to Preventing and Treating Injuries in Instrumentalists* (St. Louis, MO.: International Conference of Symphony and Opera Musicians, MMB Music, 1993); William B. Meinke, "The Work of Piano Virtuosity: An Ergonomic Analysis," *Medical Problems of Performing Artists* 10 (June, 1995): 48; Christine Helen Zaza, "Musicians' Playing-Related Musculoskeletal Disorders: An Examination of Physical, Psychological, and Behavioural Factors" (Ph.D. diss., University of Waterloo, ON, Canada, 1995) and *Faber's Cyclopedic Medical Dictionary*, 15th ed. (Philadelphia, PA: F. A. Davis, 1985).

Focal Dystonia (FD)–a movement disorder characterized by loss of voluntary control of specific muscles

Function–operation within physiologic limits

Hyperlaxity–demonstration of excessive joint laxity in accordance with established sets of criteria

Incidence–the frequency of occurrence of any event or condition over a period of time and in relation to the population in which it occurs

Neuropathy–disease or abnormality of the nervous system

Overuse–to employ a body part in an activity to a degree that exceeds its biologic limits and goes beyond its functional capacity

Parasthesia–a sensory disturbance such as numbness, tingling, or "pins and needles" sensations which accompanies certain neurological disorders

Pathology–the anatomic or functional manifestations of disease

Performance-related health disorder (PRHD)–a medical condition which interferes with the ability to play a musical instrument at the level at which an individual is accustomed, as manifest by pain, weakness, lack of control, numbness, tingling, or other symptoms

Performing arts medicine–that field of medical science which devotes itself to the diagnosis, treatment, rehabilitation, and prevention of maladies and disorders which affect performers

Prevalence–the number of cases of a disease or disorder present in a specified population at a given time

Relative rest–reduction of playing time at a musical instrument as limited by return of pain or other symptoms

Repetitive strain injury (RSI)–cumulative trauma disorder which stems from prolonged repetitive, forceful, and/or awkward hand movements

Risk factor–a condition, characteristic, or behavior which increases the likelihood of injury or pathology

Syndrome–a group of signs and symptoms that collectively characterize or indicate a particular disease or abnormal condition

Tendinitis–inflammation of a tendon

Thoracic outlet syndrome (TOS)–a conglomerate of signs and symptoms related to a compression of the brachial plexus or the subclavian vessel at various points from the base of the neck to the axilla

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The interdisciplinary nature of musicians' health issues requires a review of both medical and music education literature. The advent of performing arts medicine has led to a proliferation of articles in medical journals; a number of these periodicals are devoted entirely to the topic. *Medical Problems of Performing Artists*, the official journal of the Performing Arts Medical Association (PAMA), accounts for 12 percent of the total number of articles alone.[24] Publications such as *Hand Clinics*, the official journal of the American Society of Hand Therapists, have devoted special issues to musicians. *Performing Arts Medicine* is the most comprehensive general text on the subject to date. Other medical texts dealing with occupational disorders, although less direct sources of information, frequently contain sections which are relevant to the musician. A third category of books consists of manuals and guides written by health care professionals intended to educate musicians in issues related to the prevention of health disorders; some of these are co-authored by musicians. A special category of

---

[24]David J. Goode and Sarah-Patsy Knight, "Identification, Retrieval, and Analysis of Arts Medicine Literature," *Medical Problems of Performing Artists* 6 (March, 1991): 4.

authors includes interdisciplinary specialists trained in both music and medicine.

Other than those who have collaborated with health care professionals, few music educators have written on the subject of performance-related health disorders. Several historically important treatises on instrumental technique utilize anatomical and/or physiological principles. The remaining published sources from the music education community consist of articles and interviews from pedagogical journals, papers presented at performing arts medicine symposia, and contributions to pedagogy texts. Several teachers also have produced video presentations of injury-preventive technique; some of these are accompanied with printed explanatory information.

This review will first focus on the medical literature. The history of pianists' disorders will be traced to the formation of the performing arts medicine specialty. Chronicles describing the development of the specialty will follow, with an emphasis on research efforts. The research will be examined as it has progressed from establishing the scope of PRHD's among pianists (epidemiology), to exploring the nature and causes of these disorders (etiology), to investigating means to better prevent them.

The review of music education literature will focus on contributions of piano teachers, both historical and contemporary. The most pertinent historical documents in the field of piano pedagogy are treatises dealing with the teaching of piano technique. Leading writers who attempted to base their teaching on anatomical/physiological principles provide early instances of collaborations between music education and science. It was only after the early 1980s, when knowledge of pianists' disorders became more widespread, that teachers directly addressed performance-related injuries and

injury-preventive pedagogy. Although no contemporary teachers have written extensive texts on applications of performing arts medicine to piano pedagogy, several teachers well-known for their success in helping pianists prevent and recover from injury have provided interviews and written articles detailing their work.

This review will conclude with recommendations of both medical and educational writers regarding the piano teacher's participation in the prevention, detection, and rehabilitation of pianists' health disorders. Experts agree that the piano teacher has a vital role to play in injury prevention. The final section of this chapter will examine this new role of the piano teacher and the educational preparation it requires.

Historical Background

Pianists' performance-related disorders are not new. Dr. Hunter Fry reviewed twenty-one books and fifty-four articles from the medical literature written between 1830 and 1911, demonstrating a "high level of agreement" that the condition now known as overuse syndrome "at that time" was "common among musicians–as it is now."[25] (Fry uses the term "overuse syndrome" to represent the "hard core" of repetitive strain injury [RSI].) "Musicians were second only to writers in the recorded frequency of the disorder."[26] Fry cites nineteenth-century physicians Lewis, Oppenheim, and Wood as naming pianists to be particularly prone to the condition. Some doctors were especially concerned with the long-term effects of piano students trained to use the "Stuttgart

---

[25]Fry, 623.

[26]Ibid., 621.

method"–a technique which involved maintaining extended fingers and wrists while playing. Fry also notes that musicians of "great eminence" were not immune from injury; he observes "there appeared to be no serious proposition that this was in some way the fault of the players."[27]

Robert Schumann is the most well-known nineteenth-century pianist to have suffered a debilitating injury. Accounts of Schumann's aspirations to become a concert pianist thwarted through his misguided stretching of his right hand ring finger are commonly repeated in biographies and music history texts. Traditional reports blame Schumann's use of a mechanical device which extended his ring finger while leaving his other fingers free to exercise. Walker traces this explanation to Schumann's teacher and father-in-law, Friedrich Wieck, who may have promoted the theory in order to deflect any implications that he "forced" his students into potentially harmful physical practices.[28] Recent studies have challenged this long-held belief, suggesting that Schumann may have developed what is now referred to as a repetitive strain injury. These theories do not dispute Schumann's use of such a device, but contend he employed it therapeutically *after* the injury had already occurred. Various retrospective diagnoses have been offered: Stiehl suggests damage to the radial nerve;[29] Wristen, focal dystonia (a type of movement

---

[27]Ibid., 623.

[28]Alan Walker, "Schumann and his Background," in *Robert Schumann: The Man and His Music*, ed. Alan Walker (New York: Barnes and Noble, 1972), 13.

[29]James Stiehl, "Overuse Syndromes in Professional Musicians," *Pan Pipes of Sigma Alpha Iota* (Spring 1990): 14.

disorder–see below);[30] and Sams, mercury poisoning (a side effect of treating syphilis).[31] Kim reviews these studies and concludes that neither Schumann himself nor modern scholars examining historical evidence can "explain Schumann's hand problem satisfactorily . . ."[32] Nevertheless, "it is still clear that the mechanical device was not the original cause of his problem. Instead, it appears to have been used to improve a pre-existing condition."[33]

No such uncertainty surrounds the difficulties of Clara Schumann, Alexander Scriabin, or Ignace Paderewski. Although their injuries are not as well known as Robert Schumann's, there is no question that each suffered from a performance-related disorder. Clara Schumann intermittently suffered debilitating pain throughout her career. The earliest record of symptoms refers to pain in her fingers in 1841; pain in her fingers, hands, and arms ultimately resulted in ceasing performance entirely for eighteen months between 1874 and 1875. A diagnosis given in 1857 cited "rheumatic inflammation caused partly by overwork and partly by catching cold."[34]

Alexander Scriabin, who injured his right hand as a piano student at the Moscow Conservatory, regarded the "trouble with my hand" as the "gravest event of my

---

[30]Brenda Wristen, "Fitness and Form to Reduce Injuries," *Clavier* 35 (1996): 27.

[31]Jinie Kim, "Physical Problems Prevalent Among Pianists" (DMA diss., University of Washington, 1997), 21.

[32]Ibid., 22.

[33]Ibid., 19.

[34]Ibid., 23.

life . . ."[35] As with Robert Schumann, Scriabin's injury prodded him to more actively pursue a composing career. However, there is no question with Scriabin of a mechanical stretching device precipitating his injury; Scriabin clearly injured his hand by "over-practicing." One beneficial result of Scriabin's injury was the writing of several piano solos for the left hand alone, a significant addition to that specialized repertoire.

Paderewski injured his hand during his 1891-1892 concert tour of the United States. The rigorous itinerary demanded almost non-stop concertizing and socializing. Increasing fatigue eventually led to symptoms of aching in his hands. Encountering an improperly-regulated Steinway at a New York recital, Paderewski felt intense pain almost immediately after beginning the concert, sensing "something seemed to break in his arm."[36] He somehow managed to finish the recital but immediately afterward consulted a doctor. The physician's diagnosis of torn and strained tendons could not convince Paderewski to end the tour prematurely. Despite the pain the injury produced, Paderewski completed his obligation, attempting to avoid financial loss and professional embarrassment. It was only after the finish of the tour that he could rehabilitate his arm through rest and massage therapy, ultimately regaining its full function.[37]

Despite documentation of pianists' physiological afflictions reaching well back into the nineteenth century, it was not until the modern press publicized the cases of two prominent later twentieth-century pianists that the widespread nature of these disorders

---

[35]Sen.

[36]Ibid.

[37]Ibid.

became suspected. World-class pianists Gary Graffman and Leon Fleisher both began to develop difficulties in performance in the early 1960s. Concert obligations led Graffman and Fleisher to utilize compensatory techniques to counter initial symptoms of distress rather than ceasing performance. Graffman, who had hurt his right hand ring finger trying to play an unresponsive piano, learned to rely on using his middle finger when playing octaves. Fleisher first noticed a peculiar sluggishness in his right index finger. Rather than resting or treating it medically, he intensified his practicing. Each pianist's physical condition continued to deteriorate; ultimately Graffman and Fleisher both realized they could not hope to continue their performing careers without medical intervention.

Unlike musicians who frequently attempted to hide their difficulties (performance-related disorders are sometimes referred to as "closet disorders"), Gary Graffman "trumpeted" his "cries for help."[38] Other musicians typically avoided consulting doctors, fearing loss of employment if their injuries were revealed; many also did not trust practitioners of traditional medicine to deal with musicians sympathetically. When his problems became incapacitating, Graffman sought out eighteen doctors in the span of three months, receiving almost as many diagnoses. Finally he consulted physicians at Massachusetts General Hospital, the first practitioners who "listened to what I had to say."[39] Graffman recommended the team to Fleisher, who also sought their help.

---

[38]Gary Graffman, "Doctor, Can You Lend an Ear?" *Medical Problems of Performing Artists* 1 (March, 1986): 5.

[39]Ibid., 4.

Although neither Graffman nor Fleisher were able to resume "normal" performing (they continued concertizing using literature for the left hand), they both agreed that timely medical intervention can offer musicians hope of recovery and the resumption of performing activities.

Graffman spoke about his experience freely from the beginning. Jennifer Dunning's 1981 interview of Graffman in the *New York Times* proved to mark a watershed.[40] Dunning detailed the plights of both Graffman and Fleisher; she also mentioned the Boston doctors who had treated them. Musicians who had been "members of this growing army of the secretly-disabled" reading the interview had reason to hope that the same Massachusetts General Hospital medical team which had sympathetically treated Graffman could offer them hope as well. Word spread quickly; in the following year alone these physicians saw 300 musicians for disorders related to performance. "By the summer of 1982, when the term Music Medicine was coined, musicians with physical difficulties had begun to discover that their 'unique' miseries were, in fact, widely shared."[41]

The cases of Graffman and Fleisher proved to be precipitous. Physicians familiar with their ordeals recognized that musicians had historically been underserved by their profession. Prompted by increased investigation into musicians' disorders, these doctors helped to form the specialty of performing arts medicine. A notable increase of medical

---

[40]Jennifer Dunning, "When the Pianist's Fingers Fail to Obey," *New York Times* (June 14, 1981): sec. 2, 1.

[41]Ibid., 6.

literature dealing with musicians followed, as performing arts specialists attempted to inform other health care professionals of their research and experience.

Harman has traced the development of performing arts medicine from its historical precursors to its inception as a specialty to its "arrival" as a field.[42] The earliest references to instrumentalists' "occupational diseases" are found in Bernardino Rammazini's *Diseases of the Tradesman* of 1713. Through the next two centuries specific medical attention to musicians' physiological problems was sporadic, with the most notable contributions to the literature being *Diseases of the Musical Profession: A Systematic Presentation of Their Causes, Symptoms, and Methods of Treatment* by the German neurologist Singer (English translation, 1932)[43] and *Music and Medicine*, edited by the Americans Schullian and Schoen in 1948.[44] Interest gradually rose over the next two decades, but without overall organization. Although Harman acknowledges the 1977 publication of *Music and the Brain: Studies in the Neurology of Music*[45] as the date "many experts" cite to mark the birth of the modern field of performing arts medicine, the 1981 *New York Times* interview with Gary Graffman is when the "dam burst."

---

[42]Susan E. Harman, "The Evolution of Performing Arts Medicine," in *Performing Arts Medicine*, 1–18.

[43]Kurt Singer, *Diseases of the Musical Profession: A Systematic Presentation of their Causes, Symptoms and Methods of Treatment*, trans. W. Lakond (New York: Greenberg, 1932).

[44]Dorothy M. Schullian and M. Schoen, eds., *Music and Medicine* (New York: H. Schuman, 1948).

[45]MacDonald Critchley and R. A. Henson, *Music and the Brain: Studies in the Neurology of Music* (New York: Thomas, 1977).

Evidence of the viability of the fledgling field includes the formation of a number of performing arts medicine conferences, many of which are held annually, a growing number of clinics devoted to treating musicians and other performers, and several professional medical organizations and journals. These activities also have spawned a significant rise in the amount of research in the field. By 1990, Dr. Brandfonbrener could declare that "the presence of Arts Medicine as a medical discipline is an accepted reality today."[46]

Although performing arts medicine has passed from birth through "infancy" and "adolescence," it faces an "uncertain future." Lederman, while referring to the 1989 review of performing arts medicine in the esteemed *New England Journal of Medicine* as evidence of the specialty's "coming of age," recognizes that much more progress remains to be made.[47] Continued research is needed to better understand the cause and treatment of musicians' disorders; physicians need to be educated in the skills associated with the field; musicians and their teachers must be informed as to how they can help avoid these disorders. He believes "a multidisciplinary and collaborative approach to the problems of performing artists is not only desirable but absolutely necessary."[48]

One vital concern is the education of prospective performing arts medicine practitioners. In a study of twenty-three performing arts clinics in the United States,

---

[46]Ibid., 17.

[47]Richard J. Lederman, "The Coming of Age of Performing Arts Medicine," *The Western Journal of Medicine* 160 (Jan, 1994): 73.

[48]Ibid., 74.

Pascarelli and Bishop found that "none of the programs has integrated a teaching component."[49] This is partly due to the interdisciplinary nature of the specialty itself, reflected by the variety of specialties represented by the directors interviewed for the study. These specialties included physiatry, neurology, internal medicine, psychiatry, otolaryngology, orthopedic medicine, osteopathy, rheumatology, and rehabilitative medicine. Funding is also a problem, largely because of the limited market which performing artists constitute. Additionally, few musicians have institutional support to pay for medical care; 75 percent of the patients serviced by the surveyed clinics were treated on a *pro-bono* basis. The lack of educational components "complicates the establishment of residency programs serving to institutionalize the specialty."[50] Pascarelli and Bishop conclude that "arts academies and academic centers that teach performers their skills" may have to take the burden for ongoing development of funding of teaching programs due to the financial challenges within the health care system.[51]

Research Efforts

Recognizing that no one really knew how widespread the physical problems of performers were ("Early reviews of the subject bemoaned the lack of solid statistics."[52]),

---

[49]Emil F. Pascarelli and Christina J. Bishop, "Performing Arts Medicine: The Status of the Specialty Within an Evolving Health Care System," *Medical Problems of Performing Artists* 9 (Sept, 1994): 66.

[50]Ibid.

[51]Ibid.

[52]Harman, 10.

some of the first steps researchers took involved surveying numerous populations of musicians to determine the prevalence and incidence of performance-related disorders. (These terms as used in epidemiology have distinct meanings–prevalence refers to the percentage of a population having a disorder at a given time whereas incidence refers to the number of *new* cases occurring during a given period of time.) The results of these studies have been widely reported in the literature.

In one of the most widely-noted of such studies, Fishbein and Middlestadt conducted a survey of over 4000 professional orchestral musicians in 1986; 76 percent of the 2212 respondents reported that they had developed a problem "severe enough to affect performance."[53] Similar findings of the prevalence of "performance-induced injuries" or "overuse syndrome" among professional or " high-level" musicians range from a low of 32 percent to a high of 84 percent.[54] Studies of incidence by Fry, Lockwood, and Manchester on various student populations in Australia and the United States report rates of "overuse," "medical problems," or "hand problems" of 13, 17, and 8.5 percent, respectively. Newmark and Lederman found 72 percent of respondents attending a week-long chamber music conference "developed some new health-related problems" associated with increased playing time. The nature of these problems were symptomatic: respondents described subjective difficulties such as pain or muscle spasm as opposed to

---

[53]Martin Fishbein and Susan E. Middlestadt, "Medical Problems Among ICSOM Musicians: Overview of a National Survey," *Medical Problems of Performing Artists* 3 (March, 1988): 8.

[54]Brandfonbrener, 20

diagnosed pathologies.[55] Among all musicians, keyboard performers account for 40 to 60 percent of patients "presenting to the practices of most performing arts clinic."[56]

Zaza has critically reviewed the eighteen English-language surveys of student and professional musicians published by 1998.[57] She found that many of these studies contained serious flaws of research design and data collection. Examples of flaws include low response rates, unblinded data collection, incorrect calculations, and unclear definitions of performance-related injury. Zaza concludes the best estimates of the prevalence of performance-related musculoskeletal disorders among classically-trained professional musicians to be 43 percent and among child and adolescent music students to be 17 percent when flawed studies are excluded. These numbers are somewhat lower than those which are often reported, but significant enough to confirm that "this is a serious problem for musicians."[58]

Performance-related Health Disorders

Some of the earliest studies of musicians attempted to identify those disorders which can be associated with occupational groups previously studied. Researchers found that musicians' maladies are not unique, but fit within the "umbrella" classification of

---

[55]Richard A. Hoppmann and Nicholas A. Patrone, "A Review of Musculoskeletal Problems in Instrumental Musicians," *Seminars in Arthritis and Rheumatism* 19 (October, 1989): 18.

[56]Brandfonbrener, "Etiologies of Medical Problems," 26.

[57]Zaza, *Play it Safe*, 37–39.

[58]Ibid., 32.

cumulative trauma disorders (CTD) suffered by workers from many occupations. Moseley et al. define cumulative trauma disorder as "disorders of the nerves, muscles, tendons, and bones which are caused, precipitated by, or aggravated by repeated exertions or movements of the body."[59] Alternative terms for CTD–repetitive strain injury (RSI), overuse, misuse, regional pain syndrome, work-related cervicobrachial disorder, and others–reflect ongoing debates as to the causes and nature of these afflictions. Musicians are more susceptible to CTD than the general population and are more vulnerable to subtle forms of physiological distress because of the "exquisite" demands of musical performance. Performing arts specialists stress that what might otherwise appear to be a "mild injury" may threaten the career of a musician.[60] Musicians frequently seek medical aid at an early stage, when laboratory testing is inconclusive. Accurate reporting of symptoms and exacerbating activities is an important way to prepare for visits, since diagnosis often depends heavily on such accounting of the patient's "history" as opposed to more objective measures.

Hoppman and Petrone classify PRHD's of instrumental musicians into three categories: musculotendinous overuse/inflammatory conditions, neurological compression/entrapment syndromes, and movement disorders.[61] Not considered were

---

[59]Linda H. Moseley et al., "Cumulative Trauma Disorders and Compression Neuropathies of the Upper Extremities," in *Occupational Hand and Upper Extremity Injuries and Diseases*, ed. Morton L. Kasdan (Philadelphia, PA: Hanley and Belfus, Inc., 1991), 353.

[60]Leo M. Rozmaryn, "Upper Extremity Disorders in Performing Artists," *Maryland Medical Journal* 42 (March, 1993): 255.

[61]Hoppmann and Patrone, 117.

"concurrent" and "intercurrent" musculoskeletal or circulatory ailments such as rheumatoid arthritis or Raynaud's disease which may impede performance but are not caused by playing a musical instrument. Musculotendinous conditions accounted for 62 percent of 179 musicians' disorders studied by Hochberg, neurological problems for 18 percent; the percentage of movement disorders was not provided.[62] Clinical series analysis by Lederman identified 8 percent of 507 instrumentalists seeking health care at the Cleveland Medical Center for Performing Artists had focal dystonia, the primary movement disorder among musicians.[63]

The most common musculotendinous maladies among musicians include overuse syndrome, tendinitis, deQuervain's tenosynovitis, epicondylitis, and stenosing flexor tenosynovitis ("trigger finger"). These are soft tissue injuries which affect muscles, tendons, or other connective tissues. Locations involving the junction of tendon and muscle are particularly susceptible, as are tendon sheaths (protective linings located in areas subject to excessive friction). The distinguishing characteristic of all of these conditions is pain at various sites in the upper extremities. Typically the process which leads to inflammation begins as friction or irritation of a musculotendinous unit through repeated movements, especially when accompanied by force and/or twisted positions. If adequate rest does not follow, the resulting microtrauma of the soft tissue is not allowed to heal and a vicious cycle of pain and muscle spasm ensues. Should this cycle remain

---

[62]Ibid.

[63]Richard J. Lederman, "Focal Dystonia in Instrumentalists: Clinical Features," *Medical Problems of Performing Artists* 6 (Dec, 1991): 132.

uninterrupted, what first begins as pain only with use advances to pain which lingers up to several hours or longer after use. Fry has outlined five stages of pain as a means to gauge this progression:

> *grade 1* - pain in one site on playing
> *grade 2* - pain in multiple sites on playing
> *grade 3* - pain persists away from the instrument
> *grade 4* - all common uses of the hand cause pain
> *grade 5* - same as grade 4 with loss of capacity to use the hand due to pain.[64]

Certain musculotendinous conditions are associated with specific sites: deQuervain's tenosynovitis where two thumb tendons pass through their sheaths (the first dorsal compartment); epicondylitis at the junction of muscles and tendons at either the inside (medial) or outside (lateral) aspect of the elbow; trigger finger at the palmar base of finger joints (i.e., metacarpalphalangeal joints). "Tendinitis" more generally describes inflammation of a (i.e., any) tendon. Although true tendinitis is characterized by inflammatory processes, actual clinical evidence of inflammation of musculotendinous conditions in musicians is often undetectable. The very term "tendinitis" is controversial, since inflammation, when present, often involves the tendon sheaths, not tendons themselves. Debate also surrounds the term "overuse syndrome," partly because of a lack of objective findings of inflammation. In 1994, the PAMA appointed a committee to address the terminological inconsistencies in the profession. This committee includes in its definition of "overuse syndrome" both specific pathologies such as epicondylitis and less-defined conditions sometimes called repetitive strain injury

---

[64]Hunter J. H. Fry, "Prevalence of Overuse (Injury) Syndrome in Australian Music Schools," *British Journal of Industrial Medicine* 44 (May 13, 1986): 40.

or cumulative trauma disorder. According to the committee, overuse syndrome results from overuse practice, "an activity in which anatomically normal structures have been used in a 'normal' manner, but to a degree that has exceeded their biologic limits and thereby has produced certain physical changes."[65] Overuse injury (some prefer "syndrome"), then, can be defined as "a condition that occurs when any biological tissue–muscle, bone, tendon, ligament, etc.–is stressed beyond its physical limit."[66]

Neurological disorders of musicians are classified separately from inflammatory conditions, but they are often interrelated. Nerves which control movement and sensation of the upper extremities are susceptible to injury wherever they travel through narrow passageways. Neurological syndromes (neuropathies) may be the end-result of inflammatory conditions: swelling of inflamed tissues may either entrap or compress nerves against bones or other non-yielding structures. Symptoms include not only pain but, characteristically, numbness and/or tingling (parasthesias). The best-known nerve entrapment syndrome results from such injury as the median nerve passes through the wrist's tunnel–carpal tunnel syndrome (CTS)–but the wrist is only one of several sites at which a musician's nerves may suffer trauma. Nerve entrapment or irritation at the cervical spine (involving the vertebrae of the neck) may lead to cervical radiculitis, resulting in neck or shoulder pain; it may also cause numbness in the fingers. A major

---

[65]William J. Dawson et al., "What's in a Name?–Terminologic Issues in Performing Arts Medicine," *Medical Problems of Performing Artists* 13 (June, 1998): 46.

[66]Richard Norris, *The Musician's Survival Manual: A Guide to Preventing and Treating Injuries in Instrumentalists* (St. Louis, MO.: International Conference of Symphony and Opera Musicians, MMB Music, 1993), 1.

network of nerves known as the brachial plexus may suffer compression in one of three locations in the neck and shoulder region, leading to thoracic outlet syndrome (TOS). Overuse, tightness, and swelling of muscles at the inner bend of the elbow can lead to stretching of the ulnar nerve around the outer aspect of the elbow and concomitant "cubital tunnel syndrome." Pinpointing the exact location of nerve damage can be difficult. Upton and McComas documented 115 patients who suffered mild neurological compromise at a more proximal location (closer to the center of the body), resulting in greater vulnerability for neuropathy at a more distal site (farther from the center of the body), in this case, the carpal tunnel. Thus Upton and McComas postulate that what had been diagnosed as carpal tunnel syndrome–the diagnosis each of the 115 subjects had received prior to the study–would better be understood as "double-crush syndrome."[67] Precise diagnosis which accurately isolates the primary location(s) of nerve entrapment or compression is essential for the proper treatment of any of these neurological syndromes.

One of the most intractable physiological disorders which pianists face is focal dystonia (FD), the primary form of movement disorders which are common among musicians. *Focal* dystonia describes the loss of control of specific muscles or muscle groups as opposed to the more generalized forms of dystonia involving larger portions of the body. Unfortunately for the pianist, FD (also known as "pianists' cramp") usually affects finger and/or wrist muscles, frequently only when needed for playing the piano.

---

[67]Adrian R. M. Upton and Alan J. McComas, "The Double Crush in Nerve-entrapment Syndromes," *The Lancet* (August 18, 1973): 361.

For example, a pianist otherwise having no symptoms may find his or her ring and little fingers curling uncontrollably at the outset of playing the instrument. When playing stops, symptoms disappear. Most authors consider focal dystonia to be a type of cumulative trauma disorder, but its cause is uncertain. FD is not characterized by pain or other symptoms associated with inflammation; it does not improve with rest as most other forms of CTD do. There is no cure for FD at this time; biomechanical retraining at the piano offers the most promising form of rehabilitation. A piano teacher who routinely monitors the student while performing may be the best source of early detection, since FD is usually task-specific and few physicians other than performing arts specialists observe patients playing their instrument. The prognosis for FD, as with all CTD, is much more positive with early detection.

The search for direct causes of these disorders is an ongoing process. Although common sense or personal experience may suggest rather obvious cause-effect relationships, actual scientific verification often has not been established. The etiology of a given PRHD may be complex and involve a number of factors operating "synergistically."[68] Obviously, a single traumatic event such as the spraining of a ligament or straining of a muscle has a directly traceable cause, but even then, many factors may have accumulated over time which increase vulnerability at a particular moment. Because of the current uncertainty regarding the etiology of musicians' injuries, many writers prefer to discuss risk factors–activities or pre-existing conditions

---

[68]Katy Keller, Julie Corbett, and Diane Nichols, "Repetitive Strain Injury in Computer Keyboard Users: Pathomechanics and Treatment Principles in Individual and Group Intervention," *Journal of Hand Therapy* 11 (Jan–March 1998): 23.

making an individual more susceptible to injury–rather than definite causes.

Writers reviewing the etiology of musicians' injuries have examined documentation of workers resembling musicians as well as musicians themselves. Prior studies in occupational medicine have established that "force, repetition, and posture are associated with an increased risk of work-related musculoskeletal disorders."[69] Studies specifically dealing with musicians identify abrupt increases in amount and/or intensity of practice, new repertoire, or a recent change of teacher or instrument as variables having significant association with incidence of injury. In one of the few studies isolating pianists as a target population, Hsu analyzed risk factors among fifty pianists seeking medical assistance at Columbia-Presbyterian Hospital in Manhattan.[70] Hsu found significant correlations between postural misalignment, awkward arm, hand, or finger positions used during playing the piano, and repetitive strain injury (RSI). Postural misalignment was particularly significant, diagnosed in 98 percent of the pianists having RSI. Sakai sampled forty Japanese pianists suffering from overuse injuries to examine relationships between symptoms and particular techniques.[71] Thirty pianists regarded specific technical contexts to be responsible for their injuries; playing octaves and sixths accounted for 77 percent of these. Since 58 percent of the diagnoses involved pain or

---

[69]Christine Zaza, "Musicians' Playing-related Musculoskeletal Disorders: An Examination of Risk Factors," *American Journal of Industrial Medicine* 32 (1997): 293.

[70]Hsu.

[71]Naotaka Sakai, "Relationship Between Painful Hands of Pianists and Piano Techniques," in *Current Research in Arts Medicine: A Compendium of the MedArt International 1992 World Congress on Arts and Medicine*, ed. Fadi J. Bejjani (New York: A Cappella Books, 1993), 351-352.

inflammatory processes of the thumb or little fingers (including deQuervain's tenosynovitis and lateral epicondylitis), Sakai concluded that a relationship exists between "wide-extent techniques and painful hands."[72]

The list of suspected causes is much longer than verified causes. Altogether, the literature offers over forty possible causes, which may be divided into the following categories: physiological factors, psychophysiological factors, technique, practice habits, posture, conditioning, and environment. The effect of any one of these factors is often multiplied when combined with other factors. Table 1 lists the more significant potential causes by category.

The literature offers several other categorizations of risk factors, varying according to each author's objectives. Fry provides a framework of three contributants to the onset of overuse syndrome: "the threshold, which is probably genetically determined; the product of intensity and duration of physical activity; and technique."[73] This classification provides for the examination of an individual's biologic limits in relation to overuse syndrome. Markison lists positive, cautionary, and negative traits which "affect prognosis among musicians."[74] A positive "prognostic factor," for example, is physical fitness, a cautionary factor is "static repertoire," and a negative factor is the inability to improvise. Markison's model enhances the predictive value of risk factors. An even

---

[72]Ibid., 352.

[73]Hunter J. H. Fry, "Overuse Syndrome in Musicians: Prevention and Management," *The Lancet* (Sept 27, 1986): 729.

[74]Robert E. Markison, "Treatment of Musical Hands: Redesign of the Interface," *Hand Clinics* 6 (August 1990): 527.

Table 1.–Possible Risk Factors for Musicians' Performance-related Health Disorders by Category

Categories	Possible Risk Factors
Physiological factors	Poor nutrition; size of carpal tunnel; long neck; droopy shoulders; presence of cervical rib; growth spurts; limited forearm supination; limited finger abduction; hyperlaxity
Psychological factors	Combination of physical and emotional stress; overachieving temperament; increase of stress; performance anxiety
Technique	"Nonphysiologic" technique; changes in technique; changes in repertoire; compensatory techniques; excessive ulnar deviation, wrist flexion, wrist extension, pronation, thumb under, or elbow flexion/extension; excessive force; overflexing finger joints; improper body mechanics; holding arms still; holding arms out too far
Practice habits	Changes in activity level; changes in playing requirements; nature of repetitions; repetitive practicing; no rest periods; octaves and chords
Posture	Postural misalignment; exceeding postural boundaries; faulty head positioning
Conditioning	Lack of muscle tone; lack of physical conditioning; avoidance of physical education in younger students; muscular imbalance
Environment	Acoustical properties of an instrument; acoustical properties of the environment; extremes of temperature, lighting, or seating; resistance of keys; poor regulation of the piano

broader division of risk factors separates those which are intrinsic (having to do with an individual's body structure and work habits) from those which are extrinsic (factors external to the individual), allowing for an assessment of the degree of control which an individual may exert over each factor.

Medical researchers continue to investigate the interactions of the pianist with the

piano, recognizing that effective prevention of PRHD's depends upon accurate understanding of their causes. However, medical history includes numerous examples of implementation of prevention programs which preceded complete understanding of causality.[75] As research has documented that PRHD's are common, that they are not new, and has identified factors which place pianists at greater risk of injury, more and more attention is being focused on their prevention.

Prevention and Music Education

Prevention efforts in music education have generally been limited to those individual teachers especially interested in the topic. Few comprehensive prevention programs have been reported in American music schools.[76] Spaulding offers insight on "what is perhaps the first" prevention program implemented in a music school at the Trøndelag Music Conservatory in Norway, where she serves as professor of physiology and prevention.[77] She regards the interdisciplinary approach which enlists both musical and medical participants as essential: "The complexity and multifactorial etiologies of performance-related disorders are too great for either the medical or artistic community to resolve

---

[75]Richard J. Lederman, "Neurological Problems of Performing Artists," in *Performing Arts Medicine*, 68.

[76]Mastroianni, 29.

[77]Crispin Spaulding, "Implementing Preventive Education in the Training of Professional Musicians," in *Music Medicine: Volume 2*, ed. Rosalie Pratt and Ralph Spintge (Saline, MI: International Society for Music in Medicine, 1996), 292-298.

alone."[78] All students take "Music Physiology" in the first semester and choose from related electives in subsequent semesters. Content of the courses encourages awareness of many pertinent factors, including biology, activities of daily living, practice habits, and distinguishing characteristics of specific PRHD's. Physiology deals with postural balance, ergonomics, relaxation, and stress management. Practicality is emphasized throughout the program, with the focus of instruction on performance applications rather than on theory. Students are provided information which allows them to maintain good physical and psychological condition, to monitor their health through diaries, and to be alert to early warning signs of distress so as to avert injury. A graduate seminar called Concert Preparation addresses issues which pave the way for a healthy transition to professional life as a musician. Spaulding stresses that the Trøndelag program should serve only as a model, to be adapted to each institution as appropriate.

Zaza urges that implementation of preventive techniques should proceed on the basis of research, not solely on common sense.[79] Zaza has analyzed potential intrinsic and extrinsic risk factors as to importance and ease of modification ("changeability"). Proven intrinsic risk factors identified in studies of musicians are gender and hypermobility; extrinsic factors include nonmusical activities, stress and tension, technique, instrument, instrument group, instrument size, teacher, repertoire, increase in playing time, and practice habits. Other factors she studied were suspected, as opposed

---

[78]Crispin Spaulding, "Before Pathology: Prevention for Performing Artists," *Medical Problems of Performing Artists* 3 (Dec, 1988): 135.

[79]Zaza, "Prevention of Problems," 117–120.

to proved. The following combine as constituting both the most important and the most changeable factors: duration of practice sessions, pause breaks, variety of content, "crash practicing," practicing away from the instrument, and stress management. She concludes that "considering the factors most amenable to change, the most appropriate group for implementing prevention is music teachers."[80] She suggests that teachers engaging in preventive pedagogy may safely proceed with instruction in the modification of practice behavior (warm-ups, taking breaks, pacing, variety of content, and cognitive rehearsal) and may provide guidance regarding various measures taken outside the practice room (exercise, instruction in functional anatomy, training in the Alexander technique, and stress management).[81]

Prevention Efforts in Piano Pedagogy

Most of the research in performing arts medicine originates after 1980; the majority of the literature dealing with playing and teaching piano predates these data. Nevertheless, the training of physical skills necessary to play the piano (generally referred to as "technique") has always constituted a major component of piano pedagogy, albeit a component not equally emphasized by all teachers. Technique has been identified in the medical literature as a main factor in the physiological health of musicians. Music teachers also rank "faulty" technique as a chief cause of injury.[82]

---

[80]Ibid., 120.

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

[82]Quarrier, 107.

Distinguishing "proper" from "improper" technique has been a source of much controversy throughout the history of piano pedagogy. Theories regarding the pedagogy of technique are characterized by highly individual and often conflicting approaches–representing what Wilson refers to as a respected legacy of "folklore" theories of how to play the instrument.[83] Among these many theories are a number of treatises which attempt to base technique on anatomic and physiological principles.

Piano technique, not unlike other segments of culture, is influenced in part by the "research interest of a given period."[84] It was therefore natural that late-nineteenth and early-twentieth century teachers would turn to science to substantiate their theories. However, "Exactly which branch of scientific investigation would be most applicable was not entirely clear, and as a result forays were made into the physics of mechanics, anatomy, psychology, and more recently into neurophysiology."[85] A more fundamental difference distinguishes those efforts which include scientific information from original research employing the scientific method.

Rudolf Breithaupt and Tobias Matthay were two early writers who attempted to utilize anatomic and physiologic principles in their pedagogy; "their texts were filled

---

[83]Frank R. Wilson and Franz L. Roehmann, The Study of Biomechanical and Physiological Processes in Relation to Musical Performance," in *Handbook of Research on Music Teaching and Learning: A Project of the Music Educators National Conference*, ed. Richard Colwell (New York, Schirmer Books, 1992), 511.

[84]Stewart Gordon, "Influences on Pedagogy," in *The Well-Tempered Keyboard Teacher* (New York: Schirmer Books, 1995), 293.

[85]Ibid., 325.

with medical illustrations and discussions . . ."[86] Many others followed. The physician Friedrich Steinhausen combined anatomy and psychology in his *Die Physiologischen Fehler und Umgestaltung der Klaviertechnik* of 1905, thus marking an early example of an interdisciplinary endeavor. Twentieth-century piano teachers Otto Ortmann and George Kochevitzky actively collaborated with anatomists, ergonomists, and neurophysiologists before writing their treatises; Ortmann formally studied anatomy at the Johns Hopkins University before embarking on his research. Arnold Schultz drew heavily from Ortmann in his *The Riddle of the Pianist's Finger.*

Even though all these writers took a more "scientific" approach than many of their predecessors, the conclusions each author reached varied widely. Moreover, more recent scientific evaluations have questioned the validity of many of their theories. ". . . the various 'scientific' approaches were almost all written by nonscientists, by musicians in fact, and are frequently somewhat lacking in both accuracy and completeness."[87] William Meinke, speaking as an ergonomist, maintains "piano theory has sometimes veered into ergonomically treacherous waters. Those versed in the principles of ergonomics can only cringe at Arnold Schultz's recommendation that the workload seen by the finger flexors in the forearm be shifted to the (even smaller and more easily fatigued) intrinsic muscles of the hand."[88] Otto Ortmann's *The Physiological Mechanics*

---

[86]Harman, 3.

[87]Gordon, 296.

[88]William B. Meinke, "The Work of Piano Virtuosity: An Ergonomic Analysis," *Medical Problems of Performing Artists* 10 (June, 1995): 48.

of Piano Technique of 1929[89] remains an exception to such scientific skepticism; neurologist Frank Wilson regards the value of Ortmann's work "undiminished,"[90] Harman describes his work as "objective" and "thoroughly detailed."[91]

Ortmann's text was intended to be the second portion of a trilogy. His first volume, *The Physical Basis of Piano Touch and Tone*, was published in 1925; he never completed the third book, which was to deal with psychological aspects. In *The Physiological Mechanics of Piano Technique*, Ortmann first provides a review of two aspects of physics relevant to piano performance: levers and laws of mechanical action. He then outlines the pianists' physiology in some detail: skeletal structure, the muscular system, muscular action, nerves, and circulation. Next he investigates the geometries of movement using the technological tools then available to carry out experiments. His final section investigates individual differences in the physical makeup of pianists.

Although Ortmann wrote *The Physiological Mechanics of Piano Technique* in 1929, many of the conclusions he reached retain their validity because they were based on scientific laws. One example is his observation that the metacarpalphalangeal (MCP) joints (located at the base of the fingers) are "pre-eminently fitted for vertical movements of the fingers."[92] Modern performing arts specialists agree with this view; Leon Fleisher,

---

[89]Otto Ortmann, *The Physiological Mechanics of Piano Technique* (London: Kegan Paul, Trench, Trubner & Co., 1929; reprint, New York: Da Capo Press, 1981).

[90]Wilson, 510.

[91]Harman, 3.

[92]Ortmann, 24.

in fact, believes that operating digits from the MCP joints to be one of the lessons he has learned through his personal ordeal.[93] Similarly, Ortmann's oft-quoted dictum that movement around a joint is easiest near the middle of its range of motion remains a mainstay of modern teachers attempting to promote preventive technique.

Far from being universally accepted, the "scientific" approach of Matthay, Ortmann, and others provoked responses ranging from outright rejection to disciple-like adherence. Gordon suggests three reasons for "recalcitrance" concerning Ortmann's work.[94] Some of the negative response may be due to a natural distrust of subjecting the artistry of pianism to the objectivity of science. In particular, many teachers fear an anatomical/physiological perspective may produce excessive introspection leading to the proverbial centipede's "paralysis by analysis." Secondly, Gordon alludes to the danger of a pianist diluting the artistic whole through intensively focusing on the physical aspects of performance. Lastly, he affirms the success of teachers who rely on "psychological suggestions" rather than "physiological directions." Although Gordon's remarks specifically address Ortmann, these concerns apply to other "anatomical" writers as well. A separate reason for resistance to these treatises is less profound: they are difficult to read, at least for the piano teacher untrained in the health sciences. Few teachers are sufficiently familiar with the scientific terminology necessary to comprehend the language of many of these texts. Intricate diagrams of physical forces as well as

---

[93]Noah Adams, *Piano Lessons: Music, Love and True Adventures* (New York: Delacorte Press, 1996), 31.

[94]Gordon, 335.

drawings or photographs of different parts of the human anatomy are difficult to understand without some basic scientific training. Gordon speculates that many teachers may actually have recognized the value of such writings but were "intimidated" by them.[95]

Since these teachers were largely unaware of the physiological disorders performing arts researchers have uncovered, they did not take a specifically preventive approach either to playing the piano or to piano pedagogy. The increased data which have resulted from the efforts of the emerging field of performing arts medicine therefore have produced a "new agenda for an old liaison."[96] More recent teachers who advocate a preventive approach include Dorothy Taubman, Carola Grindea, Barbara Lister-Sink, Alexandra Pierce, and Gail Berenson. These teachers regard Matthay, Ortmann and similar writers as pioneers in the "science of piano playing" and that the discovery of the large-scale prevalence of pianists' injuries has vindicated the scientific approach such authors represent. "We should be using science to help come up with the answers, otherwise we will continue to produce crippled pianists."[97]

Wolff's 1986 interview of Dorothy Taubman referred to her as the pianist's "medicine woman."[98] Founding the Taubman Institute in Amherst, Massachusetts in

---

[95]Ibid.

[96]Frank R. Wilson, "Music and Medicine: An Old Liaison, A New Agenda," *Psychomusicology* 7 (1988): 139-146.

[97]Konrad Wolff, "Dorothy Taubman: The Pianist's Medicine Woman," *The Piano Quarterly* 34 (Spring, 1986): 25.

[98]Ibid., 25-32.

1976, Taubman has devoted her career to "research and experimentation in piano technique." Through forty years experience with teaching children, she concluded that injuries result not from "overuse" but from "misuse." Taubman's approach to prevention is through employing strategies which produce efficient movement. She has drawn from the writings of past teachers such as Matthay and Ortmann. Matthay's contribution of the importance of forearm rotation represents to Taubman "one of the most important contributions to the science of technique."[99] She regards Matthay as a genius, noting that his research into the impact of the piano's mechanical properties on piano technique is unprecedented. Like Ortmann, though, she faults Matthay for over-emphasizing relaxation, which she feels leads to "flabby" fingers and forearms. Most notably, Taubman believes that proper technique can not only prevent injury but help to rehabilitate ("cure") the injured pianist. Although she has spent thirty years preparing a yet-unpublished book explaining her approach, at this time the most thorough exposition of the "Taubman technique" is a series of five videotapes which combine lectures by her assistant Edna Golandsky with demonstrations of Taubman's work with students at the piano.[100]

In addition to studying the writings of Matthay and Ortmann, Taubman investigated standard medical texts dealing with anatomy, physiology, and coordination. She is naturally inclined to take a scientific approach in piano technique, at one time having

---

[99]Ibid., 28.

[100]Edna Golandsky, *The Taubman Techniques* (Medusa, NY: The Taubman Institute, 1995), five VHS tapes.

considered a career in science. This scientific spirit of inquiry produced an objective analysis of technique, accepting nothing on the basis of tradition alone.

Taubman's philosophy that health at the piano is both achieved and restored through proper technique has won both devotees and skeptics. Students attending the summer Taubman Institute often come back annually for many years. These attendees include both injured and non-injured pianists seeking greater technical freedom. It is not unusual for those who have suffered injury to find relief from symptoms after a single session with Taubman. Yet " 'Dorothy Taubman has always been controversial.' "[101] Sam Viviano's recent letter to the editor of *Clavier* protested Taubman's assertion that she could cure any injured pianist, given sufficient time and dedication on the part of the student.[102] (To the question published in a previous issue, "Was a student ever injured too badly to be cured?" Taubman had answered, "No, although some students do not have the patience to see it through."[103]) Viviano relates five years of his diligent attempts to overcome focal dystonia through both medical assistance and retraining in the Taubman technique, to little avail. While lauding Taubman's vast knowledge of piano technique and acknowledging the effectiveness of her instruction, Viviano warns that "dogmatic, unfair, or unrealistic statements such as the one quoted earlier can turn some

---

[101]"Comments from Students of Dorothy Taubman," *Clavier* 37 (March, 1998): 14.

[102]"Sounding Board," *Clavier* 37 (May/June 1998): 2.

[103]Margalit Berkowitz, "Taubman's Way, Naturally: An Interview with Dorothy Taubman," *Clavier* 37 (March, 1998): 10.

pianists away."[104]

Grindea, a co-founder of the International Society for the Study of Tension in Performance (ISSTP), admits to being "obsessed" with the problem of tension in musical performance.[105] She maintains that our objective as pianists should not be the elimination of tension, but to learn how to balance the generation of tension with its release. Grindea advocates five steps in the management of tension in playing the piano: coordinating inner rhythm with musical rhythm, maintaining freedom of breathing, educating inner hearing, studying rhythmic and musical accents, and observing breathing while playing. Free breathing is fundamental in balancing inner tension with physical freedom. She believes that "If only more importance were given to freedom of breathing in piano playing (and in teaching) many of the problems created by tension would solve themselves."[106] Students are instructed to observe their breathing during practice sessions–not during performance itself. Especially important is detecting any point at which the student holds his or her breath, which frequently occurs when encountering technical challenges. As the pianist learns to exhale before difficult passages, awareness of free breathing gradually increases and tension is controlled.

Lister-Sink, herself having periodically suffered physical problems at the piano, has produced a video addressing preventive technique in conjunction with movement

---

[104]Viviano, 2.

[105]Carola Grindea, "Tension in Piano Playing: Its Importance and Dangers," in *Tensions in the Performance of Music*, ed. Carola Grindea (London: Kahn and Averill, 1995), 11.

[106]Ibid., 109.

specialist and Alexander practitioner, Glenna Batson.[107] Lister-Sink likens the habits of poorly-coordinated technique to a cage entrapping our musical selves within our bodies. Technical training (or retraining) begins with an understanding of the mechanics of the piano and of the mechanics of the body. Two essential characteristics concerning the nature of the piano are the instantaneous striking of each hammer against the strings and the horizontal placement of the keyboard, allowing the pianist to use gravity to minimize effort. Well-coordinated technique also recognizes that the lever system of the body works most advantageously with optimal skeletal alignment and efficient muscle use. Lister-Sink utilizes video technology to demonstrate how these factors interact. Exercises illustrate development of body awareness away from the instrument and applications at the piano. Batson uses a human skeleton to help explain basics of anatomy and movement. Students at various stages of development are observed while playing; Lister-Sink points out both the correct observance of efficient technique as well as areas needing further attention. Vintage video recordings of Artur Rubinstein exhibit a model of ideal posture, highly-refined technique, and transcendent artistry.

In an article written for the 1992 MedArt International World Congress on Arts and Medicine, Lister-Sink welcomes the collaborative efforts of music and science, continuing for over a century, but maintains that a "common language" must be developed before meaningful communication can transpire between the various

---

[107]Barbara Lister-Sink, *Freeing the Caged Bird: Developing Well-Coordinated, Injury-Preventive Piano Technique* (Winston-Salem, NC: Wingsound, 1996).

disciplines.[108] She believes that all pianists should achieve "command of the science of playing," incorporating "biomechanics–muscle tension and release, alignment, balance, and good coordination." An important premise is that we already have the information necessary to prevent injury; the key is successfully communicating that information.

Alexandra Pierce is a movement instructor as well as a piano and theory teacher. Like Taubman, Pierce addresses movement in conjunction with technique. However, in an essay written for the *Piano Quarterly*, her focus is on the pianist's sitting posture rather than arm and hand movements.[109] She alludes to the basic postural principle that the pelvis is the keystone of posture: "*The tilt of the pelvis is the foundation for sitting support and therefore for the mobility of your whole body, including your hands at the keyboard.*"[110] She groups possible sitting positions into three general types: slumped (spine in flexion), arched (spine in extension), and balanced. A balanced position allows the postural muscles to maintain balance; other muscles are then free to control movement. Optimal sitting posture also promotes more natural breathing. Pierce describes various exercises designed to discover a well-balanced sitting position at the piano.

Pierce has co-authored two books about movement with her husband, Roger. The Pierces find profound connections between music and "generous movement."

---

[108]Barbara Lister-Sink, "Freeing the Caged Bird: Developing A Common Language for Teaching Injury-Free Piano Playing," in *Current Research*, 301–303.

[109]Alexandra and Roger Pierce, "Pain and Healing: for Pianists–Part 3," *The Piano Quarterly* 32 (Summer 1984): 45–49.

[110]Ibid., 47.

"Tonal music, with its shapely melody, self-supporting harmonic progressions, incisive rhythmic figures, and articulation into phrases that have climax and completion, has qualities like those we are seeking in physical movement."[111] The Pierces use familiar processes such as breathing awareness, sitting balance, standing balance, and swaying as guides for better movement.[112]

Gail Berenson was the chair of the NCPP's Committee on the Prevention of Medical Problems from its formation in 1988; she presently teaches a wellness course for musicians entitled "Performance Preparation" as well as chairing the piano and piano pedagogy division at Ohio University in Athens, Ohio. Berenson has contributed a chapter to the third edition of *Creative Piano Teaching* in which she outlines comprehensive guidelines for the piano teacher to help ensure students' psychological and physical well-being.[113] She believes "Injury-preventative and wellness information needs to be a part of every competent and informed piano teacher's repertoire."[114]

Berenson stresses that teachers should employ a more "holistic" approach. Ancillary teaching techniques such as Dalcroze eurhytmics and the Alexander technique can help set the stage for freedom of movement and well-regulated posture. Careful positioning

---

[111]Alexandra and Roger Pierce, *Generous Movement: A Practical Guide to Balance in Action.* (Redlands, CA: The Center of Balance Press, 1991), 14.

[112]Alexandra and Roger Pierce, *Expressive Movement: Posture and Action in Daily Life, Sports, and the Performing Arts* (New York: Insight Books, 1989).

[113]Gail Berenson, "Music Medicine and Today's Piano Teacher," in *Creative Piano Teaching*, 3rd ed., by James Lyke, Yvonne Enoch, and Geoffrey Haydon (Champaign, IL: Stipes Publishing, 1996), 374–400.

[114]Ibid., 375.

of the body and hands should characterize lessons from the beginning. Extended positions should be introduced only after a stable and natural hand position within pentascale patterns is well-established; this criteria should help guide fingering of music and the selection of repertoire for the developing student.

Berenson offers specific strategies for efficient technique, safe and effective practicing, and the teacher's response to injury. Technique should rely on gravity rather than force as much as possible; static positions should be eschewed in favor of fluid, well-choreographed movement; special care should accompany the use of exercises, especially those which isolate individual fingers. Berenson's practice strategies take environmental and general health factors into consideration, carefully pace the use of repetition and the working out of technical difficulties, and inform the student to recognize and appropriately modify practice when early warning signs of distress are encountered. Guidelines for the teacher's response to injury are based on the stages of overuse symptoms as outlined by Fry; Berenson emphasizes that a stage three injury (i.e., pain which is present at rest and during many activities of daily living) is the teacher's cue to advise a student to seek medical intervention. Berenson places these guidelines in a "pragmatic" context, recognizing the importance of psychological as well as physiological factors. A supportive teaching environment helps promote self-esteem and alleviates stress, thereby reducing tension which otherwise could lead to injury.

A distinction may be made between teachers such as Taubman who maintain that physical problems are avoided or even solved entirely at the instrument and teachers such as Berenson who take a more holistic approach. The holistic approach extends the

pedagogical domain of the teacher to include monitoring various aspects of the student's lifestyle away from the piano such as diet, breathing, rest, and stress. It also places the act of playing the piano in new contexts, such as assessing whether a physiological disorder is developing and helping determine the need for medical intervention. Both approaches are based on awareness of physiology, but the holistic approach involves a significant broadening of the traditional role of the piano teacher, redefining the boundaries which determine the meaning of who a piano teacher is and the expectations of what a piano teacher does.

The Changing Role of Piano Teachers

Stewart Gordon enumerates four factors influencing the historical development of piano pedagogy: the nature of the music itself, the physical characteristics of the instrument for which the music was written, the research interest of a given period, and that period's prevalent philosophy.[115] The emergence of performing arts medicine has not changed the music pianists play, nor the instrument on which it is played, but it has significantly augmented the body of data concerning how we play it. The increased scrutiny of musical performance by performing arts medicine specialists underscores the need of the contemporary teacher to adapt traditional training to this growing body of knowledge.

Medical experts and informed piano pedagogy leaders agree that much of the future progress in the field of performing arts medicine is in the area of prevention and that the

---

[115]Gordon, 293.

piano teacher is an integral member of the prevention team. Moreover, experts from both fields view such involvement as a *responsibility* teachers must share in the proper training of students. By including piano teachers among those responsible for the prevention of performance-related injury, these leaders have mandated a "changing role" for piano teachers.[116] This new role embodies applications of performing arts medicine research in three areas: modification of existing information and activities which characterize traditional pedagogy, addition of new activities and information related to health issues, and active collaboration of piano teachers with health care professionals. With changes in the role of piano teacher come changes in the education needed to prepare teachers to assume this role.

The role of piano teachers in conjunction with performing arts specialists is the subject of Wristen's master's thesis.[117] Her study addresses both traditional and non-traditional activities associated with this role. Three phases of instruction are affected: prevention, early detection of signs of distress, and injury management. Most critical is the teacher's role in prevention. Teachers are in a virtually unique position to proactively guide students toward injury-free practice and performance. As a standard practice, teachers should instruct students to report any pain or other symptoms promptly. Setting guidelines for safe practicing are also a pedagogical responsibility. Repertoire assignments should take individual differences in physical and emotional capabilities into account. Teachers should monitor physical tension during the lessons themselves.

---

[116]Wristen.

[117]Ibid.

Although teachers must not diagnose medical maladies (Wristen correctly points out that medical diagnosis by persons not possessing a medical license is illegal), knowledge of disorders and the processes which lead to them can help the teacher in the early detection of problems, should they occur. Besides preventing and detecting injury, the teacher can play an important role in the rehabilitation process. The recovering pianist usually resumes playing the piano very gradually; the teacher can provide invaluable assistance in reevaluating technique and posture at this critical juncture.

The addition of Berenson's chapter addressing the piano teacher and music medicine in the third edition of Lyke, Enoch, and Haydon's *Creative Piano Teaching*, a standard pedagogy text, represents an acknowledgment of the new role of the teacher by recognized leaders in the field of piano pedagogy. Berenson assigns many of the same responsibilities of teachers to the realm of wellness and prevention of injury as Wristen. Stressing the proactive role the teacher can take, she proposes that "a strong focus on prevention . . . is applicable to everyone,"[118] from young children to college students. The teacher is the "students' first line of defense against injury;"[119] it is the teacher's responsibility to "assess the seriousness of the injury, and, if possible, determine the cause."[120] Teachers should inform themselves about physiology and the mechanics of the piano in order to formulate an efficient approach to teaching technique. Practice guidelines must be clearly communicated and reinforced, taking into account such

---

[118]Berenson, 375.

[119]Ibid., 387.

[120]Ibid., 389.

factors as the practice environment, posture, comfortable fingering, pacing, variety of material, and attention to any warning sign of physical problems.

Although the recognition of performing arts medicine's impact on piano pedagogy is growing, other studies regarding the status of contemporary piano pedagogy reveal this impact to be limited. A "major finding" of Kaplan's study of pianists' experiences with the Alexander technique was a lack of the integration of physical aspects of playing with other aspects of instruction.[121] Kaplan states that "there appears to be much controversy surrounding the role of the piano teacher and the definition of a good teacher."[122] The subjects in Kaplan's study sought lessons in the Alexander technique because of discomfort at the piano, which they partly attributed to deficiencies in their training. Kaplan recommends that both teachers and music schools should be more open to equal education of the body and the mind.

In a 1994 editorial regarding the status of performing arts medicine, Dr. Lederman found that the findings of performing arts medicine have produced little change in music teaching. "There is little evidence that the development of performing arts medicine has had any effect on methods of teaching, on the playing, practicing, or dancing habits of performing artists, or on the incidence of performance-related problems."[123] He regards interdisciplinary collaboration to be not only desirable, but altogether necessary for

---

[121]Iris Kaplan, "The Experience of Pianists Who Have Studied the Alexander Technique: Six Case Studies" (Ph.D. diss., New York University, 1994), 176.

[122]Ibid., 187.

[123]Lederman, "Coming of Age," 73.

future progress in the field. It is particularly important to communicate information to those who teach young children because of the long-term effect of such instruction through habit formation. He specifies that teachers should incorporate physiologic principles in technique training, should stress the importance of maintaining variety in practicing, should instruct students to avoid multiple repetition of similar movements, and should encourage mental practice.

In her review of the epidemiology of performance-related disorders, Dr. Brandfonbrener likewise emphasizes the enormously formative influence a music teacher often exerts on a child.[124] The independent teacher maintaining a private studio is shielded from the financial cutbacks which often reduce the opportunities for music instruction in this country's public school system. Children usually do not participate in the selection of a teacher, a choice which often establishes a "one-on one" relationship for many years. These factors place a great degree of responsibility on the teacher to develop effective, non-injurious technique. In addition to the responsibility the teacher maintains for anatomically-sound technical training, Brandfonbrener stresses the need to monitor any sudden change of the amount or intensity of practice time or of repertoire.

Quarrier surveyed music teachers from two schools to investigate perceptions of music-related injuries.[125] Quarrier selected music faculty from a school which emphasized performance (the Eastman School of Music) and a school which stressed music education (the Ithaca College School of Music) to receive questionnaires designed

---

[124]Brandfonbrener, "Etoiologies of Medical Problems," 22.

[125]Quarrier.

to explore opinions regarding causes and predispositions related to music-induced injuries. A premise to Quarrier's study is that "the music teacher should be prepared to educate the music student about prevention and care of an injury,"[126] stressing the likelihood that every teacher will eventually be confronted with at least one injured student. He likens the role of the music teacher in injury management with the athletic coach. Although results of the survey revealed most teachers were "fairly knowledgeable" about causes and predispositions of music-related injuries, opinions regarding injury management were inconsistent with the literature. Many teachers did not know the relative effectiveness of various treatments and lacked awareness of basic first aid for PRHD's. The absence of responses to the section of the questionnaire dealing with treatment for injury suggests to Quarrier that teachers are unsure or unconcerned about this topic. A study Quarrier conducted prior to this survey also revealed "few teachers were able to demonstrate good unstressed and efficient postural alignment."[127] Although Quarrier feels that teachers should not be blamed for injury, he concludes that it is the teacher's responsibility to guide the student to a pain-free career.

The analogy which Quarrier draws between the athletic coach and the piano teacher allows a number of comparisons. The coach is in a position not only to teach athletes, but to help prevent and manage injuries. Several professions work cooperatively in the training and care of the athlete, including coaches, trainers, and specialists in sports medicine. In 1992, the National Association for Sport and Physical Education, an

---

[126]Ibid., 106.

[127]Ibid.

association of the American Alliance for Health, Physical Education, Recreation , and Dance (AAHPERD), appointed a task force to review standards for athletic coaches. Eventually AAHPERD developed thirty-seven standards grouped in eight domains.[128]

Several of the standards stress the need for coaches to develop preventive programs in collaboration with other professionals. Standard 7, from the domain "Injuries: Prevention, Care and Management," expects the coach to "Facilitate a unified medical program of prevention, care and management of injuries by coordinating the roles and actions of the coach and a National Athletics Trainers Association (NATA) certified athletic trainer with those of the physician." Standard 18, from the domain "Training, Conditioning and Nutrition," outlines preparation for this role as resulting in the ability to "Demonstrate a basic knowledge of physiological systems and their responses to training and conditioning."

Lederman and Brandfonbrener address traditional activities of the teacher from a new perspective. Teachers are already conscious of the role they play in the formation of a child's habits. Technique training and guidance of practice are standard pedagogical functions. Quarrier's recommendation that teachers help manage injuries, however, alludes not only to new information teachers need, but to a new realm of activities they should perform.

Active collaboration with health care professionals constitutes the most fundamental change in the role of piano teaching. Mastroianni, chair of The Catholic University of

---

[128]"National Standards for Athletic Coaches," [http://www.aahperd.org/naspe/publications-coachstandards.html#C17], August 20, 2000.

America's piano department, identifies eight collaborative projects his school has undertaken in conjunction with the National Arts Medicine Center.[129] Each project requires cooperation from both medical and educational professionals; none represents an autonomous activity of either doctors or teachers. Thus in diagnosis "the performer and teacher must seek the most competent help available."–yet "After the medical diagnosis, an informed teacher can make an assessment of the physiological aspects of technique involved in the problem . . . the technique diagnosis."[130] Similar cooperation has been applied in treatment and therapy, rehabilitation (both physical and technical), teaching of wellness courses, and research projects. Especially vital is the teacher's assistance for a recovering pianist: "A technique rehabilitation is often equally important to a medical recovery if the problem is not to recur."[131] The student in the midst of recovery needs a teacher's aid in determining whether to cancel performances or juries. Ongoing communication between physician, therapist, teacher, and student is also essential in guiding the gradual return to the normal pre-injury level of practice/performance and repertoire.

The changes in the role of the piano teacher and the relationship between the music educator and health care providers may be illustrated by contrasting two different paradigms. The first paradigm, more typical of traditional interaction between piano teachers and health science, shows pedagogy and anatomy/physiology intersecting in the

---

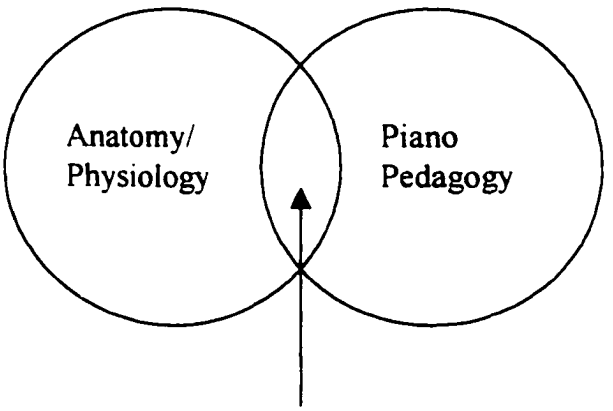
[129]Mastroianni.

[130]Ibid., 27.

[131]Ibid., 28.

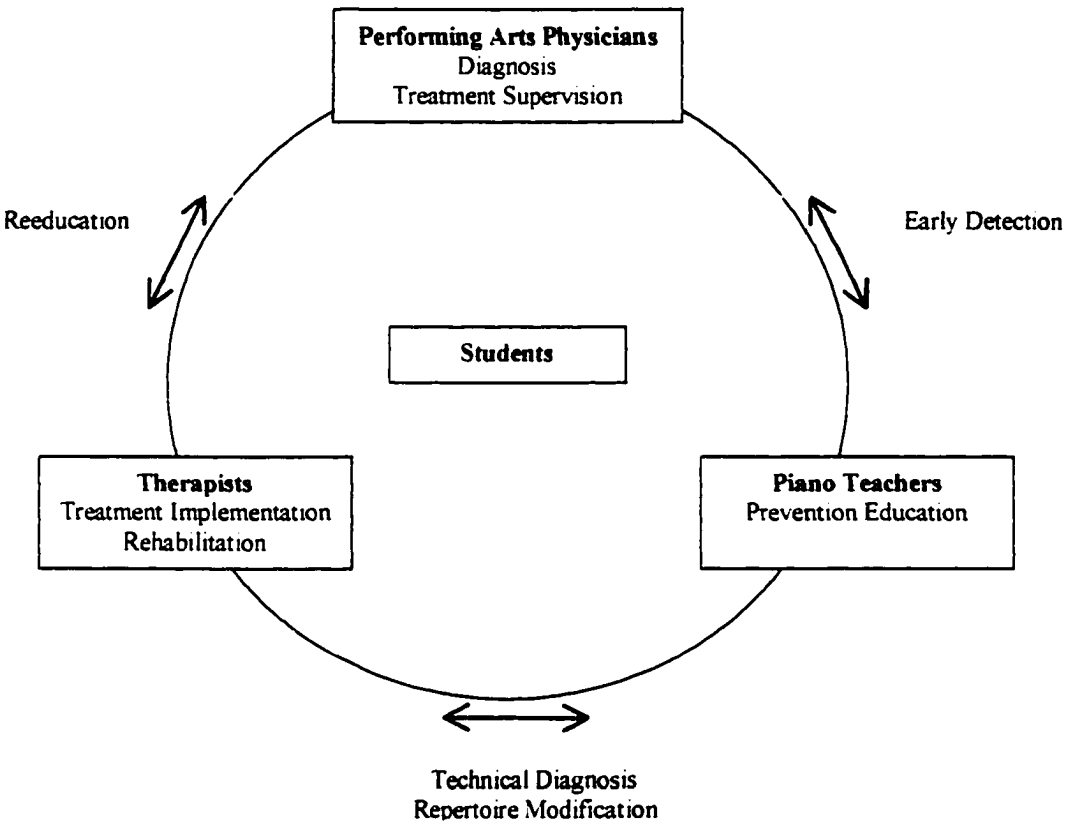
area of piano technique. Pedagogues who have relied on anatomical and physiological principles in developing theories of technique represent this paradigm. This paradigm, of course, is only one among many possible models of piano pedagogy. It must be kept in mind that the teaching of piano technique is highly individualistic and that many teachers have not and do not consciously rely on physiological principles in their teaching.

Paradigm 1: Traditional Piano Pedagogy/Health Science Interrelationship



The second paradigm combines various authors' views of the changing environment of interdisciplinary collaboration which performing arts medicine has encouraged. In this paradigm, three classes of professionals share responsibility for the well-being of the piano student. Fundamentally, the physician's main role in this paradigm is to diagnose and direct treatment plans for injured students, the teacher's main role is to educate and prevent injury, and the therapist's role is to rehabilitate. The double-pointing arrows signify that to a certain degree, these are shared responsibilities, and the roles overlap to that degree. This paradigm presents a hypothetical composite of viewpoints concerning

Paradigm 2: The Piano Teacher as Member of an Interdisciplinary Team



what the piano teacher's role should be or become in this relatively new environment of interdisciplinary cooperation.

A number of aspects of the traditional role of the piano teacher in our society support the practicability of incorporating these recommendations of performing arts specialists and teachers. In her appraisal of current trends in piano teaching, Uszler notes that the traditional mentor–apprentice relationship between teacher and student shows no

indications of decreasing in importance.[132] The individual attention each piano student receives along with a long-term commitment often extending over a number of years makes this relationship almost unique in our educational system. The constant oversight which such a relationship entails provides regular opportunity to monitor proper physical development and any necessary modifications as the need arises. Within this relationship, technical training–always seen as a responsibility of the teacher–continues to evolve. Teachers such as Dorothy Taubman and Barbara Lister-Sink demonstrate that injury-preventive pedagogy is a natural extension of the teachings of respected writers of the past like Matthay and Ortmann. In addition, the very environment of the teacher-student relationship provides an argument in favor of this role: "Schools are very good places for presenting preventative programs because students are in a setting for learning new ideas and techniques."[133]

Educational Prerequisites

As with other areas related to performing arts medicine, effective implementation of prevention programs is contingent upon careful research. Zaza has written a two-article series examining the rationale of prevention programs for musicians and those prevention strategies which music teachers can safely employ.[134] Basing her framework

---

[132]Marienne Uszler, "Research on the Teaching of Keyboard Music," in *Handbook of Research on Music Teaching and Learning: A Project of the Music Educators National Conference*, ed. Richard Colwell (New York: Schirmer Books, 1992), 584.

[133]Spangler, 20.

[134]Zaza, "Research-based Prevention," and "Prevention of Problems."

of prevention on the "precede-proceed" model of Green and Kreuter, Zaza stresses that health education must precede health promotion for the implementation of an effective prevention program. "Before health promotion in the performing arts can be fully achieved, health education must be addressed."[135] Zaza's analysis examining social, epidemiological, behavioral, educational, and organizational factors shows that musicians are concerned about health problems, that many risk factors involve modifiable behavior, and that music teachers are potentially the most effective enablors of change. Throughout both articles, Zaza emphasizes the importance of accuracy in the dissemination of prevention information. In the second article, she explores the possible risks in implementing prevention strategies without sufficient training. Improper instruction in stretching regimes, for example, may do more harm than good. Successful prevention education of music students requires adequate educating of the prevention educators themselves: music teachers themselves must first be trained in prevention education before they should train others.

Each aspect of the teacher's changing role which Wristen, Berenson, and others have described suggests a corresponding area of teacher training which is new to piano pedagogy. Understanding the nature and location of relevant structures of the human body, i.e., anatomy, is preliminary to all aspects of health involvement. "The key to prevention is to gain a better insight into and understanding of the human body."[136]

---

[135]Zaza, "Prevention of Problems," 117.

[136]Miriam C. Daum, "Musculoskeletal Problems in Musicians," [http://gopher.tenn.com:70/0/artswire/csa/arthazards/performing/musicians], 1997

Knowledge of basic anatomy also provides a theoretical base for the teacher attempting to build a scientifically-sound technique and facilitates understanding what happens when things go wrong, i.e., dysfunctional anatomy. Physiology, the study of the body in action, is an important "sister" field to anatomy–especially the physiology of exercise. "It is long overdue for music educators to respect and understand how their students' bodies function physically, physiologically, and mentally in order to better express the artistry of music."[137] In order for the piano teacher to recognize early warning signs of PRHD's, the teacher must be informed as to what those disorders are and the processes which lead to them (pathophysiology). Students developing symptoms of physiological distress often call on a teacher to help decide whether to fulfill performance obligations or to complete juries. Training is needed to assist the teacher in deciding if self-care, technical adjustment at the instrument, or medical consultation is the most appropriate route. Finally, the teacher desiring to assist a student through the rehabilitative process may benefit from understanding treatment protocols, especially as they relate to prescriptions for rest and work-hardening programs.[138] Education in anatomy, physiology, pathophysiology, and rehabilitation are not standard components of piano teacher training at this time.

Before its dissolution in 1994, the National Conference on Piano Pedagogy (NCPP) recognized that training in prevention education is a vital supplement to the training of future teachers. In 1990, the NCPP's Committee on the Prevention of Medical Problems

---

[137]Hsu, 44.

[138]Mastroianni, 28.

listed what piano teachers need in order to become effective agents for training piano students in physiologically healthy ways; the list was published in 1994.[139] As committee chair, Gail Berenson addressed the need to "implement, at the university level, courses in pedagogy which would make prospective teachers more aware of the above issues," i.e., issues related to performing arts medicine. She acknowledges that such topics are "frequently overlooked when confronted by the many other equally pressing requirements of a comprehensive music curriculum."[140] Potentially beneficial topics are numerous; they include "nutrition, stress management, intervention techniques for coping with performance anxiety, injury-preventative techniques, healthy practicing guidelines, vocal wellness, functional anatomy, postural alignment, and various mind/body disciplines, such as the Alexander Technique, yoga, and t'ai chi/qi gong."[141] Many of the other nine needs the committee identified involve teacher education, as well, including familiarity with basic physiological principles, awareness of a variety of efficient practice techniques, and knowledge of the psychological and physical risk factors which can lead to medical problems.

Wristen and Berenson encourage today's piano teacher to inform oneself in topics related to performing arts medicine. The increasing number of manuals written for this purpose present a wide spectrum of information with varying and sometimes conflicting emphases. Because of the interdisciplinary nature of the subject matter, teachers may not

---

[139]*Proceedings and Reference*, 193–199.

[140]Ibid., 199.

[141]Ibid.

be equipped to evaluate the relative importance of these emphases. Frequently the importance an author places on specific recommendations directly reflects that author's specialty. Paull, a physiotherapist, believes that musicians should know the athletic definitions of warm-ups, cool downs, stretches, strengthening, general conditioning, and cross-training.[142] In contrast, Hochberg, a physician, points out that musicians would benefit by being able to describe their symptoms in medical rather than strictly musical terms. He complains that the typical musician makes "Little mention of key words that would lead to an easy medical diagnosis."[143]

Several themes characterize the perspectives of the authors of these guides. Both Bishop[144] and Paull stress that the musician should view oneself as an athlete and pursue instrument-specific conditioning exercises. Bishop also stresses the need for proper nutrition and has a lengthy section on herbal medicine. Pascarelli, writing for computer operators while applying his comments to musicians as well, also views both groups as "upper-body athletes."[145] Weiss includes drawings of each muscle or muscle group involved in playing musical instruments, complete with their Latin names, descriptions

---

[142]Barbara Paull and Christine Harrison, *The Athletic Musician: A Guide to Playing Without Pain* (Lanham, MD: The Scarecrow Press, 1997), 110.

[143]Stephenson, 74.

[144]Dorothy Bishop, *The Musician as Athlete* (Calgary, AB: Kava Publications, 1991).

[145]Emil Pascarelli and Deborah Quilter, *Repetitive Strain Injury: A Computer User's Guide* (New York: John Wiley and Sons, 1994).

of their actions, and symptoms of muscular distress.[146] Bruser[147] and Lieberman[148] take a holistic approach, addressing yoga and meditation techniques in addition to awareness of anatomy and posture. Jameson, a chiropractor who frequently treats musicians, discusses alternative treatments for repetitive strain injuries such as chiropractic medicine, acupuncture, homeopathy, and naturopathy.[149] Norris, a doctor of physical medicine as well as a dancer and amateur flutist, provides descriptions of specific medical disorders in some detail in his *Musicians' Survival Manual*.[150] Symptomatology, etiology, and treatment protocols accompany the discussion of the common afflictions affecting musicians. Drawings or photographs of stretching and/or strengthening exercises are a common feature in these books, along with instructions on how to perform them. Although most of these books include caveats advising readers to consult health care professionals before initiating an exercise program or if symptoms of physiological ailments appear, by definition a "guide" or "manual" implies that readers can train themselves in at least some of these matters. This underscores the need for clarification, especially as to the extent either teachers or musicians in general are qualified to instruct

---

[146]Weiss.

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

[148]Julie Lyonn Lieberman, *You Are Your Instrument: The Definitive Musician's Guide to Practice and Performance*, 3rd ed. (New York: Huiksi Music, 1997).

[149]Timothy J. Jameson, *Repetitive Strain Injuries: The Complete Guide to Alternative Treatments and Prevention* (New Canaan, CT: Keats Publishing, Inc., 1998).

[150]Norris.

themselves.

The music curriculum in general and the piano pedagogy curriculum in particular has many "pressing requirements." Information and training which is essential to prepare the piano teacher to help prevent and manage PRHD's must be separated from that which is optional so as not to overly burden the curriculum. At this time there is no study that identifies this core body of knowledge.

Dissertations and Theses Consulted

Dissertations and theses consulted for the present study may be divided between those containing relevant content and those using similar methodology. Those which deal with pertinent content involve case studies of injured pianists, pianists who consulted with Alexander technique teachers, preferences of injured musicians regarding physicians and therapists, risk factors of injured pianists, awareness of teachers concerning playing-related injuries, and comparison of various biomechanical approaches to piano technique. Two studies provided methodological models: one which evaluated training of pedagogy students in technology and one which evaluated group piano pedagogy. Both of these studies combined the use of questionnaires with interviews.

Kim combines a historical study of pianists' disorders with five case studies of pianists recovering from medical problems.[151] The historical portions provide an overview of nineteenth century pianists suffering medical problems as well as the

---

[151]Kim.

development of piano technique. Kim compares the theories of Beethoven, Chopin, the Stuttgart school, Deppe, Matthay, Breithaupt, Leschetizky, Ortmann, and Schultz with modern understanding of anatomy and physiology to determine possible relationships of physical ease and the development of injury. Kim personally interviewed each of five pianists who had incurred performance-related problems to ascertain their initial development of symptoms, diagnoses, prescribed treatments, and attempted return to playing. Three of the pianists were female, two male, with ages ranging from twenty-nine to thirty-seven. The subjects reported demanding repertoire, manually writing term papers, compensating for physical impairments, stress, shoulder tension, studying with a new teacher or at a new school, lifting books, a sudden increase in time and intensity of practice, and playing an unresponsive piano as causes for their symptoms. Medical diagnoses included tendinitis, thoracic outlet syndrome, overuse syndrome, carpal tunnel syndrome, and radial tunnel syndrome. The pianists either sought or were prescribed the following treatments: training in the Alexander and Feldenkrais techniques, physical therapy, thermotherapy (applications of ice packs), prescription of anti-inflammatory drugs, surgery, biofeedback, psychotherapy, retraining of technique, modification of practice schedule, lessons with Dorothy Taubman, and conditioning of proximal muscles. Kim emphasizes that the solution to health issues at the piano is a personal one which each pianist can only fully work out on his or her own. "From these studies, it emerges that self-observation plays a critical role in the healing process of performance-related problems."[152]

---

[152]Ibid., 82.

Reports of the effectiveness of the Alexander technique in assisting the prevention and rehabilitation of musicians' injuries, though favorable, have largely been anecdotal. Kaplan undertook a qualitative study of six pianists who sought training in the Alexander technique.[153] Kaplan had two major objectives: to investigate the pianists' experiences with the technique and to explore how it affected their playing of the piano. Kaplan conducted two to three open-ended interviews with each pianist and observed them playing the piano. Kaplan coded and categorized the data, profiled each participant, and identified several themes which emerged. She found that the Alexander technique significantly enhanced the pianists' awareness of their bodies in general, of the body's role in playing the piano, and in detecting and releasing tension. Another "major finding" was that "there appeared to be an absence of piano teachers who could successfully integrate all aspects of piano playing into their technique. Participants largely complained about the lack of guidance that they received regarding the physical aspects of playing."[154] Kaplan not only recommends that piano teachers reexamine their role, but that music schools evaluate their curricula to explore means to more effectively "produce healthy musicians."[155]

Stephenson sought to find the kind of health care musicians prefer as part of her health science thesis.[156] She mailed a questionnaire consisting of three sections to three

---

[153]Kaplan.

[154]Ibid., 176.

[155]Ibid., 189.

[156]Stephenson.

orchestras which had not participated in the Fishbein-Middlestadt survey. The questionnaire's sections ascertained demographic and occupational characteristics, symptom and treatment experiences, and opinions on medical care. Of those responding, 78.6 percent reported a past musculoskeletal problem in their hands or arms. Of the 63.2 percent who sought treatment, 82.7 percent preferred consulting a physician specializing in the treatment of musicians. Similarly, 86.4 percent preferred therapists who specialized in the rehabilitation of musicians. Stephenson concludes that "the majority of respondents agree that they would prefer both physicians and therapists who specialize in treating musicians or are musicians themselves."[157]

Hsu studied fifty pianists who consulted Dr. Emil Pascarelli at Columbia-Presbyterian Hospital in Manhattan, New York between January,1995 and November, 1996.[158] Dr. Pascarelli is a cumulative trauma disorder consultant with considerable experience in treating musicians. Each pianist exhibited symptoms related to performance at the piano. The purpose of the study was to examine how hand positions and other factors contribute to physical injury while performing.

Hsu's study involved four steps. First, each pianist received a questionnaire to complete before the initial consultation. The questionnaire obtained information about initial and current symptoms, amount and nature of physical exercise, difficulties with activities of daily living, and any sleep disturbances. It also determined the patient's gender, level of playing ability (student, professional, or amateur), and age. After

---

[157]Ibid., 110.

[158]Hsu.

completing the questionnaire, Dr. Pascarelli examined each pianist; this included a postural assessment. Following the medical diagnosis, the pianist then played a selection of his or her choice while Pascarelli and Hsu observed. Finally, Pascarelli evaluated each patient to determine whether the pianist exhibited hyperlaxity (excessive looseness of ligaments).

Analysis of the data revealed equality of gender, that professionals are more likely to seek help, and that exercise of the upper extremities is often neglected. A significant correlation was demonstrated between postural misalignment and repetitive strain injury: 98 percent of the subjects exhibited poor posture. Specific hand positions which placed the pianists at greater risk of injury were hyperextension and hyperadduction of the fingers and ulnar deviation of the wrists, as well as excessive force of the fingers. Hsu draws conclusions which affect students and teachers: "This study proposes to music teachers and students several recommendations to prevent injury: warm-ups, breaks, pacing, variety of content, cognitive rehearsals, body movement and posture, exercise, studying anatomy of playing an instrument, and stress and anxiety management."[159]

Rogers surveyed piano teachers to explore their level of awareness of injuries, to examine factors which lead to greater awareness, and to explore prevention interventions.[160] The first phase of her study consisted of a questionnaire having twenty rank-order questions testing the teachers' ability to distinguish between injurious

---

[159]Hsu, 117.

[160]Sandra Margaret Rogers, "Survey of Piano Teachers: Awareness and Intervention of Predisposing Factors to Piano-related Injuries" (Ed.D. diss., Teachers College, Columbia University, 1999).

behaviors, non-injurious behaviors, and vague statements. Rogers classified those respondents who answered at least 85 percent of the question sets correctly as "highly aware," 70 to 80 percent as "generally aware," and 65 percent or less as "less aware." Teachers scoring in the "highly aware" range qualified for the second phase of the study, a structured telephone interview.

Rogers randomly selected college faculty from four states and independent teachers from the New York State Music Teachers Association. Of the 1000 questionnaires which were mailed, 211 were completed and returned, for a response rate of 21 percent. Rogers interviewed twenty-two of the seventy-eight highly aware respondents (10 percent of the total number of respondents).

Survey scores ranged from eight of twenty questions correct to twenty out of twenty, for a mean score of 14.41. The number of generally aware teachers (seventy-four, or 39 percent) almost equaled the number of highly aware teachers (seventy-eight, or 41 percent). The fewest number of teachers scored in the less aware range (thirty-eight, or 20 percent).

Rogers believes that the large number of respondents who show familiarity with issues regarding playing-related injuries shows increased attention to these problems. This attention, however, frequently comes about because of the teacher's own injury, a student's injury, or the injury of a colleague. "Unfortunately, it appears that awareness increases only after one becomes injured."[161] Rogers also found a significant relationship between education and awareness: the highly aware teachers were more likely to have

---

[161]Ibid., 139.

attended a lecture and/or symposium on related topics and were more likely to hold a higher degree than the less aware teachers.

Rogers designed the interviews to determine the factors which led to increased awareness, the factors teachers identify as predisposing pianists to injury, and the recommendations they make to students. In addition to their own injuries and the injuries of colleagues, professional development, body awareness training, and the publicity of injured artists contributed to greater awareness. Interviewees attribute injuries to tension, poor technique, potentially injurious movements, stress, genetic predisposition, and practice habits. Recommendations include body awareness training, better coordinated technique, improved practice habits, and the elimination of injurious movement.

The purpose of Wristen's dissertation was to critically review twentieth-century views of the playing apparatus, to provide a biomechanical description of selected skills associated with playing the piano, and to devise a list of prevention techniques.[162] She also examined various views on the advisability of using exercises at the piano.

Wristen reviewed both pedagogical and scientific authors. Pedagogues included Deppe, Leschetizky, Lhevinne, Matthay, Pichier, Whiteside, Ortmann, and Kochevitsky. She also summarized the views of True, Taubman, Newman, Fielden, and Sandor regarding exercises. Tubiana, Chaffin, Anderson, Harding, Bejjani, Chung, and Meinke authored some of the scientific studies in the review.

---

[162]Brenda G. Wristen, "Overuse Injuries and Piano Technique: A Biomechanical Approach" (Ph.D. diss., Texas Tech University, 1998).

Wristen maintains that, since "at the most basic anatomic level" our bodies are essentially constructed in the same way, it is possible to establish certain biological norms for playing the piano. In her paper, the combination of the critical review of pedagogical and scientific literature led to the biomechanical description of six skills: scales, arpeggios, trills, double notes, broken chords, and octaves. Wristen concluded with a list of fifteen prevention strategies.[163]

Methodological Models

Kenon Renfrow's study on the implementation of training in technology for graduate piano pedagogy students provided a methodological model.[164] Renfrow developed twenty-seven objectives for teaching students in both music and non-music technology while serving as a graduate assistant at the University of Oklahoma. These objectives formed the basis for a questionnaire which Renfrow mailed to ninety-two educational institutions in the United States offering degrees or emphases in piano pedagogy. He used a Likert scale to rate the importance of each objective from "very important" to "not important." The questionnaire also investigated which of the objectives were currently being taught. In addition, Renfrow elicited names of individuals within both piano pedagogy and music industry whom respondents deemed to be experts in music technology. He chose five pedagogy teachers and four leading music industry figures as

---

[163]Wristen, "Overuse Injuries," 233.

[164]Kenon Dean Renfrow, "The Development and Evaluation of Objectives for Educationg Graduate Piano Pedagogy Students to Use Computer and Keyboard Technology" (Ph.D. diss., University of Oklahoma, 1991).

a result of responses for follow-up interviews.

Renfrow piloted his questionnaire by administering it to pedagogy instructors familiar with technology, authors of recent dissertations using questionnaires, educational experts from the music industry, and graduate piano pedagogy students. Two weeks after the distribution of the questionnaire he telephoned recipients who had not responded in order to obtain their suggestions regarding the questionnaire. Comments of the pilot-test subjects formed the basis for revising and clarifying the questionnaire.

Renfrow then mailed the revised questionnaire to teachers of graduate piano pedagogy at the ninety-two institutions named in the *Directory of Piano Pedagogy Offerings in American Colleges and Universities* as granting degrees in piano pedagogy; a self-addressed stamped envelope and a cover letter explaining the nature of the study were included. Three weeks later he mailed a new questionnaire to those teachers who had not responded. Renfrow considered a response rate of 50 percent to be acceptable; a total of sixty-one were returned for a response rate of 66.3 percent.

E.L. Lancaster developed and evaluated a model for instructing piano pedagogy students in teaching group piano using a similar format.[165] Lancaster first developed a hypothetical list of competencies in teaching group piano. He then identified teachers of group piano by writing a sample of colleges and universities drawn from those accredited by the National Association of the Schools of Music (NASM). Teachers so identified

---

[165]E.L. Lancaster, "The Development and Evaluation of a Hypothetical Model Program for the Education of the College and University Group Piano Instructor" (Ph.D. diss., Northwestern University, 1978).

received a questionnaire which rated each competency, identified skills the teacher felt were lacking in their preparation, named exceptional programs, and suggested courses piano pedagogy students should take to prepare for teaching group piano. Responses to the questionnaire were used to identify experts whom Lancaster interviewed. Lancaster compared the results of the interviews with the results from the questionnaires to revise the hypothetical model and to identify weaknesses in teacher training.

Summary

Medical and educational literature provide strong support for enlisting piano teachers as part of an interdisciplinary team which helps prevent, detect, and manage performance-related health disorders. The historic occurrence of physical problems among pianists shows no sign of decreasing. Medical research affirms that most of these problems are preventable. Preliminary studies in prevention implementation identify music teachers as optimal prevention educators. Because this is a new role which requires new training, the determination of the new elements which should supplement the current education of piano teachers is essential.

CHAPTER III

METHODOLOGY

Introduction

The two instruments used to gather opinions of performing arts specialists concerning the training of piano teachers in health-related topics were a self-administered questionnaire and a follow-up telephone interview. The questionnaire was first pilot-tested by mailing it to six hand specialists familiar with treating musicians; their suggestions became the basis of revisions made to the questionnaire before mailing it to the target population. A target population of forty-four performing arts physicians experienced in treating pianists was identified using the 1999 Performing Arts Medicine Association membership directory and lists provided by Harman, Wristen, and Zaza. The revised questionnaire was then mailed to these physicians. Interview questions grew out of the analysis of the responses to the questionnaire. The questionnaire provided information enabling the selection of four highly-experienced physicians who became the interview candidates. Telephone interviews were conducted, tape-recorded, and transcribed. All data were analyzed in the effort to answer the four research questions.

Phase One: Selecting the Target Population

Susan E. Harman, Library and Information Services Director of the Medical and

Chirurgical Faculty of the Maryland State Medical Society, supplied a list of performing arts medicine clinics and programs by mail. Each program having an address in the United States was contacted by telephone in order to determine the physician(s) associated with the clinic who regularly treat(s) pianists. Because this list included numerous health care professionals who did not qualify for the study, had retired, had changed the nature of their practice, or were no longer reachable using the contact information Ms. Harman had provided, it became necessary to supplement this list with several others.

Three main sources served to supplement the list which Ms. Harman supplied. Although Wristen's list in her Master's thesis, "Overuse Injuries and Syndromes in Keyboard Players: The Roles of Performing Arts Specialists and Piano Teachers,"[166] was several years old, it furnished a number of additional physicians who qualified for the study. Zaza's resource manual[167] further augmented the growing list of active performing arts physicians in the United States. Finally, the 1999 membership directory of the Performing Arts Medicine Association (PAMA) added a sufficient number of qualified candidates to terminate the search.

Each clinic from the PAMA directory and the lists provided by Harman, Wristen, and Zaza was contacted by telephone or by electronic mail in order to identify the affiliated individual(s) possessing experience treating pianists. Four additional physicians were suggested in the process of contacting these clinics. Altogether, forty-

---

[166]Wristen, "Overuse Injuries," 114–120.

[167]Zaza, *Play It Safe*, 75–80.

four performing arts physicians qualified as the target population. Identifying these physicians answered the first research question: who are the performing arts physicians in the United States who have experience in treating pianists for performance-related health disorders. Given the relatively small target population, a goal of 75 percent returned surveys was set as the minimum acceptable response rate.

Phase Two: The Questionnaire

Description of the Questionnaire

Three sources formed the basis for developing the questionnaire. Literature related to the medical problems of pianists contains a number of recommendations pertaining to piano teachers assisting in the prevention and management of PRHD's. As such it represents a primary resource from which to query performing arts specialists. A second resource is personal experience. The author's own performance-related injury and subsequent rehabilitation has yielded considerable first-hand experience with performance-related health disorders and their treatment.[168] Formal course work in anatomy undertaken at the University of Oklahoma's Health Science Center further enhanced preparation for this study (see appendix D) and provided the third resource for developing the questionnaire.

The questionnaire consisted of three parts. "Curricular Content" addressed the areas of information and training in health science which have relevance for piano teachers.

---

[168]The author suffered an acute traumatic injury to the right hand during a concert performance in October, 1995. Continued loss of control of the hand led to the eventual diagnosis of focal dystonia. Primary modes of treatment included various physical and occupational therapies.

Part two, "Educational Context," identified those who are best qualified to train piano teachers in each of these areas and the optimal format for that training. The third part, "Background Information," provided a demographic profile of the respondents.

"Curricular Content" was the largest part of the questionnaire, consisting of six sections. These sections isolated the following aspects of health science: terminology, concepts and principles of anatomy and physiology, common disorders among pianists, preventive measures, medical referral, and rehabilitation. The same six topics were the basis for the second part of the questionnaire, soliciting opinions as to who constitute optimal trainers for each area.

Each of the six sections of part one followed the same format. A filter question was used to determine whether the topic as a whole represents an appropriate supplement to piano teacher training. The respondent continued with the remainder of the section when answering the filter question affirmatively, otherwise skipping to the next section. Questions within each section asked the respondent to rate the degree of importance of individual items having to do with the specified topic. The respondent could choose "essential," "beneficial, but not essential," "no opinion," "irrelevant," or "inappropriate." Each section ended with an open-ended question allowing for unanticipated responses.

Part two, "Educational Context,"consisted of two sections. The first section was designed to determine who is best qualified to instruct piano teachers in each of the six areas explored in part one (terminology, concepts and principles of anatomy and physiology, performance-related health disorders, preventive measures, medical referral, and rehabilitation). The second section of part two investigated optimal instructional

format in the same six areas. By dividing curricular content into six categories, it was possible to choose one trainer or format for one area and different trainers or formats for other areas. Respondents could choose one of five trainers for each of the six areas: piano pedagogy teachers, health science teachers, team teachers combining piano pedagogy and health science, interdisciplinary specialists, or self-instruction. Options for instructional format included "supplement to existing health science course," "supplement to existing music education course," "new course," "book/videotape for self-instruction," or "seminar/ workshop." Space was also provided in each of these sections for respondents to specify "other."

Part three of the questionnaire was a demographic section establishing the exact area of the physician's specialty, the degree of experience in performing arts medicine, and the percentage and number of patients each doctor treats who are pianists. This part also ascertained personal information such as age, gender, and the physician's ability to play the piano. Besides providing a demographic profile of the target population, information from this section was used to select the four interview candidates.

Oppenhiem's *Questionnaire Design and Attitude Measurement*,[169] Babbie's *Research Survey Methods*,[170] and Cox's *Your Opinion, Please! How to Build the Best*

---

[169]Abraham Naftali Oppenheim, *Questionnaire Design and Attitude Measurement* (New York: Basic Books, 1966).

[170]Earl R. Babbie, *Survey Research Methods*, 2nd ed. (Belmont, CA: Wadsworth, 1990).

Questionnaires in the Field of Education[171] served as guides in research design and questionnaire construction. Frey and Oishi's *How to Conduct Interviews by Telephone and in Person* helped with interview planning.[172] These sources also contain instruction in assessing the validity and reliability of the test instruments, in collecting and analyzing data, and in reporting results.

Piloting the Questionnaire

The questionnaire was first pilot-tested by mailing it to health-care professionals familiar with the issues of this study. Six hand specialists familiar with treating musicians were selected with the assistance of Virginia Clark, president-elect of the American Society of Hand Therapists. A cover letter explaining the study and a stamped, self-addressed envelope accompanied each questionnaire. The package also included provisions for suggestions to improve the questionnaire on a separate page. Those piloting the instrument were asked to record the amount of time necessary to complete the questionnaire.

The pilot questionnaire and accompanying material was mailed on December 20, 1999. Each physician received a package including a cover letter, a sample cover letter designed to accompany the actual questionnaire, the pilot questionnaire, a comment sheet, and a self-addressed, stamped envelope. The subjects were asked to return the

---

[171]James Cox, *Your Opinion, Please! How to Build the Best Questionnaires in the Field of Education* (Thousand Oaks, CA: Corwin Press, 1996).

[172]James H. Frey and Sabine Mertens Oishi, *How to Conduct Interviews by Telephone and in Person* (Thousand Oaks, CA: Sage Publications, Inc., 1995).

questionnaire packet by January 10, 2000.

Four of the specialists returned the packet by the deadline date. The remaining two packets were completed and returned after telephone and electronic mail reminders; the final packet was received on February 7, 2000. All the pilot subjects completed the questionnaire and comment sheet. Deletions, additions, or rewording based upon the pilot subjects' suggestions were made to the questionnaire before administering it to the target population. Five of these physicians are listed in appendix E; one subject preferred to remain anonymous.

Administering the Questionnaire

The questionnaire packet was mailed to these specialists on February 18, 2000. Each package included a cover letter explaining the nature of the project, an endorsement letter by Dr. Robert Sataloff, the questionnaire, and a self-addressed, stamped envelope. The endorsement letter by Dr. Robert Sataloff provided additional support and credibility to the project. Dr. Sataloff is an internationally-recognized performing arts specialist who holds an M.D. in otolaryngology as well as a D.M.A. in voice performance; he is also co-editor of *Performing Arts Medicine*. The deadline for returning the questionnaire was set as March 10, 2000.

A total of eighteen questionnaires were completed and returned by the initial deadline date of March 10. Those physicians who did not return the questionnaire were sent a reminder letter and a second questionnaire with a deadline date of March 27, 2000. An additional ten questionnaires were completed and returned by the second deadline

date. The sixteen remaining physicians who did not return the survey by the second deadline date were contacted by telephone or by electronic mail to remind them to return the survey and to inquire whether they needed an additional questionnaire. Since one subject who expressed interest in completing the survey requested a postponement, the cut-off was extended until mid-May. By this final cut-off date, eight additional physicians completed and returned the survey. The total number of thirty-six physicians who completed and returned questionnaires[173] represented a response rate of 81.6 percent, which exceeded the minimum of 75 percent set for the study.

Phase Three: The Interviews

Description of the Interview Questions

The purpose of the interviews was to verify key findings of the questionnaire, to clarify ambiguities which remained after the analysis of questionnaire responses, and to provide opportunity for interviewees to supply more detailed or unsolicited opinions. A review of the research questions combined with the analysis of the data collected by the questionnaire resulted in the following four interview questions. (Chapter four contains the complete analysis of the data gathered by the questionnaire.) The semi-structured format of these questions allowed for the objective comparison of responses while giving interviewees the freedom to offer unanticipated insights.

Interview question 1: "As a health care professional, do you believe that training in prevention education should be part of required curricula in the overall education of

---

[173]See appendix F for a complete list of respondents to the questionnaire.

piano teachers? Why or why not?"

This question verified whether performing arts physicians believe at least some components of health science training are essential in the education of piano teachers. The related research question is whether physicians agree that piano teachers should be trained to assist in the prevention, detection, and management of performance-related health disorders (research question two).

Interview question 2: "What, if any, risks are involved in training piano teachers as non-medical professionals to help prevent performance-related health disorders?"

Both this question and interview question three are related to research question three, dealing with how much training is adequate to prepare teachers for the role of assisting in the prevention, detection, and management of performance-related health disorders without being overly intricate or detailed.

Interview question 3: "Is it appropriate to train piano teachers to help determine when self-care for performance-related physical problems should end and medical consultation should begin? If so, what are the important components of such training?"

This question is an extension of interview question two. Some respondents' comments on the questionnaire implied concern that piano teachers not venture into the realm of medical diagnosis or referral to specialists.[174] For example, one subject remarked that "Lay people shouldn't decide for themselves what their diagnosis is and whether they need a specialist any more than M.D.'s should be telling students how to interpret Chopin." Interview question three was designed to clarify the collaborative

---

[174]See pages 122–126 for the complete text of respondents' comments.

relationship between music educators and health care providers.

Interview question 4: "How important do you feel it is that those who train piano teachers in health-related matters themselves have training in both medical and musical fields?"

This interview question relates to research question four, dealing with the most appropriate instructional context for training piano teachers in health-related topics. After answering interview question four, each interviewee was given the opportunity to offer additional comments regarding the training of piano teachers.

Selecting the Interview Candidates

Provision was made in the questionnaire for respondents to indicate whether they would be willing to grant a brief telephone interview to more fully investigate the issues which the questionnaire raised. All thirty-six respondents answered this question (Q-99); twenty-seven respondents expressed their willingness to grant an interview; nine of them declined. By correlating the number of years each physician has treated musicians (Q-95) with the average number of pianists each doctor treats annually (Q-97), it was possible to determine the four most experienced respondents.

Three of the candidates indicated their availability to conduct telephone interviews; one candidate, however, did not respond to repeated inquiries. Several weeks of unsuccessful attempts led to choosing the next most qualified respondent. All of the candidates who agreed to conduct an interview have treated musicians for at least sixteen years and treat at least sixteen pianists annually.

Administering the Interviews

After the candidates confirmed their availability for a telephone interview, each received a copy of the interview questions for advance preparation. These letters also explained that, with their permission, the telephone conversations would be tape-recorded and transcribed for their approval.

All interviews took place between June 17 and July 25, 2000. Interviews lasted between eight and thirty-six minutes. Each of the physicians granted permission for tape-recording before the interview began. Brief prefatory remarks preceded the reading of some of the interview questions in order to accurately communicate the intended context of the questions. Each interviewee received a copy of their interview transcript for corrections and approval. All four physicians returned a signed letter approving the transcript; one doctor included editorial corrections.

Analysis of the Data

Selecting the target population helped to answer research question one, identifying active performing arts physicians who treat pianists. Although the demographic portion of the questionnaire verified the qualifications of the respondents, the primary purpose of the questionnaire was to answer research questions two, three, and four.

Each section of part one ("Curricular Content") began with a question determining whether the physician believed piano teacher training should include instruction in each of six areas of health science curricula, thereby addressing research question two. Responses to these questions were tabulated and ranked in order to measure the degree of

consensus regarding whether piano teachers should be trained in these areas.

Since the main purpose of this study was to determine the core knowledge which piano teachers should possess in order to qualify them to prevent, detect, and manage PRHD's (research question three), those items which respondents deemed to be "essential" formed the critical portion of the data gathered. All responses in part one of the questionnaire were analyzed to determine three measures of common tendency: range, mode, and mean; standard deviation was also computed to provide a measure of variableness. Data were recorded on a computer-generated spreadsheet using Microsoft Excel 97.[175]

Once the common tendency and variableness of these data were determined, mean scores were sorted and ranked by the level of importance which respondents assigned to specific categories of instruction. This ranking allowed the mean scores to be divided into five different levels of importance. Categories receiving the highest scores were deemed to be "essential curricula"; scores within the second-highest level were "highly beneficial." The analysis of this data enabled the separation of topics which are essential for piano teachers from those which may be beneficial, but not essential. Ranking of mean scores also helped to determine if any categories are inappropriate for piano teacher training. Comparing the mean scores which individual categories of instruction received addresses research question three, isolating health science curricula which are essential for training piano teachers in prevention education from other less vital curricula.

---

[175]Microsoft Excel 97 SR 1 (Redmond, WA: Microsoft Corporation, 1997).

Analysis of part two of the questionnaire ("Instructional Format") proceeded as with the analysis of part one. After measuring common tendency and variableness, all mean scores were ranked by level of importance. This analysis determined who most respondents believe is best qualified to educate piano teachers and where to best deliver that training, thereby answering research question four. The next step of analysis correlated the results of this part with those of part one by sorting the essential curricula and the highly recommended curricula according to the optimal formats which respondents selected in each of the six areas of health science training.

Analysis of part three was helpful not only for the internal purposes of carrying out the study (i.e., by identifying the interview candidates) but also in identifying physicians most experienced in treating pianists. Although lists of performing arts specialists are readily available to the public, no list specifying those who regularly deal with pianists now exists. Questions ascertaining the degree of experience the subjects posses in treating musicians and pianists helped to verify that the thirty-six respondents qualify for this list, and thus confirmed that the selection of the target population answers research question one. Additionally, three items from part three were used for bivariate analysis with questions from parts one and two: years of experience in performing arts medicine, the physician's ability to play the piano, and gender. Chi-square analysis helped determine any significant respondent bias which may have affected the first two parts.

The semi-structured nature of the interview questions allowed both quantitative and qualitative analysis. Interview question one began with a portion which could be answered either "yes" or "no": "As a health care professional, do you believe that

training in prevention education should be part of required curricula in the overall education of piano teachers?" Interview questions two and three began with similar yes/no segments. Interview question four gauged the level of importance each interviewee assigned piano teacher trainers having dual medical and musical backgrounds. Responses to this question could be ranked by interpreting each answer using a Likert-type scale (i.e., very important, somewhat important, no opinion, somewhat unimportant, very unimportant). The objective portions of responses to interview questions one, two, and three and responses to interview question four were quantified and averaged in order to determine mean scores for each question.

The remainder of the interviews contained elaborations to the interview questions and additional comments. Analysis of this open-ended portion of the interviews consisted of the examination of these comments for the presence of any remarks which more than one interviewee offered. Interviewees' elaborations were then classified either as "comments," made by only one interviewee, or "themes," made by more than one interviewee.

CHAPTER IV

PRESENTATION OF THE DATA

Introduction

The two sources of data for this study were a self-administered questionnaire mailed to performing arts physicians who treat pianists and telephone interviews with four of the most experienced respondents. The questionnaire was designed to answer four research questions.[176] "What is the essential training necessary to prepare teachers for this role without being overly intricate or detailed?" is the most important research question. It attempts to define the core body of knowledge which performing arts physicians believe represents adequate health science training for piano teachers. This question hinges on a second, more fundamental question: "Do these physicians agree that piano teachers should be trained to assist in the prevention, detection, and management of performance-related health disorders?" A third question–"what is the most appropriate instructional format for this training?"–is contingent on the answers to the first two. Determining who should train piano teachers about health-related issues and how to best deliver this training depends on whether most experts agree that such instruction should take place and, if so, what the contents of that instruction are. The final research question attempts

---

[176]This chapter presents the research questions in order of importance. See p. 6–7 for the reference numbers of the research questions.

to identify the performing arts physicians in the United States who regularly treat pianists for performance-related health disorders.

The initial part of the questionnaire, "Curricular Content," dealt with the first two of these research questions. Each of the six sections comprising this part began with a forced-choice question determining whether the respondent agreed that piano teacher training should include the specified component of health education–research question two. Respondents who did not agree were directed to skip the rest of the questions in that section. All other respondents rated the importance of various corresponding categories of instruction. By dividing part one into six sections (terminology, concepts and principles of anatomy and physiology, common performance-related health disorders, preventive measures, medical referral, and rehabilitation), respondents could choose some areas of instruction without selecting others.

Subjects rated individual categories of instruction within each section on the basis of a Likert-type scale, choosing "essential," "beneficial, but not essential," "irrelevant," or "inappropriate." Respondents could also select "no opinion." Space was provided at the end of each section for "other" categories. The purpose of these questions was to outline a core body of knowledge physicians believe is necessary for piano teacher training without being overly detailed–the main research question (research question three).

The second part of the questionnaire focused on the educational context of health science training for piano teachers. This part sought to identify the qualifications performing arts physicians believe to be important for those who teach each area of health-related instruction and the optimal instructional format for that training (research

question four). Respondents who skipped a section(s) in part one were told to skip the corresponding question(s) in each section of part two. Besides enabling the examination of six different categories of educational context, dividing parts one and two into the same six sections provided an internal check of the questionnaire's reliability.

Part three of the questionnaire, "Background Information," provided a demographic profile of the responding physicians. This information was useful in selecting the four respondents most qualified for the telephone interview. In addition, items from part three were used for chi-square analysis to test whether opinions expressed in part one are independent from such variables as gender, experience in performing arts medicine, and the ability to play the piano. Finally, this part helped answer research question one–who are the performing arts physicians experienced in treating pianists for performance-related health disorders?

Description of the Performing Arts Physicians

The 1999 PAMA membership directory and lists of performing arts specialists supplied by Harman, Wristen, and Zaza comprised the primary sources for identifying the target population. Two physicians familiar with the study supplemented these lists with the names of four additional performing arts physicians. The two criteria which determined the eligibility of the physicians on these lists were (1) the regular treatment of musicians for performance-related health disorders and (2) the inclusion of pianists among those musicians they treat. Retired physicians and physicians who no longer treat musicians for performance-related disorders were excluded. Forty-four physicians

qualified for the study according to the two eligibility criteria. Thirty-six of the qualified physicians completed and returned questionnaires, for a response rate of 81.6 percent.

At this time, performing arts medicine does not include residencies or other characteristics which normally define specialties. Physicians who regularly treat performers hold specialties in a number of other established medical fields; strictly speaking, then, performing arts medicine is a subspecialty. Physical medicine and rehabilitation is the single most common specialty of the respondents, but ten other specialties are represented as well (table 2).

Table 2.–Physicians by Specialty

Specialty	Responses	Percent
Physical medicine and rehabilitation	13	36.1
Hand specialist	6	16.7
Neurology	4	11.1
Occupational medicine	2	5.6
Orthopedics	1	2.8
Rheumatology	1	2.8
Other		
Family practice	2	5.6
Primary care	2	5.6
Internal medicine	2	5.6
Primary care sports med/ emergency med	1	2.8
Chiropractic	1	2.8
Hand specialist/neurology	1	2.8
No response	0	0.0
	N = 36	

In a survey of performing arts clinics, conducted to determine the status of performing arts medicine as a specialty (i.e., subspecialty), Pascarelli and Bishop found a similar representation of specialties among the clinics' directors.[177] Twenty-two clinics responded to the survey; all but one of the directors were physicians. The directors included six doctors of physical medicine and rehabilitation ("physiatrists"), six neurologists, two internists, two psychiatrists, two otolaryngologists, one orthopedist, one rheumatologist, and one doctor of osteopathic medicine. One director specialized in both internal medicine and rehabilitation.

It is likely that the differences in the physicians' specialties in Pascarelli and Bishop's survey compared to those in the present study are due to differences in the kinds of musicians treated. It is reasonable, for example, to expect a greater number of hand specialists among doctors who regularly treat pianists than among performing arts specialists as a whole. Similarly, it is not surprising that directors of clinics include otolaryngologists, but to find no otolaryngologists among the doctors who treat pianists.

Because of the limited population of performing arts physicians, no attempt was made to achieve gender equality in the present group. Of those responding, 75 percent are male, 25 percent female. Chi-square analysis allowed examination of responses for possible gender bias.

The age of the respondents ranges from under 30 to over 60 years. The largest single category is 40 to 49 years. Of all respondents, 72.2 percent ($\underline{n} = 26$) are 40 years of age or older. The extensive nature of medical training may help explain the preponderance

---

[177]Pascarelli and Bishop, "Performing Arts Medicine," 64.

Table 3.–Physicians by Age

Age	Responses	Percent
Under 30	1	2.8
30-39	9	25.0
40-49	13	36.1
50-59	8	22.2
60 or older	5	13.9
No response	0	0.0
	N = 36	

of physicians who are at least forty in this sample.

Three questions measured the extent of the physicians' experience. First, the physicians were asked to supply the number of years of experience in treating all musicians. This established their general experience as performing arts specialists.

Table 4.–Physicians: Years of Experience

Years Treating Musicians	Responses	Percent
0–5 years	5	14.3
6–10 years	11	31.4
11–15 years	6	17.1
16–20 years	8	22.9
21 or more years	5	14.3
No response	0	0.0
	N = 36	

Two subsequent questions determined their experience in treating pianists: the

percentage of their total patient load which pianists represent and the actual count of pianists which the physicians treat annually.

Eliciting the percentage of pianists which the doctors treat helped determine the degree the physicians specialize in treating pianists as a subgroup. Over half the respondents have a clientele which consists of 10 percent or fewer pianists.

Table 5.–Physicians: Percentage of Patients Who Are Pianists

Pianist Percentage	Responses	Percent
1–10 %	21	58.3
11–20 %	5	13.9
21–30 %	8	22.2
31–40 %	1	2.8
41–50 %	1	2.8
51 % or more	0	0.0
No response	0	0.0
	N = 36	

The third question regarding physicians' experience determined the number of pianists each physician treats per year. Although most of the respondents have practices of which pianists represent only a minority (10 percent or less of the total patient load), the actual number of pianists they treat varies considerably. The most frequent response was twenty-one or more pianists treated annually (see table 6). Twenty-one respondents (58.3 percent) play the piano while fifteen (41.7 percent) do not. Eleven of the twenty-two directors in Pascarelli and Bishop's study (50 percent) were

Table 6.–Physicians: Number of Pianists Treated Annually

Number of Pianists	Responses	Percent
1–5	6	16.7
6–10	8	22.2
11–15	6	16.6
16–20	6	16.6
21 or more	10	27.8
No response	0	0.0
	N = 36	

"former professional or current amateur musicians, dancers, or actors,"[178] a similar proportion. No attempt was made to ascertain the playing level of the respondents. Chi-square analysis explored these data for the presence of any respondent bias due to playing or not playing the piano.

Curricular Content

A major question which this study explored was whether performing arts physicians who treat pianists agree that piano teachers should be trained to assist in the prevention, detection, and management of performance-related health disorders (research question two). Each of the six sections comprising the first part of the questionnaire ("Curricular Content") began with a forced-choice question which determined whether the respondent agreed that piano teacher training should include a specific component of health

[178]Ibid.

education. Only those who answered affirmatively completed the remaining questions in that section, which allowed the respondent to rate the importance of related categories of health science training.

Responses to these six filter questions (Q-1, Q-11, Q-28, Q-49, Q-61, and Q-70) showed strong agreement with the view that piano teacher training should include instruction in relevant components of health science (table 7). The level of agreement

Table 7.–Curricular Content by Level of Importance

Category	Yes	No	N/R	N	Percent
Preventive measures	34	0	2	34	100.0
Medical referral	33	0	3	33	100.0
Anatomy/physiology	33	3	0	36	91.7
Performance-related health disorders	32	3	1	35	91.4
Rehabilitation	28	3	5	31	90.3
Terminology	30	4	2	34	88.2

ranged from 88.2 percent (terminology) to 100 percent (both preventive measures and medical referral). Several respondents left answers to some filter questions blank, but answered the questions in the following section. Although the completion of sections following the filter question implies agreement that such training should be included in piano teacher training, blank answers were not computed as "yes" responses. (Blank answers are listed N/R for no response.)

Terminology

Q-1: Should piano teacher training include instruction in health science terminology which is relevant to playing the piano?

Of the thirty-four subjects answering Q-1, 88.2 percent agreed that piano teacher training should include instruction in health science terminology relevant to playing the piano. Those who agreed rated the importance of eight categories of terminology, having to do with anatomical terms, terms describing signs and symptoms, and terms related to medical specialties. Average responses (mean scores) ranged from 1.89 for terms describing movement to 3.44 for terms describing fields of study affiliated with performing arts medicine. Table 8 presents responses for each of these categories by level of importance (Q-2 through Q-10).[179]

Table 8.–Terminology by Level of Importance

Category	Mean	Mode	Range	Standard Deviation
Movement	1.89	1	1–5	1.30
Orientation	2.36	2	1–5	1.36
Symptoms	2.44	2	1–5	1.40
Dysfunction	2.58	2	1–5	1.56
Relationship	2.67	3	1–5	1.24
Muscle names	2.72	2	1–5	1.28
Bone names	2.86	2	1–5	1.29
Fields of study	3.44	4	1–5	1.16

[179]See appendix I for a complete list of responses for questions in the six sections of part one.

Concepts and Principles of Anatomy and Physiology

Q-11: Should piano teacher training include instruction in concepts and principles of anatomy and physiology which are relevant to playing the piano?

All thirty-six subjects answered Q-11; 91.7 percent agreed that piano teacher training should include instruction in concepts and principles of anatomy and physiology relevant to playing the piano. These respondents rated the importance of fifteen categories of anatomical and physiological concepts and principles. Average responses ranged from 1.39 for principles of postural alignment to 3.58 for the microanatomy of soft tissue. Table 9 presents responses for each of these categories by level of importance (Q-12 through Q-27).

Table 9.–Anatomy/Physiology by Level of Importance

Concept	Mean	Mode	Range	Standard Deviation
Postural alignment	1.39	1	1–5	0.77
Ergonomics	1.61	1	1–5	0.80
Biomechanics	1.66	1	1–5	0.87
Kinetics	1.97	2	1–5	1.06
Exercise physiology	2.02	2	1–5	1.07
Range of motion	2.11	2	1–5	1.17
Upper quarter	2.14	2	1–5	1.18
Musculoskeletal system	2.22	2	1–5	1.25
Nervous system	2.31	2	1–5	1.09
Muscle classification	2.34	2	1–5	1.03
Soft tissue adaptation	2.44	2	1–5	1.18
Design aspects	2.50	2	1–5	1.08
Modes of contraction	2.64	2	1–5	1.13
Vascular system	2.77	2	1–5	1.19
Soft tissue microanatomy	3.58	4	1–5	1.05

One respondent wrote "Mobility of joints" for "other" concepts and principles of anatomy and physiology (Q-27). Another wrote "Isn't worth the extra time and effort required to learn many of those concepts (anatomy, etc.). Stick to things that they can be more expert on, like Q-22–26 [i.e., principles of biomechanics, ergonomics, and kinetics, physiology of exercise, and postural alignment]."

Common Performance-related Health Disorders

Q-28: Should piano teacher training include instruction related to medical disorders common among pianists?

Of the respondents answering Q-28 (N = 35), 91.4 percent believe that piano teacher training should include instruction related to medical disorders common among pianists. These respondents rated the importance of characteristics of fourteen common disorders and five other related topics. Average responses ranged from 1.17 for early warning signs to 3.11 for double crush syndrome. Table 10 presents responses for each of these categories by level of importance (Q-29 through Q-48). Note that the topics related to common performance-related health disorders are all ranked higher than instruction regarding the disorders themselves.

Preventive Measures

Q-49: Should piano teacher training include instruction in the prevention of performance-related health disorders?

All of the respondents who answered Q-49 (N = 34) agreed that piano teacher training should include instruction in the prevention of performance-related health

Table 10.–Performance-related Health Disorders by Level of Importance

Concept	Mean	Mode	Range	Standard Deviation
Early warning signs	1.17	1	1–2	0.38
Risk factors	1.28	1	1–2	0.45
Etiology	1.56	1	1–5	0.97
Sites of vulnerability	1.61	1	1–5	0.90
Physiological processes	1.72	1	1–5	1.59
Carpal tunnel syndrome	1.94	2	1–5	1.81
Tendinitis	1.97	2	1–5	1.21
Overuse syndrome	2.03	1	1–5	1.28
Hyperlaxity	2.06	2	1–5	1.24
DeQuervain's tenosynovitis	2.17	2	1–5	1.28
Focal dystonia	2.19	2	1–5	1.35
Trigger finger	2.22	2	1–5	1.29
Osteoarthtritis	2.25	2	1–5	1.23
Cubital tunnel syndrome	2.28	2	1–5	1.30
Ganglion cysts	2.28	2	1–5	1.28
Cervical radiculitis	2.33	2	1–5	1.37
Thoracic outlet syndrome	2.36	2	1–5	1.38
Radial tunnel syndrome	2.75	2	1–5	1.20
Double crush syndrome	3.11	2	1–5	1.40

disorders. Respondents rated the importance of ten categories of preventive measures, dealing with practice habits, stretching and strengthening regimes, body awareness techniques, stress management, and nutrition. Average responses ranged from 1.19 for pacing of practice sessions to 2.22 for nutrition. Table 11 presents responses for each of these categories by level of importance (Q-50 through Q-60).

Table 11.–Preventive Measures by Level of Importance

Concept	Mean	Mode	Range	Standard Deviation
Pacing of practice	1.19	1	1–2	0.40
Physical conditioning	1.44	1	1–5	0.88
Warm-ups	1.51	1	1–3	0.66
Cool-downs	1.58	1	1–3	0.60
Stretching regimes	1.58	1	1–5	0.91
Physiological technique	1.67	1	1–4	1.04
Stress management	1.78	1	1–5	1.07
Body awareness	1.92	1	1–5	0.97
Strengthening regimes	2.00	1	1–5	1.17
Nutrition	2.22	2	1–5	1.20

Medical Referral

Q-61: Should piano teacher training include instruction in referring students to health care professionals?

All of the respondents who answered Q-61 (N = 33) indicated that piano teacher training should include instruction in referring students to health care professionals. Respondents rated the importance of seven categories of instruction related to medical referral, having to do with medical consultation and the nature of medical specialties and therapies related to performing arts medicine. Average responses ranged from 1.66 for indicators mandating medical consultation to 2.89 for pain-grading scales. Table 12 presents responses for each of these categories by level of importance (Q-62 through Q-69); tables 27 through 31 show the responses for each category (see appendix I).

Table 12.–Medical Referral by Level of Importance

Concept	Mean	Mode	Range	Standard Deviation
Medical consultation indicators	1.66	1	1–5	1.00
Features of clinics	1.75	2	1–3	0.50
Related specialties	1.78	2	1–3	0.68
Related therapies	1.86	2	1–4	0.59
Second opinion indicators	2.17	2	1–5	1.16
Screening	2.72	2	1–5	1.23
Pain-grading scales	2.89	2	1–5	1.02

In the space provided for "other" categories of instruction in medical referral (Q-69), one respondent wrote "It's up to the general physician to decide type of specialist, if any, is needed. It's inappropriate for a lay-person to decide which type of specialist or therapist he/she needs without first consulting his/her own M.D."

Rehabilitation

Q-70: Should piano teacher training include instruction concerning the rehabilitation and treatment of performance-related health disorders?

Of those subjects who answered Q-70 (N = 31), 90.3 percent agree that piano teacher training should include instruction in the rehabilitation and treatment of performance-related health disorders. Those who concurred rated the importance of eight categories of rehabilitation, dealing with medical treatments and general therapeutic strategies. Average responses ranged from 1.67 for modifications of technique to 3.25 for surgical

treatments. Table 13 presents responses for each of these categories by level of importance (Q-71 through Q-79).

Table 13.–Rehabilitation by Level of Importance

Concept	Mean	Mode	Range	Standard Deviation
Modifications of technique	1.67	1	1–5	1.04
Postural retraining	1.89	2	1–5	0.95
Absolute/relative rest	1.94	1	1–5	1.19
Activities of daily living	2.25	2	1–5	1.30
Work hardening	2.44	2	1–5	1.30
Treatment protocols	2.81	2	1–5	1.31
First aid	2.92	2	1–5	1.38
Surgical treatments	3.25	2	1–5	1.38

In the blank space left to offer suggestions for "other" categories of instruction in rehabilitation (Q-79), one respondent remarked "Therapists and surgeons and performing arts M.D.'s can communicate with teachers about individual cases."

Summary of Curricular Content

The main research question of this study is to determine a core body of knowledge necessary to prepare piano teachers to effectively assist in preventing, detecting, and managing PRHD's (research question three). It is important to distinguish that which is essential from that which is beneficial, but not essential. It is also important to identify any training which physicians regard as inappropriate for piano teachers.

Altogether, twenty-seven component categories of instruction received mean scores

between 1 ("essential") and 2 ("beneficial, but not essential"), thirty-six categories received scores between 2 and 3 ("no opinion"), and four categories received scores between 3 and 4 ("irrelevant"). There were no mean scores between 4 and 5 ("inappropriate"). Subdividing all mean scores which fell between 1 and 4, five categories scored between 1.0 and 1.49, twenty-two between 1.5 and 1.99, twenty-three between 2.0 and 2.49, twelve between 2.5 and 2.99, three between 3.0 and 3.49, and one between 3.5 and 3.99.

Table 14.–Mean Scores, 1.0–1.49

Section	Category	Mean Score
Performance-related disorders	Early warning signs	1.17
Preventive measures	Pacing of practice sessions	1.19
Performance-related disorders	Risk factors	1.28
Anatomy/physiology	Postural alignment	1.39
Preventive measures	Physical conditioning	1.44

Table 15.–Mean Scores, 1.5–1.99

Section	Category	Mean Score
Preventive measures	Warm-ups	1.51
Performance-related disorders	Etiology	1.56
Preventive measures	Physiologically-based technique	1.57
Preventive measures	Cool-downs	1.58
Preventive measures	Stretching regimes	1.58
Anatomy/physiology	Ergonomics	1.61
Performance-related disorders	Vulnerable sites	1.61
Anatomy/physiology	Biomechanics	1.66
Medical referral	Consultation indicators	1.66
Rehabilitation	Modifications of technique	1.67
Performance-related disorders	Physiological processes of injury	1.72
Medical referral	Features of performing arts clinics	1.75
Preventive measures	Stress management	1.78
Medical referral	Nature of related medical specialties	1.78
Medical referral	Nature of related therapies	1.86
Terminology	Terms of movement	1.89
Rehabilitation	Postural retraining	1.89
Preventive measures	Body awareness techniques	1.92
Performance-related disorders	Carpal tunnel syndrome	1.94
Rehabilitation	Absolute/relative rest	1.94
Anatomy/physiology	Principles of kinetics	1.97
Performance-related disorders	Tendinitis	1.97

Table 16.–Mean Scores, 2.0–2.49

Section	Category	Mean Score
Preventive measures	Strengthening regimes	2.00
Performance-related disorders	Overuse syndrome	2.03
Anatomy/physiology	Physiology of exercise	2.03
Performance-related disorders	Hyperlaxity	2.06
Anatomy/physiology	Normal range of motion	2.11
Anatomy/physiology	Anatomy of upper quarter	2.14
Performance-related disorders	DeQuervain's	2.17
Medical referral	Second opinion indicators	2.17
Performance-related disorders	Focal dystonia	2.19
Anatomy/physiology	Musculoskeletal system	2.22
Performance-related disorders	Trigger finger	2.22
Preventive measures	Nutrition	2.22
Performance-related disorders	Osteoarthritis	2.25
Rehabilitation	Impact of ADLs	2.25
Performance-related disorders	Cubital tunnel syndrome	2.28
Performance-related disorders	Ganglion cysts	2.28
Anatomy/physiology	Nervous system	2.31
Performance-related disorders	Cervical radiculitis	2.33
Anatomy/physiology	Muscle classification	2.34
Terminology	Terms of orientation	2.36
Performance-related disorders	Thoracic outlet syndrome	2.36
Terminology	Terms describing symptoms	2.44
Anatomy/physiology	Soft tissue adaptation	2.44
Rehabilitation	Work hardening	2.44

Table 17.–Mean Scores, 2.5–2.99

Section	Category	Mean Score
Anatomy/physiology	Design of bones, joints, muscles	2.50
Terminology	Terms describing dysfunction	2.58
Anatomy/physiology	Modes of muscle contraction	2.64
Terminology	Terms of relationship	2.67
Anatomy/physiology	Muscle names	2.72
Medical referral	Screening students	2.72
Performance-related disorders	Radial tunnel syndrome	2.75
Anatomy/physiology	Vascular system	2.77
Rehabilitation	Treatment protocols	2.81
Anatomy/physiology	Bone names	2.86
Medical referral	Pain grading scales	2.89
Rehabilitation	First aid	2.92

Table 18.–Mean Scores, 3.0–5.0

Section	Category	Mean Score
Performance-related disorders	Double crush syndrome	3.11
Rehabilitation	Surgical treatments	3.25
Terminology	Related fields	3.44
Anatomy/physiology	Microanatomy of soft tissue	3.58

Educational Context

One research question related to establishing the core body of knowledge essential for training piano teachers examines the optimal educational context for such training (research question three). This question may be subdivided into two parts, seeking to identify who is best qualified to train piano teachers in health-related issues and what

instructional format(s) provides the best means of delivering that training. The two sections of part two of the questionnaire ("Educational Context") address these questions.

Trainers

The instructions for this section directed respondents to omit answering any area(s) they had skipped in part one of the questionnaire. All other respondents were told to select the trainer best qualified to instruct piano teachers for each section of curricular content from part one.

Q-80–Q-85: Please indicate who is best qualified to train piano teachers in the following areas related to preventing medical problems among piano students.

Respondents chose two trainers more frequently than any other: health science teachers for the categories of terminology and anatomy/physiology and interdisciplinary specialists for the categories of common performance-related disorders, preventive measures, medical referral, and rehabilitation. Four respondents recommended "other" trainers: health care providers–physicians, therapists (for Q-82–Q-85), physical medicine and rehabilitation specialist (for Q-85), chiropractors (for Q-81–Q-84), and physical therapist/occupational therapist (for Q-80–Q-83). The responses for all the areas from this section are presented in table 19.

Table 19.–Optimal Trainer

Category	Piano Ped. Teacher (%)	Health Sci Teacher (%)	Team Teacher (%)	Interdisciplinary Specialist (%)	Self-instr (%)	Other (%)	N/R	N
Terminology	3.1 (1)	53.1 (17)	21.8 (7)	15.6 (5)	3.1 (1)	3.1 (1)	4	32
Anat/phys	0.0 (0)	59.4 (19)	18.8 (6)	12.6 (4)	3.1 (1)	6.2 (2)	4	32
PRHD	0.0 (0)	15.1 (5)	24.2 (8)	51.5 (17)	0.0 (0)	9.1 (3)	3	33
Prevention	0.0 (0)	2.9 (1)	41.1 (14)	47.1 (16)	0.0 (0)	8.8 (3)	2	34
Medical referral	0.0 (0)	15.1 (5)	24.2 (8)	51.5 (17)	0.0 (0)	9.1 (3)	3	33
Rehabilitation	3.0 (1)	9.1 (3)	30.3 (10)	51.5 (17)	0.0 (0)	6.1 (2)	3	33

Instructional Format

Q-86–Q-91: Please indicate the most appropriate format for instructing piano teachers in the following areas related to preventing medical problems among piano students.

As in section one of the educational context part of the questionnaire, respondents who skipped any section(s) of curricular content omitted that area when indicating the most appropriate format for instructing piano teachers in health-related issues. Those respondents answering this section chose three formats more frequently than any other: a supplement to an existing health science course (for the areas of terminology and anatomy/physiology), a seminar or workshop (for the areas of common performance-related disorders and rehabilitation), and a supplement to an existing music education course (for the area of preventive measures). Responses for the area of medical referral were evenly divided between a new course, a supplement to an existing music education course, and a seminar/workshop. For "other" recommendations for instructional format, one respondent submitted "Instructions from medical care provider" (Q-91); another respondent indicated that a supplement to an existing music education course is equally recommended as a seminar/workshop (Q-89). One respondent marked "other" formats for Q-86–Q-91 without specifying what the other formats should be. The responses for all the areas from this section are presented in table 20.

Table 20.–Instructional Format

Category	New Course (%)	Health Sci Supp (%)	Mus Ed Supp (%)	Seminar (%)	Book/tape (%)	Other (%)	N/R	N
Terminology	13.8 (4)	44.8 (13)	10.3 (3)	17.2 (5)	10.3 (3)	3.5 (1)	7	29
Anat/phys	26.7 (8)	40.0 (12)	3.3 (1)	16.7 (5)	10.0 (3)	3.3 (1)	6	30
PRHD	23.3 (7)	16.7 (5)	23.3 (7)	26.7 (8)	6.7 (2)	3.3 (1)	6	30
Prevention	22.6 (7)	12.9 (4)	32.3 (10)	22.6 (7)	6.5 (2)	3.2 (1)	5	31
Medical referral	25.8 (8)	16.1 (5)	25.8 (8)	25.8 (8)	3.2 (1)	3.2 (1)	5	31
Rehabilitation	19.4 (6)	16.1 (5)	19.4 (6)	38.7 (12)	0.0 (0)	6.5 (2)	5	31

Comments

Respondents volunteered three types of remarks in addition to the comments in the space provided for "other" answers. These written remarks included minor corrections or changes in the wording of questions, specific remarks inserted after particular questions, and more extended, general comments in the comment section.

The corrections and rewordings were generally added for the clarification of terms. Examples include changing "stretching regimes" to "stretching regimens" (Q-56) and replacing "kinetics" with "kinesiology" (Q-25). Some words were circled with a question mark, such as the word "design" in the question asking about "design aspects of bones, joints, and muscles" (Q-17). Other comments sought clearer definition for terms such as "interdisciplinary specialists" (Q 80–85). One respondent inserted "major" (i.e., major bones and muscles) for the category of instruction in knowing names of bones and muscles (Q-5 and Q-6).

A number of respondents submitted elaborations of their own ratings of categories of instruction. These remarks are listed below with a reference to each question by number.

> (After Q-7, terms describing physiological dysfunction): These are medical diagnoses
>
> (After Q-12 , anatomy/physiology of the musculoskeletal system, a respondent inserted): Partic. [i.e., particularly] Upper body
>
> (After Q-42, characteristics of common performance-related health disorders): Again, general familiarity is useful (i.e., know the terms and to a certain extent, why they occur). It's unlikely that a musician should spend as much time as would really be needed to thoroughly understand all these dx [diagnoses].
>
> (After Q-50, physiologically-based technique): This cannot be taught until there is at least a minimum concurrence among professional teachers as to what constitutes 'phys-based [physiologically-based] technique.'

(After Q-64, indicators which mandate medical consultation): Implies differential diagnosis – better to always suggest professional advice

(After Q-67, features of performing arts clinics): Are there 'typical features'?

(After Q-70, rehabilitation and treatment of performance-related health disorders): But you understand there is little consensus re: who will decide the curriculum?

(Before Q-86, instructional format section): What difference does it make? Whether you make a new course or supplement an existing one depends on what already exists . . . .

Several respondents clarified or elaborated on answers from parts one and two in the comment section.

I don't believe all piano teachers require the above mentioned training. Rather, I was refering [*sic*] to teachers who teach high-level pianists that play more than one hour per day.

'Normal' progression thru repertoire . . . More [instruction?] in practice habits

I have no objection to teaching piano teachers basic information about various performance-related health problems, but I do believe that's the least essential part of the 'curriculum' that's implied in this survey. [This respondent answered Q-28 "No."]

Some respondents provided more general remarks, either supporting the concept of training piano teachers in health-related issues or stating precautions.

This is fantastic! We also need to train our physicians about performance related disorders.

The addition of required curriculum in the areas of anat/physiol/kines & postural alignment would greatly help future students.

Lay people shouldn't decide for themselves what their dx [diagnosis] is and whether they need a specialist any more than M.D.'s should be telling students how to interpret Chopin. Let's have respect for each other's expertise. An environment should be created in which docs and piano teachers talk together about individual cases and educate each other.

I believe it is important that piano teachers understand basic anatomical and physiological terms. Caution should be shown though when teachers begin learning rehabilitation subjects or treatment programs. These should be left to professionals trained in the field. Also, it is very important that teachers understand alternative health measures, i.e. chiropractic and acupuncture, and their benefits for care of the musician population.

The key is to avoid presenting material that will only serve to confuse music teachers, and at the same time emphasize the practical usefulness of the needed information not just in terms of avoidance of injury, but also in terms of a much more pleasing performance arrived at with much less physical struggle and discomfort.

I see no evidence that professional interest among educators (including piano pedagogues) is adequate to support change of the type contemplated in this questionnaire. Real change will require a full generation or two of trial and success if attitudes are to change.

Two comments specifically addressed instructional format and optimal trainers.

The format you choose for education will depend largely on circumstances and whether a pedagogical program already has a course, etc. People learn differently and a video might be better for some, a workshop for others, so I think you won't know what's most effective until you try it out. . . .

In summary–I think teachers should be instructed by health care providers in the medical issues. [Added as a footnote: 'Arts performance is an evolving field–health care providers are the ones who can keep up to date on them.'] Rehabilitation can be so varied that each teacher will need to work with them and their students on the various recommendations. Preventive measures can be taught by teachers trained in these techniques.

Two physicians described instruction they had presented to musicians or music educators.

I taught a 1 credit course at NE [New England] Conservatory in Boston for three semesters with 25 students each semester–18 weeks, 1 hour a week–1st 9 weeks were functional anatomy (kinesiology) and how it relates to music making. 2nd 9 weeks were 'Ther. [Therapeutic] Exercises for Musicians'–I've long dreamed of putting the course on CD Rom for use as a self-directed course–

SFSU [San Francisco State University] uses me to speak to the Music Forum for majors each semester about various medically related music topics.

Educational Contexts for Teaching Piano Teachers Selected Health Science Topics

Several of the questions concerning the training of piano teachers as prevention educators are interrelated. Knowing who is best qualified to instruct piano teachers, for example, depends on identifying the contents of the training. Wilson confirmed this observation in his interview, pointing out that the qualifications of piano teacher trainers depend on "what ought to be in that package." We cannot know who should train piano teachers and where to train them until we know what that training should contain.

The design of the questionnaire allowed analysis of the responses to these questions both separately and in relationship with each other. Part one of the questionnaire investigated the contents of health science instruction which may be important for piano teachers; part two assessed possible educational contexts, exploring both the optimal trainers for piano teachers and instructional format. Both parts one and two divided potentially beneficial health science topics into the same six areas: terminology, concepts and principles of anatomy and physiology, common performance-related health disorders, preventive measures, medical referral, and rehabilitation. Because the two parts of the questionnaire divided instructional topics into the same six areas, it is possible to examine the delivery of health science training for piano teachers in the same context as its contents.

Educational Context

Part one of the questionnaire asked respondents to rate potentially beneficial categories of instruction as "essential," "beneficial, but not essential," "no opinion,"

"irrelevant," or "inappropriate." The coding of responses followed a Likert-type scale, with "essential" being 1.0 and "inappropriate" being 5.0. Twenty-seven categories received mean scores between 1.0 and 1.99. By subdividing these scores into two levels, with 1.0–1.49 being level one and 1.5–1.99 being level two, it becomes possible to distinguish the categories of instruction which the performing arts physicians believe to be most essential from those they believe to be highly beneficial, but not essential. Five categories attained mean scores in the level one range, twenty-two in the level two range. As these categories of instruction are placed within the context of educational format, level one scores will be classified as "essential curricula," and level two scores as "highly recommended curricula."

Responding physicians chose three formats for training piano teachers more than any of the others: a supplement to an existing health science course, a seminar/workshop, and a supplement to an existing music education course. Their most frequent choices for trainers were health science teachers and interdisciplinary specialists. Table 21 correlates the trainers with the formats which received the greatest mean responses for each of these six areas. Summaries of essential and highly recommended curricula in each educational context follow.

Supplement to Health Science Course

Most respondents chose health science teacher as the most qualified instructor in two areas: terminology and anatomy/physiology. They also chose the same optimal format for both areas (as a supplement to an existing health science course). Five categories in the two sections of terminology and anatomy/physiology received mean scores between

Table 21.–Educational Contexts for Piano Teacher Training: Most Frequent Choice

Topic	Trainer	Format
Terminology	Health science teacher	Supplement to health science course
Anatomy/physiology	Health science teacher	Supplement to health science course
Common disorders	Interdisciplinary specialist	Seminar/workshop
Preventive measures	Interdisciplinary specialist	Supplement to music education course
Medical referral	Interdisciplinary specialist	New course OR supplement to music education course OR seminar/workshop
Rehabilitation	Interdisciplinary specialist	Seminar/workshop

1.0 and 2.0; of these five categories, only postural alignment received a level one score (table 22).

Table 22.–Curricula Recommended as a Supplement to a Health Science Course

Essential Curricula	Highly Recommended Curricula
Postural alignment	Principles of ergonomics Principles of biomechanics Principles of kinetics Terms describing movement

Seminar/Workshop

Respondents selected the format of a seminar/workshop for the areas of common performance-related disorders and rehabilitation. They also indicated the same optimal trainer, interdisciplinary specialist, for both areas.

The level one categories from these two areas include instruction in the recognition of early warning signs and risk factors. Level two categories include characteristics of two disorders; all other categories are more general.

Table 23.–Curricula Recommended as a Seminar/Workshop

Essential Curricula	Highly Recommended Curricula
Early warning signs	Etiology
Risk factors	Vulnerable sites
	Technical modification
	Physiological processes leading to injury
	Postural retraining
	Characteristics of carpal tunnel syndrome
	Characteristics of tendinitis

Supplement to Music Education Course

Respondents chose one area, preventive measures, to be taught as a supplement to an existing music education course. As in the areas of common performance-related disorders and rehabilitation, the optimal trainer which most respondents chose for teaching preventive measures to piano teachers is an interdisciplinary specialist.

The two level one categories for preventive measures are pacing of practice sessions

and general physical conditioning. The six categories of instruction which scored in the level two range include some categories which are related to physical conditioning such as warm-ups and cool-downs.

Table 24.–Curricula Recommended as a Supplement to a Music Education Course

Essential Curricula	Highly Recommended Curricula
Pacing of practice sessions	Warm-ups
General physical conditioning	Physiologically-based technique
	Cool-downs
	Stretching regimes
	Stress management
	Body awareness

Other

Opinions regarding the optimal format for the area of medical referral were evenly divided between a new course, a supplement to an existing music education course, or a seminar/workshop. Respondents chose interdisciplinary specialist as the trainer best qualified to instruct piano teachers in this area.

Table 25.–Curricula Recommended as a New Course, a Supplement to a Music Education Course, or a Seminar/Workshop

Essential Curricula	Highly Recommended Curricula
(None)	Indicators for medical consultation
	Nature of related specialties
	Nature of related therapies

No categories of instruction for medical referral scored within the first level. Level two categories include indications mandating medical consultation, the nature of related specialties, and the nature of related therapies.

Discussion of Hypothetical Contexts

Altogether, five categories scored within level one–the "essential curricula." The most frequently chosen formats for these topics are a supplement to an existing health science course, a supplement to an existing music education course, and a seminar/workshop. These formats do not need to be considered mutually exclusive. In the setting of an educational institution, for example, either a workshop or a component of a health science course could be added as a supplement to an existing music education course. Since postural alignment is the only essential category of instruction recommended as a health science supplement, it is not necessary for piano teachers to formally enroll in a health science course. Health science teachers could adapt the supplement to whatever format best fit the institution. As a visiting lecturer, for example, such teachers could come to either a class of music students or a seminar. The most effective means to reach current teachers in the field, however, would most likely be a weekend seminar or workshop

Overall, respondents chose "interdisciplinary specialist" as the optimal trainer more frequently than any other. One respondent, however, sought a clearer definition for this choice. The interview question, "How important is it that those who train piano teachers in health-related matters themselves have training in both medical and musical fields?"

allowed the four respondents with the greatest amount of experience in treating pianists to clarify the recommended qualifications for those who train piano teachers.

All four interviewees believe that it is important that piano teacher trainers have both medical and musical training. Wilson maintains that it is "crucial," but the extent of that training ("what level of sophistication they have") has not yet been determined. "What ought to be contained in this kind of training really needs to grow out of the experience that, so far, we haven't managed to put together yet." Clearman's interview helps to clarify who might qualify as an "interdisciplinary specialist." Such an individual may come from either the musical or medical profession. In either case, having training in the secondary discipline is a "must." Medical professionals need not have extensive musical training, but should at least have made a minimal attempt to learn to play the piano. "I think that they should certainly, at a minimum, know what the issues are involved in piano-playing. They must really love music and musicians. They have to know the life-cycle of a musician, what that work entails. And they must have either training or successful experience in treating musicians." Music education professionals attempting to teach other piano teachers health-related topics without medical training are just "blowing smoke."

According to this definition, it is conceivable that virtually any of the choices for optimal trainer could qualify as an interdisciplinary specialist, provided they have adequate supplemental training. These could include piano pedagogy teachers, health science teachers, and team teachers, as well as "interdisciplinary specialists." Brandfonbrener relates that she relies on outside expertise as needed when she teaches

musicians. This practice amounts to a team teaching approach.

Those optimal trainers who were *not* selected may provide the most revealing data. Piano pedagogy teachers and self-instruction (i.e., teachers teaching themselves) were chosen by very few physicians. In most of the six areas of health science instruction, no respondent chose either piano pedagogy teacher or self-instruction. Among the choices for optimal instructional format, a book/videotape was chosen very infrequently: the greatest number of choices for this selection was in the areas of terminology and anatomy/physiology (n = three in each). This confirms that self-instruction is not recommended, at least as the primary mode of teacher training, since reading a book or watching a videotape would be two common examples of how teachers might instruct themselves. All of the most frequently chosen trainers presume at least some health science training. In summary, those who train piano teachers should have training in both disciplines (the extent of which is yet to be determined), whether they are health science instructors, piano pedagogy teachers, or a team approach is used. Interdisciplinary collaboration characterizes all of these solutions.

Although it may be expedient to divide the workload among more than one trainer, it would also seem advisable that one individual should coordinate the various components of training. The most likely candidate would be an interdisciplinary specialist, that is, a trainer who has both medical and musical qualifications. One context for reaching future teachers could be through a piano pedagogy class, with the teacher arranging for health science teachers as guest lecturers as needed.

The level two scores represent categories which are highly beneficial, but not

essential. These topics could be treated as elective or optional subjects. Any number of other factors may result in specific institutions implementing one or more of these recommended topics. Certain instructors may specialize in areas giving them particular expertise; financial resources may allow particular schools to develop more extensive programs. These topics could also complement the essential categories, as needed and practicable.

Perhaps most significant are the comments that we do not yet have the experience to be dogmatic about any one instructional format. One respondent remarked "The format you choose for education will depend largely on circumstances and whether a pedagogical program already has a course." Although the number of prevention education programs appears to be growing, there are few data about the scope of those programs and the impact they are having. We do not yet know with certainty the best educational context for training piano teachers, or even if there is one context which is best. These findings represent a point of departure, and should be treated with flexibility.

Tests of Independence

The main hypothesis of this study is that the physicians' responses represent a consensus regarding the training they believe is important to include for piano teachers to assist in the prevention, detection, and management of performance-related health disorders. In order to test this hypothesis, three demographic characteristics were chosen as a basis for tests of independence with the categories of instruction that received the lowest and the highest mean scores (those between 1.0 and 1.49 and those over 3.0).

A chi-square test of independence compares the observed count in each cell of a contingency table with that cell's expected value. The larger the difference between the observed count and the expected value, the less likely that the differences are due to chance, and the more likely that one variable is dependent upon the other. The chi-square statistic measures the disagreement between the data and the null hypothesis that the two variables are independent. If the chi-square statistic exceeds a critical value as determined by the desired confidence level, the null hypothesis that the variables are independent is rejected.

In order to achieve samples large enough to legitimately use a chi-square test, contingency tables were constructed which plotted the demographic characteristics against grouped responses. (Expected counts in contingency tables used for chi-square analysis must be five or greater for reliable results.) Group A contained the responses "essential" and "beneficial"; group B contained "no opinion," "irrelevant," and "inappropriate." Four contingency tables produced cells large enough (i.e., having expected frequencies of at least 5) for chi-square analysis.

The chi-square statistic fell well within the critical value for all four tests. A 95 percent confidence interval was used for each calculation with one degree of freedom. Tables 26 through 29 present these tests, where the observed counts appear in each cell with the expected values in parentheses. There is not sufficient evidence to warrant rejection of the claim that the responses are independent from the demographic variables in any of the four cases; no further chi-square analysis was performed.

Table 26.–Test of Independence: Play Piano and Double-crush Syndrome

	Play Piano	Do Not Play Piano	Row Totals
Group A	7 (6.67)	9 (9.33)	16
Group B	8 (8.33)	12 (11.67)	20
Column totals	15	21	36 (Grand total)

Level of significance: $\alpha = 0.05$
Degrees of freedom = 1
$\chi^2 = 0.822$
Critical value = 3.841
H_o = Opinions regarding the importance of teaching piano teachers characteristics of double crush syndrome are independent from the ability to play the piano

Tests which involved the number of years of experience combined all physicians into either group I (0 – 15 years of experience) or group II (16 or more years experience).

Table 27.–Test of Independence: Years Experience and Double-crush Syndrome

	0 – 15 Years Experience	16 or More Years Experience	Row Totals
Group A	10 (10.06)	6 (5.94)	16
Group B	12 (11.94)	7 (7.06)	19
Column totals	22	13	35 (Grand total)

Level of significance: $\alpha = 0.05$
Degrees of freedom = 1
$\chi^2 = 0.966$
Critical value = 3.841
H_o = Opinions regarding the importance of teaching piano teachers characteristics of double crush syndrome are independent from years of experience in performing arts medicine

Table 28.–Test of Independence: Play Piano and Surgical Treatments

	Play Piano	Don't Play Piano	Row Totals
Group A	8 (8.75)	7 (6.25)	15
Group B	13 (12.25)	8 (8.75)	21
Column totals	21	15	36 (Grand total)

Level of significance: $\alpha = 0.05$
Degrees of freedom = 1
$\chi^2 = 0.607$
Critical value = 3.841
H_o = Opinions regarding the importance of teaching piano teachers surgical treatments for PRHD's are independent from the ability to play the piano

Table 29.–Test of Independence: Years Experience and Surgical Treatments

	0-15 Years Experience	16 or More Years Experience	Row Totals
Group A	6 (8.80)	8 (5.20)	14
Group B	16 (13.20)	5 (7.80)	21
Column totals	22	13	35 (Grand total)

Level of significance: $\alpha = 0.05$
Degrees of freedom = 1
$\chi^2 = 0.046$
Critical value = 3.841
H_o = Opinions regarding the importance of teaching piano teachers surgical treatments are independent from years of experience in performing arts medicine

Interviews

Introduction

The second phase of soliciting performing arts specialists' opinions on piano teacher training consisted of follow-up telephone interviews. The four respondents with the greatest amount of experience in treating pianists for performance-related disorders qualified for the interviews. This number represents approximately 10 percent of the total number of respondents (N = 36).

Description of the Interviewees

The candidates who agreed to conduct a telephone interview were Dr. Alice G. Brandfonbrener, Dr. Rebecca R. Clearman, Dr. Michael E. Charness, and Dr. Frank R. Wilson. All interviewees have a minimum of sixteen years of experience in treating musicians and treat at least sixteen pianists each year. Three interviewees have between sixteen and twenty years of experience; one has more than twenty years of experience. One physician treats an average of sixteen to twenty pianists each year; three see twenty-one or more pianists.

The selection of the interview candidates resulted in an even distribution of both gender and geographical location. Two interviewees are male, two are female. The physicians are located in Massachusetts, Illinois, Texas, and California. All of the interviewees play the piano. Biographical sketches of each of these physicians precede the brief synopses of their interviews below; the edited transcriptions of their interviews may be found in appendix G.

Interview with Alice G. Brandfonbrener. M.D.

Biography

Alice Brandfonbrener is a specialist in internal medicine with a long and prominent career in performing arts medicine. She received her medical training from Columbia's College of Physicians and Surgeons, Northwestern University, and Evanston Hospital; she also earned a Bachelor of Arts degree from Wellesley College. Early music training included studies in piano, flute, and voice.

From 1971 to 1977, Dr. Brandfonbrener served as the physician for the National Music Camp at Interlochen, Michigan, followed by seven years in a similar role at the Aspen Music School and Festival. In 1983, Brandfonbrener initiated the Annual Symposium on the Medical Problems of Musicians and Dancers, which now serves as the annual meeting for the Performing Arts Medical Association. In 1985, she founded the Medical Program for Performing Artists at Northwestern Hospital, now at the Rehabilitation Institute of Chicago.

Dr. Brandfonbrener is currently an Adjunct Professor of Performance Studies at Northwestern School of Music as well as an Assistant Professor in Northwestern's Medical School. She is co-editor of *Performing Arts Medicine* and has been the editor of *Medical Problems of Performing Artists* since the journal's inception in 1986. For three years Brandfonbrener served on the Wellness Committee of NCPP and continues to lecture for medical audiences, orchestras, conservatories, and music education organizations on issues related to the medical problems of musicians.

Required Curricula

Dr. Brandfonbrener believes that prevention education should be part of the required curricula for training piano teachers. "Some understanding in terms of basic science is critical." She maintains, however, that it is important to closely examine what that training should include. Health education "covers a wide variety of possibilities." Referring to her own experience in teaching musicians, this basic training could incorporate some structural knowledge of anatomy, such as "how muscles work and what the limitations of muscles are, muscle-tendon units, what the limitations of joints are and their range of motion." She also stresses awareness of the biological and psychological ("psychobiological") variations from individual to individual.

Risks in Training Piano Teachers

Brandfonbrener believes there are more risks in not training teachers than in training them. The training itself should prevent piano teachers from venturing into a role with inadequate preparation. "In other words, train them to understand what their limitations are. . . . The more training one has in the subject, the more one becomes conscious of how little one knows." This question relates to the need for ongoing collaboration between the medical and music education professions. "If the interaction is proper in the interdisciplinary collaboration, then everyone knows everyone else's limits and where they need to call on someone else."

Piano Teachers and Self-care versus Medical Consultation

According to Brandfonbrener, it is appropriate to train teachers to help determine

when self-care should end and medical consultation should begin. Setting arbitrary "rules" to guide the teacher in every situation, however, is difficult. "Common sense is a very good attribute"; at the same time, having "more scientific understanding than the average teacher does now" will help the teacher know the proper limits.

Dr. Brandfonbrener mentioned several variables which affect the teacher's role in guiding a student encountering physical difficulties. Each teacher varies in the ability to recognize their own limitations; the relationship between the teacher and each student is different as well. The ability of the teacher to provide guidance in dealing with physical problems is dependent on any given student's willingness to receive such advice. A teacher can help analyze various factors which may contribute to the problem--"if a student wants this." The age of the student is also a factor.

Two specific concerns of Brandfonbrener are with teachers who advise students to take medications–even when it comes to over-the counter medications, teachers should "hold back"–and in making proper medical referrals. "I think that referrals to particular doctors have to be watched." This is admittedly "complicated."

Trainers with Medical and Musical Background

Dr. Brandfonbrener maintains that it is more important that the individuals who instruct piano teachers have access to others who can make up for areas in which they lack expertise than they themselves have both medical and musical training. Again, she draws from her own experience in training music students. ". . . even in my own course that I teach to music students, I bring in other people in areas I don't feel competent in."

This is yet one more situation which depends upon interdisciplinary collaboration for success.

Interview with Michael E. Charness, M.D.

Biography

Michael Charness founded and directs the Performing Arts Clinic at Brigham and Women's Hospital in Brookline, Massachusetts. Charness received his medical training at the Johns Hopkins School of Medicine and the University of California. He is board certified in both neurology and internal medicine. Dr. Charness also studied piano at McGill University and remains active in performing the piano with his wife and children.

Dr. Charness has treated musicians since 1984; in 1986 he co-founded the Health Program for Performing Arts at the University of California in San Francisco. He established the Performing Arts Clinic at Brigham and Women's Hospital in 1989.

Charness is currently Associate Professor of Neurology at Harvard Medical School, Associate Chief of Neurology at Brigham and Women's Hospital, and Chief of Neurology at the VA Boston Healthcare System. He serves on the editorial board of *Medical Problems of Performing Artists* and has published in the areas of nerve entrapment and focal dystonia. Dr. Charness has lectured nationally on performing arts medicine and injury prevention and presents annual seminars on these topics at the New England Conservatory and the Juilliard School.

Required Curricula

Dr. Charness believes that prevention education should be part of the required

curricula for piano teachers. There are two reasons for this viewpoint: most of the pianists' injuries which doctors see are preventable; piano teachers "are in the best position to disseminate the information that could help prevent injuries."

Risks in Training Piano Teachers

While recognizing the risk that piano teachers might go too far in assuming the role of physician, Charness considers that this is a "very minor concern, because I don't think there are many piano teachers who would want to take on that role." The risks which he addressed are not so much risks involved with training teachers, but risks which the piano teacher can help prevent. Information is required in order for teachers to prevent risks. (This information has to do with the essential knowledge which this study attempts to ascertain.) Topics of instruction should include time management, technique, mechanics, and basic anatomy.

Piano Teachers and Self-care versus Medical Consultation

Charness believes that training in this area is helpful for both teachers and students. Both should know the "cardinal signs and symptoms" indicating the need for further investigation by health care professionals. Exploration of what those signs and symptoms are is beyond the scope of this study, but would constitute a valuable subject for further research.

Trainers with Medical and Musical Background

It is possible for trainers instructing piano teachers in health-related matters to have a

primarily musical background, if that background has been supplemented with basic medical training. This supplement should include training in anatomy and mechanics and information about performing arts medicine.

Additional Comments

Dr. Charness affirmed the efficacy of reaching large numbers of music students through proper training in music schools. The main reasons for pianists' problems are idiosyncracies of technique and poor design of practice schedules, so reaching piano students should be a fruitful way to avoid injury. Charness cites his own experience of teaching both students and teachers at Juilliard and the New England Conservatory of Music. "It's the kind of thing that I think should develop more."

Interview with Rebecca R. Clearman, M.D.

Biography

Rebecca Clearman is a specialist in Physical Medicine and Rehabilitation. She received her medical training at the Baylor School of Medicine in Houston. Clearman also pursued training in various artistic fields, including the piano, visual arts, and dance. As a doctor, her interests extend to writers and designers, as well as musicians and visual artists.

From 1988 to 1997 Dr. Clearman chaired the Medical Executive Committee at The Institute of Rehabilitation and Research in Houston, where she also directed the Musculoskeletal Program. She was Associate Director of Rehabilitation Services at the University of Texas–M.D. Anderson Cancer Center from 1997 to 1999 and now serves

on the faculties of the Baylor School of Medicine and the University of Texas Health Science Center in Houston.

Dr. Clearman has presented numerous lectures on performing arts medicine, with an emphasis on evaluation, management, and rehabilitation. She has served as secretary of the Performing Arts Medicine Association and currently maintains an arts medicine clinic as part of her practice. As a performing arts specialist, Clearman recognizes the need to return musicians to performing as soon as possible and emphasizes principles of relative rest to enable performers to successfully manage physical difficulties during critical times.

Required Curricula

Dr. Clearman believes that prevention education should be part of required curricula for piano teachers. She gives three reasons. Musicians are "small-muscle athletes"; as a result of using their bodies in "marathon ways," musicians' bodies undergo certain kinds of changes. Understanding these effects can help prevent injury. The third reason is that playing a musical instrument really involves the interplay between *two* instruments–in this case, the human body and the piano. "The more you can know about each instrument . . . the better."

Risks in Training Piano Teachers

According to Clearman, there is very little to no risk in this type of training. The key to preventing such risk is in the quality of the training. That quality has to do with explaining the parameters of when it is acceptable for teachers to give advice.

Clearman points out that musicians and pianists have been dealing with the body for centuries; training piano teachers in matters which relate to health is really nothing new. "Why would education make it worse?"

Piano Teachers and Self-care versus Medical Consultation

Dr. Clearman's reply to whether teachers should help determine when self-care should end and medical consultation begin was unequivocal: "Absolutely!" There are three general aspects which guide the piano teacher. The teacher must know the parameters which define when it is and is not proper to give advice, must know the possibility of underlying health conditions which can mimic a performance-related disorder (e.g., late-onset diabetes, cancer, and peripheral neuropathy), and must understand the damage which may result from delayed medical evaluation and/or treatment. Understanding when pain is indicating damage is of key importance. Although devising a list of absolute and relative indicators for medical referral was beyond the scope of this question, Clearman suggests that such a project would be a feasible undertaking for a team of collaborators. In order to protect themselves legally, teachers should couch any advice they do give with the acknowledgment that they are not medical doctors.

Trainers with Medical and Musical Background

Clearman regards having both medical and musical backgrounds as a "must" for those training piano teachers in health-related matters. This is true whether the trainer is a health care professional who has taken some music lessons or a music educator with

supplemental medical training.

For the medical professional, additional musical training need not be extensive. Even learning to play a musical instrument at the age of forty-five is helpful. Knowing the processes involved in playing the piano is only part of the story, however. "They must really love music and musicians. They have to know the life-cycle of the musician, what that work entails." As far as musicians needing supplemental medical training to prepare for training piano teachers, it, too, is essential; otherwise they would just be "blowing smoke."

Additional Comments

Dr. Clearman commented on financial realities in the process of answering several of the interview questions. About ten years ago, a number of hospitals were initiating performing arts programs. These have almost entirely folded, due to lack to funding. Doctors who treat musicians often do so on a *pro-bono* basis. In her own practice, this is true 90 to 95 percent of the time.

Interview with Frank R. Wilson, M.D.

Biography

Frank Wilson is the Medical Director of The Peter F. Ostwald Health Program for Performing Artists at the University of California, San Francisco, which he co-founded and serves as Clinical Professor of Neurology. As a neurologist, Wilson has a primary research interest in the neurologic and anthropologic foundations of hand movement. He has recently published some of his findings in this area in his book, *The Hand: How its*

Use Shapes the Brain, Language, and Human Culture.

Dr. Wilson narrated his experiences as an adult learning to play the piano in an earlier book, *Tone Deaf and All Thumbs?* Wilson relates his initial interest in piano study which resulted from observing his daughter's progress as an advancing pianist and was curious to observe the process of music learning from the perspective of a neurologist.

Wilson has served on numerous interdisciplinary committees and organizations dealing with performing arts medicine. His most recent publications include an investigation of Glenn Gould's medical problems. Wilson hypothesizes that Gould may have developed focal dystonia, partly due to anatomic predispositions and partly due to poor posture at the piano.

Required Curricula

Dr. Wilson believes that training piano teachers in prevention education should be a part of the required curricula. There are a number of impediments, however, which have prevented implementing such training, the need for which "there can't really be any argument." The problem is not in determining whether piano pedagogy should incorporate training in health-related matters, but in how to integrate it with the current curricula. Piano students already have too much to learn "that is of a purely musical nature." More profoundly, no consensus exists among professional educators as to what such training should include.

Compounding these impediments, Wilson finds a resistance in certain musical circles

to the efforts of performing arts medicine. The reasons for this resistance are also multifactorial. The medical community itself has not demonstrated concurrence on these issues. Some teachers detect an implied criticism in this movement, "an implied criticism . . . that teaching isn't good, that mistakes are being made . . . . " The fundamental reason underlying all these factors is that "there is simply no effective liaison, no working relationship between these two professions–the health care profession represented by many different kinds of providers, and the education profession."

Wilson acknowledges certain individual teachers have made attempts to include prevention education in their teaching, but points out that these isolated examples do not represent a "systematic response." Wilson believes the only way the situation will change is through evolution. "As time goes on, and as younger artists come up and are more familiar with these ideas and begin to make changes . . . the atmosphere will change." Such a "grass-roots or cultural change" will take a long time.

Risks in Training Piano Teachers

Wilson believes any risks in training piano teachers in health-related matters to be "more theoretical than real." The biggest risk is in "not knowing what you don't know." The most dangerous teachers are those who mistakenly believe they already have a sophisticated understanding of "how things work."

Wilson points out that teachers are already dealing with the issue of technique in some way or another, some more knowledgeably and rationally than others. "We're

simply saying, really, that there's a new group of 'players' or 'participants' in this discussion." The challenge is in building a working relationship between the new players (performing arts practitioners) and the old players (piano teachers).

Risks are already present in piano pedagogy. "I have a number of examples in my own practice of teachers who regularly provide patients." Two particular risks are "failing to observe biomechanical reality" and employing principles for all students without modification for individual differences. The risks involved with this new training are no different than the old risks, the risks that "you will get it wrong, and that you'll give people information which they'll either misinterpret or which they will follow slavishly to a bad result."

Piano Teachers and Self-care versus Medical Consultation

Wilson believes that yes, it is appropriate to train teachers to help distinguish between the time for self-care and the time for medical consultation. "The question is, should that suggestion be made at an earlier stage than it often is now." (Any teacher would advise medical consultation if a situation got bad enough, but this kind of problem often needs more prompt action than others.)

Medical consultation is compounded by a number of factors. Teachers are dependent upon the quality of medical care that is available in a given locale. "If the pianist and the teacher are working in a community that doesn't have anybody with any experience, then the doctor may not be helpful either." The cost of medical consultation in certain metropolitan centers such as New York City can be prohibitively expensive, a cost which

medical insurance may not cover. The availability of qualified therapists is just as important as doctors. Without access to properly trained therapists, carrying out a successful treatment program may be impossible.

All of these factors lead to the need for what Dr. Wilson refers to as a "sliding threshold." A teacher can make a referral at an earlier stage if access to qualified health care providers is readily accessible. Otherwise, the teacher may have to continue working with a student with limited or no medical assistance.

Trainers with Medical and Musical Background

According to Dr. Wilson, it is crucial that trainers have both medical and musical training. The nature and extent of that training have yet to be established, however. As with the actual content of the training, we should not expect to know the answer to the question as to "what should be in the package" in advance. Such knowledge will have to grow out of experience, "experience that, so far, we haven't managed to put together."

One growing resource for trainers which Wilson mentions is injured musicians themselves. It is natural for such musicians to want to help other injured musicians, and more than one have dedicated themselves to becoming therapists or Feldenkrais instructors. Ultimately, though, change will come about only as more people who are in the position to make decisions regarding curriculum are sold on the idea.

Additional Comments

As with Dr. Clearman, Dr. Wilson commented on some of the financial realities of treating musicians. He likewise frequently does not charge musicians for treatment,

knowing that they cannot pay. Unfortunately, he finds it is not unusual for a musician to expect treatment with little advance notice and to make no effort at payment. "It is amazing how often they come, they want your stuff, they want your ideas, help, and solutions, and they don't say thank you." On the other hand, doctors often find musicians gratifying to work with, because they respect how hard musicians have to work to become good at what they do.

Wilson frequently interspersed his answers with anecdotes from his own experience. He quoted Joseph Polisi of Juilliard, who felt that "I think there is still a very high wall between the doctors and music teachers." Veda Kaplinsky, chair of the piano department at Juilliard, provided an example of a piano teacher with extensive training in the mechanics of movement who has tried to introduce these principles to her department as a whole. Wilson narrated the ordeal of several students and musicians who have developed injuries and the difficulties they have encountered in accessing proper medical care. One experience with a drummer from Guinea served as a contrast with attitudes Wilson often finds with musicians from our own country. Wilson met the Guinean drummer on a chance encounter while sight-seeing. After giving advice to the drummer, who was experiencing hand problems, the musician was "practically on his hands and knees" in gratitude. Many musicians in the United States, however, treat doctors as if they are an "unpleasant necessity."

Analysis of the Interviews

The semi-structured nature of the interview questions allowed an objective

comparison of responses to the first parts of interview questions one and three as well as interview questions two and four in their entirety. The beginning of interview question one, "Do you believe that training in prevention education should be part of required curricula in the overall education of piano teachers?" and of interview question three, "Is it appropriate to train piano teachers to help determine when self-care for performance-related physical problems should end and medical consultation should begin?" are classifiable as yes/no questions. Similarly, responses to question two may be divided between those who agree and those who do not agree that there are risks in training piano teachers to help prevent performance-related disorders. Responses to these three interview questions may be quantified by classifying "yes" responses with a score of 1.0 and "no" responses with a score of 2.0.

Table 30.–Interview Questions One, Two, and Three

	Yes	No	No Response	Mean Score
Question 1	4	0	0	1.0
Question 2	4	0	0	1.0
Question 3	4	0	0	1.0

Interview question four measured the level of importance each interviewee assigned to trainers of piano teachers having both medical and musical training. Responses to this question may be compared by using a Likert-type scale, where 1.0 equals "not important at all," 2.0 equals "somewhat unimportant," 3.0 is "no opinion," 4.0 signifies "somewhat

important," and 5.0 is "very important." Each interviewee was allowed to use their own wording in rating the importance of trainers' dual medical/musical background. Brandfonbrener stated that it was important that trainers have access to outside experts; this response was scored with 4.0, "somewhat important." Charness' response, that some medical training would be useful, also received a score of 4.0. Clearman thought such training is a "must" and Wilson thought it is "crucial." Both Wilson and Clearman's responses scored 5.0, "very important." Using this procedure, the mean score of the four responses to interview question four is 4.5.

Themes and Comments

Interviewees offered elaborations to each of the interview questions. The first three questions overtly sought elaboration. After answering "Do you believe that training in prevention education should be part of required curricula in the overall education of piano teachers?" for example, interviewees explained "why or why not?" Several physicians volunteered unsolicited elaborations, as well. Elaborations offered by more than one interviewee will be considered "themes"; all others will be referred to as "comments."

Elaborations to the first interview question consisted of specific components piano teacher training should include, rationale which justifies such training, and impediments to implementing piano teacher training in prevention education. Brandfonbrener commented that training should include basic structural anatomy, muscular action, biological variations, and psychobiologogy. It is important to note that a chief purpose of

the present study is to delineate the contents of piano teacher training; Brandfonbrener's comments affirm the need to identify a consensus among performing arts physicians.

Charness's comments were succinct and direct. His statement that teacher training should include prevention education because the majority of pianists' injuries are preventable and that piano teachers are in the best position to disseminate information to prevent injury, is practically inarguable. His second comment, that teachers are in the best position to disseminate such information, does not necessarily mean that they are adequately prepared to do so. Charness made clear throughout his interview that, *with instruction from health care professionals* (emphasis added), teachers have the capability to reach large numbers of students.

Wilson emphasized the impediments blocking the implementation of prevention education training. He made frequent reference to personal experience and specific cases which signify his grappling with these questions over many years. Although Wilson stated that there are two such impediments, he actually discussed three: lack of consensus among music educators, lack of consensus among medical professionals, and lack of an effective working relationship between the two professions. Wilson's comments on obstacles to training piano teachers grow from his conviction that "there can't really be any argument" concerning the need for such training.

Regarding the second interview question, none of the interviewees considered risks involved in training piano teachers as non-medical professionals to be very significant. One theme which emerged in the responses to this question, in fact, is that there is more risk in not training teachers than in training them. Another theme is that teachers have

already been dealing with these issues, that training in prevention education is simply a continuation of an aspect of piano pedagogy that already has a long history. Wilson describes approaching technical problems from a preventive perspective as "putting another name on something that already exists," that many teachers already try to solve technical problems in a rational way. Thus injury prevention can be thought of as an extension of the pedagogy of technique. Charness and Clearman both suggested that risks in training piano teachers as non-medical professionals can be minimized by clarifying the parameters of when giving advice is acceptable. This theme was repeated in answers to the third interview question.

Each of the interviewees thought that it is appropriate to train teachers to help determine whether self-care or medical consultation is advisable (interview question three). Most of them addressed whether some criteria could be used to assist teachers in the decision-making process. Brandfonbrener commented that it is difficult to come up with rules that would cover every situation. Indeed, she stressed the individual differences between teachers and students. She also believes that the teacher who has some basic training in biological science will be better prepared to make such determinations.

Both Charness and Clearman stated that it would be possible to develop a list of cardinal signs which could help the teacher to determine when to send a student to a doctor for help. They also both felt that the precise components of such a list was beyond the scope of what they were being asked to answer, although Clearman did offer some suggestions. These include understanding underlying health conditions which can

mimic PRHD's and distinguishing between pain which reflects damage and pain which does not.

Wilson offered some extended comments on the realities of piano teachers attempting to deal with physical difficulties students encounter in reference to various financial and logistical obstacles. Experienced medical professionals are more available in some locations than others. Even when they are available, the costs can be prohibitive. Health insurance is not always sufficient to cover expenses. It is also important to remember that access to experienced therapists can be as important as access to experienced physicians. Because of these considerations, Wilson recommends teachers develop a "sliding threshold," depending on the availability of competent medical assistance. In general, that threshold should occur at an earlier point than is often the case. This emphasis on an earlier threshold is directly related to the ability to recognize early warning signs.

Each of the interviewees had a personal perspective to add to the last question. Brandfonbrener emphasized interdisciplinary collaboration among those who train piano teachers. All such trainers should have access to others who can provide expertise which they themselves lack. Clearman stressed that medical trainers should have at least a minimum amount of musical training. Most of her comments addressed piano teacher trainers having a primarily medical background, whereas Charness assumed the reverse.

Wilson believes that it is crucial that those who train piano teachers in prevention education have both medical and musical backgrounds, dependent on the nature of that prevention education. He pointed out that the answer to this question is linked to the

answer to the first interview question, i.e., what sort of prevention education training piano teachers need. Virtually anyone would agree that those who train piano teachers in prevention education should have some background in both fields, but specifying the extent of that background is an entirely different question. Wilson provided an example of one type of individual who might be a particularly good candidate to train teachers: injured pianists. Drawing from his own experience, he considers one of the best therapists in the San Francisco area to be a Juilliard-trained pianist who, after suffering physical difficulties of her own, has become a Feldenkrais therapist. Wilson regards the perspective which such individuals bring to be highly valuable and believes we need more of this sort of interaction.

Discussion

The four doctors who provided telephone interviews answered each of the interview questions with virtual unanimity. Each one believes that training in prevention education should be part of required curricula for piano teachers, that the risks involved in training piano teachers in health-related matters are minimal, if not negligible, that it is appropriate to train piano teachers to help determine when to seek medical consultation, and that it is important that those who train piano teachers in health-related issues have both medical and musical training. It is important to note, however, that some interviewees qualified their answers with certain stipulations.

"Training in prevention education" can be interpreted in many ways. It is important to delineate those components of prevention education training which piano teachers

need. At this point we do not know what truly works–that is, which part (if any) of piano teacher training really helps prevent injury. We may not know what really does work until we gain more experience. There are several impediments which have stymied even beginning a systematic, profession-wide application of performing arts research in piano pedagogy. One of those impediments has been the absence of a consensus, among both physicians and music educators, as to what that instruction should contain. Another reason, though, is a sometimes unspoken resistance or suspicion among music educators that what physicians have to offer may not be helpful–indeed, may even be harmful–or that the emphasis on healthy performance carries with it an implied criticism of current teaching.

Both Clearman and Wilson discussed the financial difficulties in treating musicians. Several factors cause stress on the medical delivery system for musicians. Frequently, doctors who have experience in treating musicians for PRHD's are located in metropolitan centers which may make access difficult. Fees for such services may be prohibitively expensive. These factors, combined with the musician's often limited financial resources, have led to the demise of many performing arts programs within hospitals. The doctors who do treat musicians often do so on a *pro-bono* basis, out of love for the work and dedication to the musician.

All of the interviewees emphasized the need for ongoing collaboration between the fields of performing arts medicine and piano pedagogy, as well as music education in general. Many physicians need education in the treatment and prevention of PRHD's, since many doctors who treat musicians are not familiar with performing arts medicine.

More fundamentally, there is still a need for a more effective liaison to maintain a working relationship, develop a shared vocabulary, and acquire a shared experience between the two professions. Finally, since some of our knowledge of how to improve prevention depends upon experience we do not yet have, it is important that both fields together help to modify nascent prevention education programs as they evolve.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Performing arts medicine in the United States is entering into its second generation as a recognized medical subspecialty. Although it is still a relatively new field, the current interest in the medical care of musicians has generated a substantial increase of research concerning performance-related health disorders among musicians and music students. While we do not yet fully understand all the causes of PRHD's, we do know many of the factors which increase the risk of developing them. We also know that most PRHD's are preventable.

Music teachers in general, including piano teachers, have been identified as forming a key group to assist in prevention education. Such a role is new for piano pedagogy. Because the role of prevention educator presumes knowledge and skills from a field outside of music, piano teachers must first receive training in prevention education before they can train students. The literature offers many suggestions as to what could constitute this training, including several recommendations in a position paper prepared by the Committee on the Prevention of Medical Problems of the National Conference on

Piano Pedagogy.[180] Given the already-overburdened status of piano pedagogy curricula, however, attempting to systematically train piano teachers in all of the potentially beneficial topics present in the literature would be unfeasible. The chief purpose of this study is to identify that body of knowledge which performing arts specialists believe represents the essential core necessary for all piano teachers involved in prevention education.

Performing arts physicians embody a major resource of empirical knowledge concerning PRHD's. Due to the nature of the subspecialty, these physicians are more familiar with the act of making music and the demands of learning such a skill than most other health care providers. Many of these physicians play musical instruments themselves. They are highly dedicated to the health of all musicians, as their frequent offering of services at reduced rates attests. Since performing arts physicians are experienced in dealing with the consequences of the lack of proper prevention, and because they are highly sympathetic to musicians' needs, performing arts physicians with experience in treating pianists were chosen as the target population.

A questionnaire investigating the possible contents and educational context of training piano students in categories of health science was developed and pilot-tested by sending it to six hand specialists who have treated pianists for PRHD's. All six physicians completed the surveys and returned them with suggestions for improvement. They also reported how long it took to complete the questionnaire. Forty-four performing arts physicians who have experience in treating pianists then received the

---

[180] *Proceedings and Reference*, 193–199.

revised questionnaire by mail. Thirty-six of these physicians completed and returned the survey, yielding a response rate of 81.6 percent.

Respondents provided information regarding the extent of their experience in treating musicians and pianists as well as opinions about the importance of specific categories of health science instruction for pianists. The information they supplied guided the selection of those four physicians with the greatest amount of experience in treating pianists. These respondents became the candidates for follow-up telephone interviews.

The analysis of the questionnaire data and comparison of that analysis with the research questions served as the basis for designing the interview questions. After the interview candidates confirmed their availability, each one received a copy of these questions to review in advance of the interview. Each interviewee granted permission to tape-record the telephone conversation. After the interviews, all conversations were transcribed and sent to the physicians for final approval, which they subsequently granted.

Responses to the questionnaire show that a large proportion of performing arts physicians agree that piano teacher training should include instruction in various relevant areas of health science. Strength of this consensus ranges from 88 percent for terminology to 100 percent for both preventive measures and medical referral. Analysis of responses to the individual categories of instruction revealed five categories which could be ranked as essential: postural alignment, pacing of practice sessions, knowledge of early warning signs, knowledge of risk factors, and general physical conditioning. Tests of independence utilizing chi-square calculations demonstrated that there are no

significant relationships between subjects' responses and demographic variables of gender, experience, or the ability to play the piano.

Telephone interviews confirmed that performing arts physicians believe that piano teachers should receive instruction in relevant components of health science. Risks in supplying such training are minimal; in fact, the risks which can result from *not* training teachers may outweigh any risk the training itself may present. Data which documents the effectiveness of instructing piano teachers in health-related topics are limited; as more teachers become aware of these issues, confidence in predicting the real impact of training piano teachers in injury prevention should grow. Those who train piano teachers in such matters should have training in both musical and medical fields, but establishing the requisite extent of such a dual background is also contingent upon experience which the profession has yet to accumulate.

Discussion

The target population consisted of physicians, who are notable for maintaining busy schedules and being difficult to contact. The strong response rate of 81.6 percent of completed and returned surveys indicates a significant level of interest among performing arts physicians in training piano teachers in health-related matters.

Several motivational factors may explain such a high level of interest. Rebecca Clearman and Frank Wilson both alluded to how frequently these specialists treat musicians free of charge–Clearman believes that performing arts physicians treat musicians "for the love of the art." Such statements agree with Pascarelli and Bishop's

survey, which found that clinics at that time (1994) treated musicians on a *pro-bono* basis 75 percent of the time.[181] The lack of personal financial reward associated with this field suggests a more altruistic concern these doctors have with improving the condition of musicians. Many of the responding physicians (58.3 percent) also play the piano; it is possible that those who do not play the piano do play other musical instruments. Although they may not be professional musicians, this personal involvement with music-making gives evidence of the kinship between the two disciplines. Wilson mentioned the respect which physicians have for the amount of work musical performance requires, another motivating factor. Finally, Charness states that piano teachers are not only in a good position to disseminate information on injury prevention, but in the *best* position to do so. Clearly, these doctors regard the piano teacher as a vital member of the interdisciplinary team who can help promote better health among those who play the piano.

Research question one sought to identify performing arts physicians in the United States who regularly treat pianists. All the respondents listed in appendix F currently treat pianists for performance-related disorders. The interviewees are four of the physicians who have the greatest amount of experience in treating pianists.

Research question two, determining whether performing arts practitioners agree that piano teachers should be trained to assist in the prevention, detection, and management of PRHD's, is fundamental to answering all other questions about the contents and contexts of such instruction. There are two aspects to this question. The most critical

---

[181]Pascarelli and Bishop, "Performing Arts Medicine," 65.

aspect is whether it is appropriate for piano teachers to assist in activities which overlap with health care; the second aspect is whether teachers require training for these activities.

In order to explore the subjects' position on this primary matter, each section of part one in the questionnaire began with a similar filter question. The first question in section one (Q-1) serves as an example: "Should piano teacher training include instruction in health science terminology which is relevant to playing the piano?" The high percentage of positive replies strongly affirms that these physicians do agree that piano teachers should be trained in health-related issues. Of those who responded, the lowest degree of agreement is 88 percent, for the area of terminology. Two areas reached 100 percent agreement: preventive measures and medical referral.

The questionnaire and the interviews provided several measures which checked the reliability of the responses to these filter questions. Only those who agreed that a particular area should be incorporated within piano teacher training were to answer the remaining questions for that section. Opportunity was then given for rating individual categories of instruction "inappropriate" as well as "irrelevant"; respondents could still choose to indicate that any or all of the associated topics should not be taught to piano teachers. No respondent who answered a filter question affirmatively chose "irrelevant" or "inappropriate" for all categories in the ensuing section.

Respondents were directed to omit answering any of the areas in part two ("Educational Context") which they had skipped in part one. This step gave another opportunity to indicate that certain areas may not be appropriate for piano teacher

training. Most respondents who indicated that piano teacher training should not include instruction in a particular area(s) skipped the corresponding question(s) in part two; however, five inconsistencies occurred. It is unclear whether these were intentional or accidental omissions.

Each interview began with the question, "Do you believe that training in prevention education should be part of required curricula in the overall education of piano teachers?" The words, "required curricula," emphasize that ideally all piano teachers should receive such training and imply that, by definition, the role of piano teacher should include prevention educator. All four interviewees agreed that such training should be part of required curricula. Wilson maintains that such a proposal can have "no argument."

In the process of answering this interview question, Wilson volunteered comments supporting the need to identify the contents of this "prevention education." For fifteen years, Wilson has personally tried to "get underneath" the problem as to why music education has not more fully integrated instruction in prevention with teacher training. One impediment is the lack of consensus as to what "this package" should contain, both on the part of the medical community and the music education community. Likewise, Brandfonbrener was quick to point out that "prevention education" needs delineation, offering the topics she teaches music students as a possible list. Both Wilson's and Brandfonbrener's comments confirm the need for the present study.

Research question three (the most central of the four research questions) is, what is the training necessary to prepare teachers for the role of prevention educator without

being overly intricate or detailed. Several interviewees pointed out that we are limited in what we can know about this subject in advance, i.e., before the implementation of prevention education programs. Respondents who indicated that a particular category of instruction is essential, beneficial, irrelevant, or inappropriate were offering an opinion based on their professional experience in treating pianists for disorders related to playing the piano. This empirical knowledge is one of the strongest bases we currently have for developing a curriculum for training piano teachers in health-related topics.

Five categories of instruction received mean scores between 1.0 and 1.49: knowledge of risk factors, knowledge of early warning signs, pacing of practice sessions, general physical conditioning, and postural alignment. The standard deviations for these categories were all relatively low, ranging from 0.38 for early warning signs to 0.77 for postural alignment. Although we may not know whether these topics are truly essential, i.e., whether training piano teachers in these categories actually prevents injuries, these data do suggest a consensus regarding those categories physicians consider to be of the greatest importance. Chi-square tests showing the lack of significant relationship between subjects' responses and demographic characteristics strengthen the interpretation that these data do represent a consensus.

The patterns which tie these five categories together may be as important as the categories themselves. None of the categories deal with intricacies of scientific instruction. All are more practical in nature than theoretical. All of them, except recognition of early warning signs, have the potential to enhance the efficiency of piano students, even for students who may not be suffering from playing-related physical

problems. Finally, implementing all five categories for piano teacher instruction involves minimal risk, with the possible exception of general physical conditioning. (A physical conditioning program, if improperly carried out, may place a student at greater risk of injury than if no program were initiated at all.) In short, although the long-term effect of prevention programs involving piano teachers is not known at this time, interpreting the consensus ranking of these five categories of instruction as those which represent a core body of essential information for piano teachers carries with it relatively little risk, has a good probability of enhancing student efficiency, and narrows curricular choices to a manageable number. One respondent's comment on the questionnaire confirmed the need to make teacher training as pragmatic as possible. "The key is to avoid presenting material that will only serve to confuse music teachers, and at the same time emphasize the practical usefulness of the needed information not just in terms of avoidance of injury, but also in terms of a much more pleasing performance arrived at with much less physical struggle and discomfort."

Only four categories of instruction scored an average greater than 3.0: characteristics of double-crush syndrome, surgical treatments for PRHD's, terminology concerning related fields, and the microanatomy of soft tissue. These categories may be interpreted as having limited to no relevance for piano teacher training. Double-crush syndrome is a hypothesis which postulates that a slight disturbance in a more proximal site of the peripheral nervous system may result in a neuropathy in a more distal site. The relatively large number of respondents who believe that knowledge of this syndrome is irrelevant may be due to its still-controversial status as a hypothesis. The high ratings which the

other categories received may be explained because they deal with a level of detail that is either irrelevant or inappropriate for piano teacher training.

All other categories of instruction scored greater than 1.49 but less than 3.0. These categories may be regarded as beneficial for piano teacher training, but not essential. The twenty-two categories between 1.5 and 1.99 (level two scores) may be regarded as highly beneficial. Of these, six categories had to do with preventive measures, five with PRHD's, four with medical referral, three each with anatomy/physiology and rehabilitation, and one with terminology. The large number of preventive measure categories suggest that training piano teachers in prevention may be more important than education for the detection or management of PRHD's. Only two PRHD categories related to characteristics of specific disorders (carpal tunnel syndrome and tendinitis); etiology, vulnerable sites, and physiological processes leading to injury all scored higher. These choices suggest the training of the piano teacher as prevention educator should be geared toward practical applications and interdisciplinary collaboration with health care professionals. Although only one category of terminology rated a level two score (terms regarding movement), definition of basic terminology is understood as fundamental to any instruction, especially in an interdisciplinary context. It is altogether natural that a teacher would define lordosis or kyphosis, for example, when explaining postural defects to piano teachers. Again, the stress seems to be on practicality, with little emphasis on knowing the names of bones, muscles, or other anatomical structures as one might expect would be the case with medical students.

Whereas research question three sought to determine what piano teachers should be

taught, research question four inquired as to who and how to teach them. Part two of the questionnaire attempted to answer research question four. Opinions in part two were more divided than in part one. No instructional format, for example, received a majority of the total responses–the highest was 44.8 percent for a supplement to a health science course in the area of terminology. The most conclusive findings are the negative ones, dealing with who should not be trainers and which formats should not be used. Teachers should not instruct themselves in health-related matters. Corresponding to this, books and videotapes are not seen as effective formats for instruction. The importance of these "negative" findings should not be overlooked. Since performing arts specialists believe that piano teachers should be trained in prevention education, and since they do not believe that reading books or viewing videotapes provides sufficient training, it is clear that some degree of formal training is needed.

Overall, the optimal trainer which the respondents chose most often is interdisciplinary specialist, but comments from the interviewees show that the term, "interdisciplinary specialist," may be defined broadly. All interviewees feel that it is important for those who train piano teachers to have both a medical and musical background. The individual may either be a medical professional with supplemental music training or the reverse. At this time, the extent of training needed in the supplemental field is open to conjecture. Utilizing outside expertise–a form of "team teaching"–can accomplish virtually the same result as individual instructors having dual backgrounds. One advantage of drawing on the expertise of health care professionals is that, as a rule, medical experts have greater access to new research in performing arts

medicine.

All of the most common choices for instructional format involve some form of supplementation to an existing class. This finding is consistent with the need to isolate a core curriculum of essential training. Although the material which physicians rated as beneficial for piano teacher instruction is more than sufficient to warrant a new course, practical issues of balancing this curriculum with those curricula already present in piano pedagogy make the implementation of supplementary instruction a more workable proposition, and therefore one which is more likely to take place. Seminars and workshops have the advantage of accessibility to teachers already in the field as well as other individuals who are not enrolled in piano pedagogy course work.

Although the questionnaire presented seminar/workshops, supplements to existing health science courses, and supplements to existing music education courses as separate choices, there are a number of ways they could be combined or thought of as interchangeable. A seminar/workshop can have virtually the same meaning as a supplement to an existing music education class, the only difference being one of scheduling and accessibility to those not enrolled in degree programs. A supplement to an existing health science class could function as a supplement to an existing music education class by having a health science teacher visit a music education class as an outside expert.

In summary, the most conclusive answer to any of the research questions is that performing arts specialists express strong agreement with the opinion that piano teachers should be trained to assist in the prevention, detection, and management of PRHD's.

This finding clearly implies a broadening of the role of the piano teacher to encompass prevention educator. Although opinions about the contents of that instruction are largely based upon empirical observation, the five categories of postural alignment, recognition of early warning signs, risk factors, general physical conditioning, and pacing of practice sessions received scores which may be interpreted as essential for piano teacher training and thereby represent a core curriculum. As more educational programs implement this kind of piano teacher training, the experience which is gained may modify these priorities. The most beneficial categories of instruction are those which emphasize practicality as opposed to pure science. The most conclusive finding regarding educational context is that piano teachers should not train themselves and that books and videotapes are the least effective formats for training piano teachers. A number of options exist for engaging instructors from both medical and musical fields to supplement current piano pedagogy curricula, whether for training teachers already in the field or future teachers.

Conclusions

Training piano teachers and piano pedagogy students in prevention education may proceed with the confidence that it has the full support of performing arts physicians. The following conclusions may be made on the basis of the data collected by this survey and the ensuing interviews of four particularly experienced respondents.

(1) Performing arts physicians experienced in treating pianists are unanimous in the belief that piano teachers should be trained in at least some components of relevant

health science. All four of the interviewees believe that prevention education should be part of required curricula for piano teachers. In the words of one of these interviewees, "Piano teachers are in the best position to disseminate the information which can help prevent injury in developing pianists."

Since curricula including training prevention education should not simply be recommended, but required, it is clear that these performing arts physicians believe all teachers should receive such training. The importance that these specialists place on training piano teachers implies the need for a systemic revision of teacher education curricula.

(2) These data presuppose a new paradigm of the piano teacher as a member of an interdisciplinary team. Since piano teacher training should include instruction in health-related matters, teachers' participation in the prevention and management of PRHD's among piano students is an inherent part of their role. Two interviewees spoke of possible legal liability of teachers who place students at greater risk of physical injury through improper teaching. Such language emphasizes the serious responsibilities of the piano teacher in this new paradigm.

(3) These data represent a consensus among performing arts specialists who treat pianists concerning the essential preparation for any piano teacher assisting in the prevention, detection, and management of performance-related health disorders. Chi-square analysis strongly suggests that the responses of these physicians are independent from bias due to gender, amount of experience, or the ability to play the piano.

(4) Statistical analysis of these data identifies five essential areas of instruction.

Although many topics could be beneficial for piano teachers, the most essential instruction includes postural alignment, general physical conditioning, knowledge of early warning signs, knowledge of risk factors, and pacing of practice sessions. Isolating the essential curriculum from the many potentially beneficial topics answers the most crucial of the four research questions, determining how much training is adequate to prepare teachers for this role without being overly intricate or detailed.

(5) Piano teacher training in health science should be oriented more toward practicality than theory or pure science. Principles of biomechanics, ergonomics, and movement are more important than knowing the names of bones, joints, or muscles; the processes which lead to injury are more important than knowing characteristics of individual disorders. Instruction in terminology should not be an end in itself, but serve as preparation to intelligently discuss the essential curricula.

The five essential topics satisfy this requirement. None of these topics involve technical or extensive medical or scientific education. Most of the essential curricula overlap standard pedagogical practices, albeit from a new, preventive standpoint. For example, many teachers already emphasize the importance of proper sitting and playing position–instruction in postural alignment enhances the teacher's understanding of proper position from a physiological perspective. The guidance of students' practicing is viewed by many as a chief task of the teacher–instruction in proper pacing of practice sessions extends this acknowledged responsibility to include risk management. General physical conditioning is an extension of conditioning at the piano many teachers already promote through technical exercises.

(6) The five essential topics emphasize the improved overall performance of the piano student. Pianists who are trained to use the body efficiently not only reduce risk, but improve efficiency of performance. Pedagogy which incorporates instruction in postural alignment, general physical conditioning, knowledge of early warning signs, knowledge of risk factors, and pacing of practice sessions may produce results superior to those achieved without knowledge of PRHD's and the factors which place students at risk of developing them.

(7) It is important that prevention education training include assistance in knowing when self-care for playing-related physical problems should end and medical consultation begin. Teachers need to be alerted to other medical conditions which may mimic performance-related disorders. Piano teachers should not attempt to diagnose students and should make even such seemingly-innocuous medical suggestions as recommending over-the-counter pharmaceuticals with caution. The line separating self-care from medical consultation is not well-defined, however. Absolute criteria which determine the need for medical referral have not yet been determined. Not all piano students have equal access to qualified health care professionals. Preparing teachers to face this large variety of contexts requires that piano teacher training be adequate to guide the student's self-care when possible.

(8) Although it is important that teachers do not assume the role of the health care professional, there is more risk in not training teachers than in training them. Proper training of piano teachers may actually decrease any such risk. Many teachers may already be advising students in health-related issues, with or without adequate prevention

education training. At the same time, there is no indication that the numbers of injured pianists are decreasing. To delay implementation of systematic prevention education prolongs the risk of the unacceptably high prevalence of PRHD's.

(9) Conclusions regarding educational context are less definitive than conclusions regarding content. However, it is clear that the performing arts specialists do not believe that piano teachers should train themselves through reading books or watching videotapes. The essential curriculum does not necessarily warrant a new course. Nevertheless, since teachers should not train themselves, it is important that some formal training take place, whether by means of a seminar, workshop, or supplement to an existing course. Those who instruct piano teachers should have training in both fields, whether their primary field be in a health care or music education profession.

(10) Continued progress in preparing piano teachers to assist in preventing medical problems requires ongoing collaboration with performing arts specialists. Education in performing arts medicine is important not only for musicians and music educators, but for health care providers as well.

Recommendations

In 1994, the National Conference on Piano Pedagogy's Committee on the Prevention of Medical Problems published a position paper listing ten "essential principles to help preserve musicians' wellness." The committee hoped the paper would "serve as a catalyst in mobilizing musicians to reevaluate their educational methods, assess their effectiveness and initiate changes as needed, enhancing their ability to cultivate skilled,

happy, healthy musicians."[182] Although a number of individual teachers are incorporating such principles into their pedagogy, no systematic implementation of these recommendations has yet been undertaken.

The data obtained from this questionnaire and the ensuing interviews encourage the continued collaboration of several professions, organizations, and institutions. These data support the following recommendations.

(1) All piano teachers and prospective piano teachers are strongly encouraged to redefine their roles to include the role of prevention educator. Performing arts physicians agree that piano teachers should assist in the prevention, detection, and management of performance-related health disorders. Those teachers who do not receive training in basic health science may inadvertently place their students at greater risk of injury.

(2) Piano teachers are encouraged to embrace the findings of performing arts medicine as leading to healthier and more rewarding pianism. In particular, teachers should become more aware of postural alignment, early warning signs of physical distress, specific factors which increase the risk of injury, general physical conditioning, and the proper pacing of practice sessions.

(3) Organizations such as the National Association of the Schools of Music (NASM) and the Music Teachers National Association (MTNA) should issue statements promoting essential curricula for healthy music-making, subsequent to confirmation of these findings among other populations. Training in prevention education should not be

---

[182]Gail Berenson, "Position Paper on Musician Wellness,"in *The National Conference on Piano Pedagogy: Proceedings and Reference, 1994-1995* (Los Angeles: The National Conference on Piano Pedagogy, 1995): 192.

left to chance or to the inclination of a particular school or teacher, but should be systemically incorporated as a standard component of piano teacher education. Instruction in the essentials should be part of required piano teacher training, both for current and prospective teachers.

(4) The professions of performing arts medicine and music education should make every effort to encourage a more systematic liaison/working relationship. Teachers need a network of physicians, therapists, and other associated health care providers to whom they may confidently entrust their students. Dialogue needs to be ongoing to allow the sharing of research and collaboration with individual students on a case-by-case basis.

(5) Those familiar with the issues of performing arts medicine, as they relate to playing the piano, should provide a written text which thoroughly focuses on practical health science education for piano teachers and/or music educators. The profusion of guides and other self-help manuals leads to confusion among readers as to what the essentials are and the extent to which self-instruction is effective. Ideally, the authorship of this text would be multi-disciplinary, incorporating expertise from both medical and musical professions.

(6) Educational institutions should support supplementing piano pedagogy instruction with trainers and workshops outside the parameters of piano pedagogy teachers and classes. Until enough specialists are trained in both medical and music education curricula, pedagogy classes may have to rely on utilizing performing arts specialists, health science instructors, musicians who have used their personal experience with injury to focus their energies on injury prevention, or other experts as needed.

(7) It is recommended that the implementation of prevention education programs begin without delay. Knowledge of how to minimize risk of injury through piano teacher training can only be gained by putting the knowledge we now have into practice. Although there is no proof that training piano teachers in the areas of postural alignment, early warning signs of physical distress, specific factors which increase the risk of injury, general physical conditioning, and the proper pacing of practice sessions will decrease injury, these five curricula represent a point of departure which can establish an effective baseline for further research.

Further Research

Throughout the various stages of the present study, it became apparent that more research is necessary for continued progress. Possible topics for further research follow.

(1) This study focused on performing arts physicians; other populations should be surveyed as well. These groups could include therapists, teachers experienced with performing arts medicine, and related specialists such as body awareness teachers. All participants in the paradigm of the piano teacher as prevention educator should be investigated in order to achieve a balanced comparison of all viewpoints.

(2) Many piano teachers may define efficient posture differently than physiologists do. It is possible that teachers may mistakenly believe that they understand good posture when in fact they do not. It would be beneficial to discover the current piano teacher's working definition of efficient posture as a baseline for teacher training. All aspects of posture should be included, both at and away from the piano.

(3) We should study existing programs which train both music educators and musicians in general in order to explore the current status of prevention education. These could include full-spectrum programs such as described by Spaulding as well as more specialized programs such as Alexander technique workshops. It is recommended that such a study be international in scope, as several important and well-established programs are located outside the United States. The contexts of instruction (e.g., the qualifications of trainers and class/workshop format) should be investigated as well as the curricular content.

(4) Longitudinal studies tracking prevention education programs are important to gauge the actual impact of such programs on injury prevention. These studies should include both the effectiveness of the training process itself as well as long-term effects on piano students.

(5) In order for teachers to know when medical consultation is appropriate, the feasibility of establishing absolute and relative criteria for medical referral should be investigated. This investigation should draw on the expertise of both health care and music professionals.

(6) This study has primarily focused on training piano teachers in physiological topics. In spite of the interrelatedness of psychology and physiology, the psychological factors involved in PRHD's were delimited. Prevention education involving training piano teachers in psychological topics warrants its own study.

The consensus findings of this study provide an important link between performing arts medicine and music education. Until a stronger liaison between performing arts

medicine and music education exists, piano teachers who assist in the prevention, detection, and management of PRHD's must rely on guidance from health care professionals as it becomes available. Although the health science topics which the respondents to this survey recommended for piano teacher training confirm what common sense may have suggested, their high level of agreement regarding these topics produce a stronger degree of confidence than common sense alone could yield. Piano teachers who receive supplemental training in the five "essential" curricula, as well as the "highly recommended" curricula, can be only better prepared to deal with physical problems when they arise and, ultimately, to prevent them from arising in the first place.

WORKS CITED

Adams, Noah. *Piano Lessons: Music, Love and True Adventures.* New York: Delacorte Press. 1996.

Babbie, Earl R. *Survey Research Methods,* 2nd ed. Belmont, CA: Wadsworth, 1990.

Berenson, Gail. "Music Medicine and Today's Piano Teacher." In *Creative Piano Teaching.* 3rd ed., edited by James Lyke, Yvonne Enoch, and Geoffrey Haydon. Champaign, IL: Stipes Publishing, 1996.

_____. "Position Paper on Musician Wellness." In *The National Conference on Piano Pedagogy: Proceedings and Reference, 1994-1995.* Los Angeles: The National Conference on Piano Pedagogy, 1995, 192.

Berkowitz, Margalit. "Taubman's Way, Naturally: An Interview with Dorothy Taubman." *Clavier* 37 (March, 1998): 8–12.

Brandfonbrener, Alice G. "The Etiologies of Medical Problems of Performing Artists." In *Performing Arts Medicine.* 2nd ed., edited by Robert Thayer Sataloff, Alice Brandfonbrener, and Richard J. Lederman. San Diego, CA: Singular Publishing Group, Inc., 1998.

_____. "Prevention Strategies: Will They Help or Harm?" *Medical Problems of Performing Artists* 8 (December 1993): 115.

_____. "The Teacher Needs to Understand the Function of the Human Body in Relation to the Instrument for Achieving Optimum Comfort." In *The National Conference on Piano Pedagogy: Proceedings and Reference, 1994-1995.* Los Angeles: The National Conference on Piano Pedagogy, 1995.

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

Critchley, MacDonald and R. A. Henson. *Music and the Brain: Studies in the Neurology of Music.* New York: Thomas, 1977.

Council of Arts Accrediting Associations. "Briefing Paper: An Overview of Health Issues for Performing and Visual Arts Students." March 1991.

Cox, James. *Your Opinion, Please! How to Build the Best Questionnaires in the Field of Education.* Thousand Oaks, CA: Corwin Press, 1996.

Daum, Miriam C. "Musculoskeletal Problems in Musicians." [http://gopher.tenn.com:70/0/artswire/csa/arthazards/performing/musicians], 1997.

Dawson, William et al. "What's in a Name?–Terminologic Issues in Performing Arts Medicine." *Medical Problems of Performing Artists* 13 (June, 1998): 45–50.

Dunning, Jennifer. "When the Pianist's Fingers Fail to Obey." *New York Times* (June 14, 1981): sec. 2, 1.

Faber's Cyclopedic Dictionary. 15th ed. Philadelphia, PA: F. A. Davis, 1985.

Fishbein, Martin and Susan Middlestadt. "Medical Problems Among ICSOM Musicians: Overview of a National Survey." *Medical Problems of Performing Artists* 3 (March, 1988): 1–8.

Frey, James H. and Sabine Mertens Oishi. *How to Conduct Interviews by Telephone and in Person.* Thousand Oaks, CA: Sage Publications, Inc., 1995.

Fry, Hunter J. H. "Overuse Syndrome in Musicians–100 Years Ago: A Historical Review." *The Medical Journal of Australia* 145 (December 1/15, 1986): 620–624.

_____. "Overuse Syndrome in Musicians: Prevention and Management." *The Lancet* (September 27, 1986): 728–731.

_____. "Prevalence of Overuse (Injury) Syndrome in Australian Music Schools." *British Journal of Industrial Medicine* 44 (May 13, 1986): 35–40.

Golandsky, Edna. *The Taubman Techniques.* Medusa, NY: The Taubman Institute, 1995. Five VHS tapes.

Goode, David J. and Sarah-Patsy Knight. "Identification, Retrieval, and Analysis of Arts Medicine Literature." *Medical Problems of Performing Artists* 6 (March, 1991): 3–6.

Gordon, Stewart. "Influences on Pedagogy." In *The Well-Tempered Keyboard Teacher*, edited by Marienne Uszler, Stewart Gordon, and Elyse Mach. New York: Schirmer Books, 1995.

Graffman, Gary. "Doctor, Can You Lend an Ear?" *Medical Problems of Performing Artists* 1 (March, 1986): 3–6.

Grindea, Carola. "Tension in Piano Playing: Its Importance and Dangers." In *Tensions in the Performance of Music*, edited by Carola Grindea. London: Kahn and Averill, 1995.

Harman, Susan E. "The Evolution of Performing Arts Medicine as Seen Through the Literature." In *Performing Arts Medicine*. 2nd ed., edited by Robert Thayer Sataloff, Alice Brandfonbrener, and Richard J. Lederman. San Diego, CA: Singular Publishing Group, Inc., 1998.

Hoppmann, Richard and Nicholas Patrone. "A Review of Musculoskeletal Problems in Instrumental Musicians." *Seminars in Arthritis and Rheumatism* 19 (October, 1989): 117–128.

Hsu, Yu-Pin. "An Analysis of Contributing Factors to Repetitive Strain Injury (RSI) Among Pianists." Ed. D. diss., Columbia University, 1997.

Jameson, Timothy J. *Repetitive Strain Injuries: The Complete Guide to Alternative Treatments and Prevention.* New Canaan, CT: Keats Publishing, Inc., 1998.

Kaplan, Iris. "The Experience of Pianists Who Have Studied the Alexander Technique: Six Case Studies." Ph.D. diss., New York University, 1994.

Keller, Katy, Julie Corbett, and Diane Nichols. "Repetitive Strain Injury in Computer Keyboard Users: Pathomechanics and Treatment Principles in Individual and Group Intervention." *Journal of Hand Therapy* 11 (January–March 1998): 9–25.

Kim, Jinie. "Physical Problems Prevalent Among Pianists." DMA diss., University of Washington, 1997.

Lancaster, Emanuel Leo. "The Development and Evaluation of a Hypothetical Model Program for the Education of the College and University Group Piano Instructor." Ph.D. diss., Northwestern University, 1978.

Lederman, Richard J. "The Coming of Age of Performing Arts Medicine." *The Western Journal of Medicine* (Jan, 1994): 73–74.

_____. "Focal Dystonia in Instrumentalists: Clinical Features." *Medical Problems of Performing Artists* 6 (December 1993): 132–136.

Lederman, Richard J. "Neurologic Problems of Performing Artists." In *Performing Arts Medicine*. 2nd ed., edited by Robert Thayer Sataloff, Alice Brandfonbrener, and Richard J. Lederman. San Diego, CA: Singular Publishing Group, Inc., 1998.

Lieberman, Julie Lyonn. *You Are Your Instrument: The Definitive Musician's Guide to Practice and Performance*. 3rd ed. New York: Huiksi Music, 1997.

Lister-Sink, Barbara. *Freeing the Caged Bird: Developing Well-Coordinated, Injury-Preventive Piano Technique*. Winston-Salem, NC: Wingsound, 1996.

_____. "Freeing the Caged Bird: Developing A Common Language for Teaching Injury-Free Piano Playing." In *Current Research in Arts Medicine: A Compendium of the MedArt International 1992 World Congress on Arts and Medicine*, edited by Fadi J. Bejjani. New York: A Cappella Books, 1993.

Markison, Robert E. "Treatment of Musical Hands: Redesign of the Interface." *Hand Clinics* 6 (August 1990): 525–544.

Mastroianni, Thomas and Richard Norris. "Performers, Teachers, and Medical Practitioners: Working Together to Promote Wellness." *American Music Teacher* 42 (April/May 1993): 26–29.

Meinke, William B. "Musicians, Physicians, and Ergonomics: A Critical Appraisal." *Medical Problems of Performing Artists* 9 (September 1994): 67–68.

_____. "The Work of Piano Virtuosity: An Ergonomic Analysis." *Medical Problems of Performing Artists* 10 (June, 1995): 48–61.

Microsoft Excel 97 SR 1. Redmond, WA: Microsoft Corporation, 1997.

Moseley, Linda H. et al. "Cumulative Trauma Disorders and Compression Neuropathies of the Upper Extremities." In *Occupational Hand and Upper Extremity Injuries and Diseases*, edited by Morton L. Kasdan. Philadelphia: Hanley and Belfus, Inc., 1991.

The National Conference on Piano Pedagogy: Proceedings and Reference: 1994-1995. Los Angeles: The National Conference on Piano Pedagogy, 1995.

"National Standards for Athletic Coaches," [http://www.aahperd.org/naspe/publications-coach standards.html#C17], August 20, 2000.

Norris, Richard. *The Musician's Survival Manual: A Guide to Preventing and Treating Injuries in Instrumentalists*. St. Louis, MO.: International Conference of Symphony and Opera Musicians, MMB Music, 1993.

Oppenheim, Abraham Naftali. *Questionnaire Design and Attitude Measurement.* New York: Basic Books, 1966.

Ortmann, Otto. *The Physiological Mechanics of Piano Technique.* London: Kegan Paul, Trench, Trubner & Co., 1929; reprint, New York: da Capo Press, 1981.

Pascarelli, Emil and Deborah Quilter. *Repetitive Strain Injury: A Computer User's Guide.* New York: John Wiley and Sons, 1994.

Pascarelli, Emil and Christina Bishop. "Performing Arts Medicine: The Status of the Specialty Within an Evolving Health Care System." *Medical Problems of Performing Artists* 9 (Sept, 1994): 63–66.

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

Pierce, Alexandra and Roger Pierce. *Expressive Movement: Posture and Action in Daily Life, Sports, and the Performing Arts.* New York: Insight Books, 1989.

_____. *Generous Movement: A Practical Guide to Balance in Action.* Redlands, CA: The Center of Balance Press, 1991.

_____. "Pain and Healing: for Pianists–Part 3." *The Piano Quarterly* (Summer 1984): 45–49.

Quarrier, Nicholas F. "Survey of Music Teachers: Perceptions about Music-related Injuries." *Medical Problems of Performing Artists* 10 (September 1995): 106–110.

Renfrow, Kenon. "The Development and Evaluation of Objectives for Educating Graduate Piano Pedagogy Students to Use Computer and Keyboard Technology." Ph.D. diss., University of Oklahoma, 1991.

Rogers, Sandra Margaret. "Survey of Piano Teachers: Awareness and Intervention of Predisposing Factors to Piano-related Injuries." Ed.D. diss., Teachers College, Columbia University, 1999.

Rozmaryn, Leo. "Upper Extremity Disorders in Performing Artists." *Maryland Medical Journal* (March, 1993): 255–260.

Sakai, Naotaka. "Relationship Between Painful Hands of Pianists and Piano Techniques." In *Current Research in Arts Medicine: A Compendium of the MedArt International 1992 World Congress on Arts and Medicine*, edited by Fadi J. Bejjani. New York: A Cappella Books, 1993.

Schullian, Dorothy and M. Schoen, eds. *Music and Medicine.* New York: H. Schuman, 1948.

Schultz, Arnold. *The Riddle of the Pianist's Finger and Its Relationship to a Touch-Scheme.* New York, Carl Fischer, 1936.

Sen, Jonas. *Playing the Piano, Playing . . . with Fire?* [http://rvik.ismennt.is/jssen/musmed.html], 1995.

Singer, Kurt. *Diseases of the Musical Profession: A Systematic Presentation of Their Causes, Symptoms, and Methods of Treatment.* Translated by W. Lakond. New York: Greenberg, 1932.

Spangler, Andrea. "Common Upper Extremity and Jaw Injuries of Instrumental Musicians: Treatment and Prevention Techniques." B.M. thesis, University of Northern Colorado, 1996.

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

_____. "Implementing Preventive Education in the Training of Professional Musicians." In *Music Medicine: Volume 2*, edited by Rosalie Pratt and Ralph Spintge. Saline, MI: International Society for Music in Medicine, 1996: 292–298.

Stiehl, James. "Overuse Syndromes in Professional Musicians." *Pan Pipes of Sigma Alpha Iota* (Spring 1990): 8–9.

Upton, Adrian and Alan McComas. "The Double Crush in Nerve-entrapment Syndromes." *The Lancet* (August 18, 1973): 359–362.

Uszler, Marienne. "Research on the Teaching of Keyboard Music." In *Handbook of Research on Music Teaching and Learning: A Project of the Music Educators National Conference*, edited by Richard Colwell. New York: Schirmer Books, 1992.

Walker, Alan. "Schumann and his Background," in *Robert Schumann: The Man and His Music*, edited by Alan Walker. New York: Barnes and Noble, 1972.

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

Wilson, Frank R. "Glenn Gould's Hand." In *Medical Problems of the Instrumental Musician*, ed. Peter Amadio and Raoul Tubiana. London: Martin Dunitz, Ltd., 2000.

Wilson, Frank R. *The Hand: How Its Use Shapes the Brain, Language, and Human Culture*. New York: Pantheon Books, 1998.

_____. "Music and Medicine: An Old Liaison, A New Agenda." *Psychomusicology* 7 (1988): 139–146.

_____. *Tone Deaf and All Thumbs?* New York: Viking-Penguin, 1986.

Wilson, Frank R. and Franz L. Roehmann. "The Study of Biomechanical and Physiological Processes in Relation to Musical Performance." In *Handbook of Research on Music Teaching and Learning: A Project of the Music Educators National Conference*, ed. Richard Colwell. New York, Schirmer Books, 1992.

Wolff, Konrad. "Dorothy Taubman: The Pianist's Medicine Woman." *The Piano Quarterly* 34 (Spring, 1986): 25–32.

Wristen, Brenda G. "Overuse Injuries and Piano Technique: A Biomechanical Approach." Ph.D. diss., Texas Tech University, 1998.

_____. "Overuse Injuries and Syndromes in Keyboard Players: The Roles of Performing Arts Specialists and Piano Teachers." M.M. thesis, Texas Tech University, 1995.

_____. "Fitness and Form to Reduce Injuries," *Clavier* 36 (1996): n.p.

Zaza, Christine and V.T. Farewell. "Musicians' Playing-related Musculoskeletal Disorders: An Examination of Risk Factors." *American Journal of Industrial Medicine* 32 (1997): 292–300.

Zaza, Christine. "Musicians' Playing-Related Musculoskeletal Disorders: An Examination of Physical, Psychological, and Behavioural Factors." Ph.D. diss., University of Waterloo, Canada, 1995.

_____. *Play it Safe: A Health Resource Manual for Musicians and Health Professionals.* London, ON: Canadian Network for Health in the Arts, 1998.

_____. "Prevention of Musicians' Playing-Related Health Problems: Rationale and Recommendations for Action." *Medical Problems of Performing Artists* 3 (December 1993): 117–121.

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

APPENDIX A

COVER LETTER ACCOMPANYING THE QUESTIONNAIRE

Dear (name of performing arts physician):

Researchers in performing arts medicine emphasize the integral role music educators can play in the prevention of performance-related health disorders among music students. Traditional piano teacher curricula do not include training which specifically prepares piano teachers to assist in the prevention of these disorders. The enclosed questionnaire is designed to help identify those components of health science education which should supplement piano pedagogy instruction for this purpose. Performing arts physicians in the United States who regularly treat pianists have been chosen to receive this questionnaire. This study is being conducted as an approved doctoral dissertation in Music Education (Piano Pedagogy) at The University of Oklahoma, Norman.

The questionnaire is divided into three parts. The first part explores six areas of health science information or training which are potentially relevant for piano teacher training. The second part seeks to identify the optimal educational contexts for implementing this training. The final part ascertains background information to assist in the classification of the data from the first two parts.

In addition to the questionnaire, please find enclosed a letter written by Dr. Robert T. Sataloff supporting this project. Dr. Sataloff is the Chairman of Otolaryngology–Head & Neck Surgery at Thomas Jefferson University, the Director of Jefferson Arts Medicine Center, and is a co-editor of the *Textbook of Performing Arts Medicine*.

Your participation in this project is greatly appreciated. It takes approximately twelve minutes to complete the questionnaire. All answers will remain strictly confidential; the final report will reveal no direct association between individual respondents and their specific responses. Space has been provided in the questionnaire to indicate your interest in receiving the results of this study. I have included my phone number and e-mail address below for your reference should questions arise in answering the questionnaire. A self-addressed, stamped envelope has been included for your convenience. Please return the completed survey no later than March 10, 2000.

Sincerely yours,

Charles Turon
3908 Cape Vista Drive
Bradenton, Florida 34209-6744
(941) 795-1831
e-mail: turon@attglobal.net

APPENDIX B

SUPPORT LETTER ACCOMPANYING

THE QUESTIONNAIRE

January 18, 2000

Mr. Charles Turon
3908 Cape Vista Drive
Bradenton, FL 34209-6744

Dear Charles:

Thank you for the opportunity to review your proposed thesis. I enjoyed reading the abstract and questionnaire.

I support your efforts to expand our prospectus on the education of arts medicine professionals. We need more piano teachers who are familiar with medical diagnosis and treatment, physical therapy techniques, and the terminology and practices necessary to function in a medical milieu. I hope that the response of physicians to your questionnaire is excellent, and that your dissertation leads to guidelines for the enhancement of piano pedagogy programs in order to prepare interested teachers for interdisciplinary collaboration on health care teams.

With best regards,

Very truly yours,

Robert T. Sataloff, M.D., D.M.A.

RTS/lvp

(Copy of original letter)

APPENDIX C

QUESTIONNAIRE TO PERFORMING ARTS PHYSICIANS

Educational Prerequisites for Piano Teachers Assisting in the Prevention, Detection, and Management of Performance-related Health Disorders

The purpose of this study is to determine information and training which piano teachers should receive in order to effectively assist in the prevention, detection, and management of performance-related health disorders among piano students. Selected performing arts specialists with experience in treating pianists are invited to respond. The data gathered from the questionnaire will be the basis for a doctoral dissertation at The University of Oklahoma. All answers provided will remain strictly confidential; the final report will reveal no direct association between individual respondents and their specific responses. Please follow the instructions for completing each item.

Directions:

All questions refer to **categories** of health science education which may be important to include in the training of piano teachers.

Use the following code for answering sections I–VI found under the heading, "Curricular Content."

Information is:

1 = Essential
2 = Beneficial, but not essential
3 = No opinion
4 = Irrelevant
5 = Inappropriate

CURRICULAR CONTENT

SECTION I: TERMINOLOGY

Q-1. Should piano teacher training include instruction in health science terminology which is relevant to playing the piano? (Check box)

- ❑ No
- ❑ Yes

If you answered "No" to Q-1, skip to Q-11 now.

Please indicate the degree of importance for piano teachers to receive instruction in the following categories of health science **terminology** in order to help prevent performance-related health disorders among piano students. Examples have been included for some categories for clarification. (Place check in appropriate box)

1 = Essential 2 = Beneficial 3 = No opinion 4 = Irrelevant 5 =Inappropriate

		1	2	3	4	5
Q-2.	Terms of orientation (e.g., proximal, distal)					
Q-3.	Terms of movement (e.g., flexion, extension)					
Q-4.	Terms of relationship (e.g., superior, anterior)					
Q-5.	Anatomical names of bones in the upper quarter					
Q-6	Anatomical names of muscles in the upper quarter					
Q-7.	Terms describing physiological dysfunction (e.g., spasm, inflammation, syndrome)					
Q-8.	Terms relating to symptoms of musicians' disorders (e.g., acute, chronic, edema, parasthesia)					
Q-9.	Names of affiliated fields of study (e.g., epidemiology, pathology)					

Q-10. Other: _____

SECTION II: CONCEPTS AND PRINCIPLES OF ANATOMY AND PHYSIOLOGY

Q-11. Should piano teacher training include instruction in concepts and principles of anatomy and physiology which are relevant to playing the piano? (Check box)

- ❑ No
- ❑ Yes

If you answered "No" to Q-11, skip to Q-29 now.

Please indicate how important it is for piano teachers to receive instruction in the following **concepts and principles of anatomy and physiology** in order to help prevent performance-related health disorders among piano students. (Place check in appropriate box)

1 = Essential 2 = Beneficial 3 = No opinion 4 = Irrelevant 5 = Inappropriate

		1	2	3	4	5
Q-12.	Anatomy/physiology of musculoskeletal system					
Q-13.	Anatomy/physiology of nervous system					
Q-14.	Anatomy/physiology of vascular system					
Q-15.	Anatomy/physiology of the upper quarter					
Q-16	Microanatomy of soft tissue					
Q-17.	Design aspects of bones, joints, and muscles					
Q-18.	Normal range of motion of joints of the upper quarter					
Q-19.	Muscle classification (e.g., agonist/antagonist)					
Q-20.	Modes of muscular contraction (e.g., concentric, eccentric)					
Q-21.	Processes of soft tissue adaptation					
Q-22.	Physiology of exercise					
Q-23.	Principles of biomechanics					
Q-24.	Principles of ergonomics					
Q-25.	Principles of kinetics					
Q-26.	Postural alignment					

Q-27. Other:_____

SECTION III: COMMON PERFORMANCE-RELATED HEALTH DISORDERS

Q-28. Should piano teacher training include instruction related to medical disorders common among pianists? (Check box)

- ❑ No
- ❑ Yes

If you answered "No" to Q-28, skip to Q-49 now.

Please indicate how important it is for piano teachers to receive instruction in the following aspects of **performance-related health disorders** in order to help prevent performance-related health disorders among piano students.

1 = Essential 2 = Beneficial 3 = No opinion 4 = Irrelevant 5 =Inappropriate

Characteristics of the following disorders/conditions. (Place check in appropriate box)

		1	2	3	4	5
Q-29.	Carpal Tunnel Syndrome					
Q-30.	Cervical Radiculitis					
Q-31.	Cubital Tunnel Syndrome					
Q-32.	DeQuervain's Tenosynovitis					
Q-33.	Double-Crush Syndrome					
Q-34.	Focal Dystonia					
Q-35.	Ganglion cysts					
Q-36.	Hyperlaxity					
Q-37.	Osteoarthritis					
Q-38.	Overuse Syndrome					
Q-39.	Radial Tunnel Syndrome					
Q-40.	Tendinitis					
Q-41.	Thoracic Outlet Syndrome					
Q-42.	Trigger Finger					

SECTION III: COMMON PERFORMANCE-RELATED HEALTH DISORDERS (continued)

Please indicate how important it is for piano teachers to receive instruction in the following aspects of **performance-related health disorders** in order to help prevent performance-related health disorders among piano students. (Place check in appropriate box)

1 = Essential 2 = Beneficial 3 = No opinion 4 = Irrelevant 5 =Inappropriate

		1	2	3	4	5
Q-43.	Physiological processes leading to injury					
Q-44.	Sites of greater vulnerability					
Q-45.	Etiology of performance-related health disorders					
Q-46.	Risk factors					
Q-47.	Early warning signs					

Q-48. Other:_____

SECTION IV: PREVENTIVE MEASURES

Q-49. Should piano teacher training include instruction in the prevention of performance-related health disorders? (Check box)

❑ No
❑ Yes

If you answered "No" to Q-49, skip to Q-61 now.

Please indicate how important it is for piano teachers to receive instruction in the following **preventive measures** in order to help prevent performance-related health disorders among piano students. (Place check in appropriate box)

1 = Essential 2 = Beneficial 3 = No opinion 4 = Irrelevant 5 =Inappropriate

		1	2	3	4	5
Q-50.	Physiologically-based technique					
Q-51.	Pacing of practice sessions					
Q-52.	General physical conditioning					
Q-53.	Warm-ups away from the instrument					
Q-54.	Cool-downs					
Q-55.	Stress management					
Q-56.	Stretching regimes					
Q-57.	Strengthening regimes					
Q-58.	Body awareness techniques (e.g., Alexander Technique)					
Q-59.	Nutrition					

Q-60. Other:_____

SECTION V: MEDICAL REFERRAL

Q-61. Should piano teacher training include instruction in referring students to health care professionals? (Check box)

- ❑ No
- ❑ Yes

If you answered "No" to Q-61, skip to Q-70 now.

Please indicate how important it is for piano teachers to receive instruction in the following aspects regarding **medical referral** in order to help prevent performance-related health disorders among piano students. (Place check in appropriate box)

1 = Essential 2 = Beneficial 3 = No opinion 4 = Irrelevant 5 =Inappropriate

		1	2	3	4	5
Q-62.	Screening students for preexisting health conditions					
Q-63.	Pain grading scales (e.g., the Fry overuse scale)					
Q-64.	Indicators which mandate medical intervention					
Q-65.	Indicators which warrant a second opinion					
Q-66.	Nature of related medical specialties					
Q-67.	Features of performing arts clinics					
Q-68.	Nature of related therapies (e.g., occupational therapy)					

Q-69. Other:_____

SECTION VI: REHABILITATION

Q-70. Should piano teacher training include instruction concerning the rehabilitation and treatment of performance-related health disorders? (Check box)

❑ No
❑ Yes

If you answered "No" to Q-70 skip to Q-80 now.

Please indicate how important it is for piano teachers to receive instruction about **rehabilitation** from performance-related injury in order to help manage performance-related health disorders among piano students. (Place check in appropriate box)

1 = Essential 2 = Beneficial 3 = No opinion 4 = Irrelevant 5 =Inappropriate

		1	2	3	4	5
Q-71.	Treatment protocols					
Q-72.	Pharmacological alternatives					
Q-73.	Surgical alternatives					
Q-74.	Absolute vs. relative rest					
Q-75.	Work hardening schedules					
Q-76.	Postural retraining					
Q-77.	Training in first aid for acute injury					
Q-78.	Modifications of technique and repertoire for rehabilitative purposes					

Q-79. Other:_____

EDUCATIONAL CONTEXT

SECTION I: TRAINERS

Please indicate who is best qualified to train piano teachers in the following areas related to preventing medical problems among piano students. Choose **one** trainer for each area. Do not choose trainers for any section(s) you skipped in Part One. (Place check in appropriate box)

1 = **Piano pedagogy teachers** (i.e., instructors of piano teachers)
2 = **Health science teachers** (e.g., instructors of anatomy or physiology)
3 = **Team teachers** (combining medical and music teachers)
4 = **Interdisciplinary specialists** (trained in both music and medicine)
5 = **Self-instruction** (using printed or videotaped training material)
6 = **Other** _____

		1	2	3	4	5	6
Q-80.	Terminology						
Q-81.	Concepts and principles of						
Q-82.	Common performance-related health						
Q-83.	Preventive measures						
Q-84.	Medical referral						
Q-85.	Rehabilitation						

SECTION II: INSTRUCTIONAL FORMAT

Please indicate the most appropriate format for instructing piano teachers in the following areas related to preventing medical problems among piano students. Choose **one** format for each area.
Do not choose formats for section(s) you skipped in Part One. (Place check in appropriate box)

1 = New course
2 = Supplement to existing health science course
3 = Supplement to existing music education course
4 = Seminar/Workshop
5 = Book/Videotape for self-instruction
6 = Other _____

		1	2	3	4	5	6
Q-86.	Terminology						
Q-87.	Concepts and principles of anatomy/physiology						
Q-88.	Common performance-related health disorders						
Q-89.	Preventive measures						
Q-90.	Medical referral						
Q-91	Rehabilitation						

BACKGROUND INFORMATION

The following personal data is needed for purposes of classification.

Q-92. Gender: (Circle number)

1. Female
2. Male

Q-93. Age: (Circle number)

1. Under 30
2. 30–39
3. 40–49
4. 50–59
5. 60 or older

Q-94. Area of specialty: (Circle number)

1. Hand specialist
2. Neurology
3. Occupational medicine
4. Orthopedics
5. Physical medicine and rehabilitation
6. Rheumatology
7. Other _____

Q-95. Number of years you have treated musicians (Circle number)

1. 0–5 years
2. 6–10 years
3. 11-15 years
4. 16–20 years
5. 21 or more years

Q-96. Percentage of patients you treat who are pianists (Circle number)

1. 1–10 %
2. 11–20 %
3. 21–30 %
4. 31–40 %
5. 41–50 %
6. 51 % or more

Q-97. Average number of pianists you treat annually (Circle number)

1. 1–5
2. 6–10
3. 11–15
4. 16–20
5. 21 or more

Q-98. Do you play the piano? (Circle number)

1. No
2. Yes

Q-99. Would you be willing to grant a brief telephone interview to discuss these issues further? (Circle number)

1. No
2. Yes

Please provide any additional comments regarding educational prerequisites for piano teachers assisting in the prevention, detection, and management of performance-related health disorders in the space below. (Use the back of this paper if additional room is needed.)

Thank you for your time in completing this questionnaire. The information you have provided is of valuable assistance in the ongoing interdisciplinary collaborations between performing arts medicine and music education.

Check here if you would like a copy of the survey results: ☐

Please use the enclosed self-addressed, stamped envelope to return your completed survey no later than **March 10, 2000**, or use the fax number provided.

Charles Turon
3908 Cape Vista Drive
Bradenton, Florida 34209-6744
(941) 795-1831 Fax: (941) 792-2524
e-mail: turon@attglobal.net

APPENDIX D

ACADEMIC PREPARATION FOR THIS STUDY

The author enrolled in two courses at The University of Oklahoma to prepare for research in performing arts medicine: "Measurement and Evaluation in Music Education" and "Directed Readings in Physical Therapy." Topics studied included general anatomy, anatomy of the upper extremities, physiology, pathophysiology, the physiology of exercise, posture, biomechanics, and measurement and evaluation of neuromuscular systems. Work in these two courses resulted in two unpublished papers: "Physiological Measurement and Evaluation of Pianists" and "Functional and Dysfunctional Anatomy for Pianists." A selected bibliography of texts and other sources studied for these courses is included below.

SELECTED BIBLIOGRAPHY

Acland, Robert D. and Garrett H. Riggs. *Video Atlas of Human Anatomy, Tape I: The Upper Extremity*. Baltimore, MD: Williams and Wilkins, 1996.

American Society for Surgery of the Hand. *The Hand. Examination and Diagnosis*, 2nd edition. Edinburgh: Churchill Livingston, 1993.

Daniels, Lucille and Catherine Worthingham. *Muscle Testing: Techniques of Manual Examination*, 5th edition. Philadelphia, PA: W.B. Saunders Company, 1986.

Hoppenfeld, Stanley. *Physical Examination of the Spine and Extremities*. New York: Appleton-Century-Crofts, 1976.

Hunter, James M., ed. *Rehabilitation of the Hand*, 2nd edition. St. Louis, MO: The C.V. Mosby Company, 1984.

Kasdan, Morton L., ed. *Occupational Hand and Upper Extremity Injuries and Diseases*. Philadelphia, PA: Hanley and Belfus, 1991.

Kendall, Henry O. and Florence P. Kendall. *Posture and Pain*. Baltimore, MD: Williams and Wilkins, 1952.

Morehouse, Laurence E. and Augustus T. Miller. *Physiology of Exercise*, 7th ed. St. Louis, MO: The C.V. Mosby Company, 1976.

Moore, Keith L. *Clinically Oriented Anatomy*, 3rd ed. Baltimore, MD: Williams and Wilkins, 1992.

Norkin, Cynthia and Pamela Levangie. *Joint Structure and Function: A Comprehensive Analysis*. Philadelphia, PA: F.A. Davis Co., 1983.

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

APPENDIX E

PILOT SUBJECTS FOR THE QUESTIONNAIRE

Six hand specialists who treat musicians pilot-tested the questionnaire. One pilot subject preferred to remain anonymous; the other subjects are listed below.

Jeffrey E. Budoff, M.D.
Baylor College of Medicine
6550 Fannin, Suite 2525
Houston, Texas 77030

Paul Dell, M.D.
200 B S.W., 62nd Boulevard
Gainesville, Florida 32607

Richard G. Eaton, M.D.
St. Luke's–Roosevelt Hospital
1000 Tenth Avenue
New York, New York 10019

Gerald Harris, M.D.
448 East Ontario Street, Suite 500
Chicago, Illinois 60611

John McAuliffe, M.D.
Cleveland Clinic FL
3000 West Cypress Creek Road
Fort Lauderdale, Florida 33309

Thomas Weidrich, M.D.
448 East Ontario Street, Suite 500
Chicago, Illinois 60611

APPENDIX F

RESPONDENTS TO THE QUESTIONNAIRE

The thirty-six respondents are performing arts physicians who regularly treat pianists.

Peter C. Amadio, M.D.
200 First Street S.W.
Rochester, MN 55905

Susan Arjmand, M.D.
1953-C North Clybourn
Chicago, IL 60614

Keith A. Bengtson, M.D.
Mayo Clinic
200 First Street S.W.
Rochester, MN 55905

Alice G. Brandfonbrener, M.D.
680 North Lakeshore Drive
Chicago, IL 60611

Patricia Chandler, M.D.
Assistant Professor
UT Southwestern Medical Center
5323 Harry Hines
Dallas TX 75235-9067

Michael E. Charness, M.D.
Brigham and Women's Hospital
45 Francis Street
Boston, MA 02115

Martin Cherniak, M.D.
The Occupational and Environmental Health Center
263 Farmington Avenue
Farmington, CT 06030-6210

Rebecca Clearman, M.D.
3619 South Braeswood
Houston, TX 77025-3601

Irene (Zsuzsi) S. Danek, M.D.
7941 Truesdale Lane
Traverse City, MI 49686

Patrick J. Fazzari, M.D.
425 West 59th Street, No. 8B
New York, NY 10019

Joseph Feinberg, M.D.
535 East 70th Street
New York, NY 10021

Kathleen Fink, M.D.
6410 Rockledge Drive, Suite 600
Bethesda, MD 20817

Mark Hallett, M.D.
Clinical Director, NINDS
National Institutes of Health
NIH Building 10, Room 5N226
10 Center Drive, MSC 1428
Bethesda, MD 20892-1428

David H. Hildreth, M.D.
6550 Fannin, Suite 2525
Houston, TX 77030

Richard A. Hoppmann, M.D.
University of South Carolina
Department of Medicine
2 Medical Park, Suite 506
Columbia, SC 29203

Timothy Jameson, D.C.
Bayshore Chiropractic Center for Performing Arts Injuries
Bayshore Chiropractic Holistic Health Center
3319 Castro Valley Boulevard
Castro Valley, CA 94546

Kim Jiensup, M.D.
Department of Physical Medicine and Rehabilitation
Loma Linda University Medical Center
11406 Loma Linda Drive
Loma Linda, CA 92354

Mitchell Kahn, M.D.
Director, Kathryn & Gilbert Miller Health Care Institute for Performing Artists
425 West 59th Street, Suite 6A
New York, NY 10019

Frederick Langendorf, M.D.
Hennepen County Medical Center
Department of Neurology
701 Park Avenue South
Minneapolis, MN 55415

Richard J. Lederman, M.D.
Director, Medical Center for Performing Artists
Cleveland Clinic Foundation
9500 Euclid Avenue, S-91
Cleveland, OH 44195

Bong S. Lee, M.D.
Department of Orthopedics
34th & Civic Center Boulevard
Wood Building, 2nd Floor
Philadelphia, PA 19104

Ralph Manchester, M.D.
Box 617
250 Crittenden Boulevard
Rochester, NY 14642

William Meinke, M.D.
418 South Mill Street
Lexington, KY 40508-2926

Clay Miller, M.D.
Boston Medical School and Center
441 Stuart Street, 3rd Floor
Boston, MA 02116

Michael P. Nancollas, M.D.
475 Irving Avenue, Suite 418
Syracuse, NY 13210

Richard Norris, M.D.
73 Barrett Street, #1025
Northampton, MA 01060

Heidi Prather, M.D.
1 Barnes-Jewish Hospital
Suite 11300, West Pavilion
St. Louis, MO 63110

Lillie Rosenthal, D.O.
Kathryn & Gilbert Miller Health Care Institute for Performing Artists
425 West 59th Street, Suite 6A
New York, NY 10019

Karl J. Sandin, M.D.
Central Coast Physical Medicine and Rehabilitation
433 Camino del Remedio
Santa Barbara, CA 93110

Marie D. Schafle, M.D.
Student Health Center
San Francisco State University
1600 Holloway Avenue
San Francisco, CA 94132

Jeanine Speier, M.D.
Instrumental Artists Hotline and Clinic
Sister Kenny Institute
800 East 28th Street
Minneapolis, MN 55407

Stuart L. Trager, M.D.
Orthopaedic Surgical Group
2100 Quaker Pointe Drive, Suite 102
Quakertown, PA 18508

Michael S. Weinstein, M.D.
Medical Director, Clinic for Performing Arts
Virginia Mason Medical Center
110 Ninth Avenue
P.O. Box 900
Seattle, WA 98111

David S. Weiss, M.D.
530 First Avenue-Suite 5D
New York, NY 10016

Frank Wilson, M.D.
4096 Sugar Maple Drive
Danville, CA 94506-4641

Scott C. Woska, M.D.
Columbia Presbyterian Medical Center
73-49 217th Street
Bayside, NY 11346

APPENDIX G

TRANSCRIPTIONS OF TELEPHONE INTERVIEWS

Transcripts of Telephone Interviews

Dr. Alice G. Brandfonbrener Telephone Interview
June 17, 2000

Turon: My doctoral study explores components of health science which may be important as part of piano teacher training. **As a health care professional, do you believe that training in prevention education should be part of required curriculum in the overall education of piano teachers? Why or why not?**

Brandfonbrener: Yes I do, but I think it needs more definition than just ["training in prevention education"]. I mean that covers a wide variety of possibilities when you speak in terms of health education. As I have kind of tried to put it into practice in terms of my own teaching, it includes some basic facts [which include the following list]. I think there ought to be some structural knowledge in terms of basic anatomy. I think that people who are teaching any musical instrument, piano included, ought to know something about how muscles work and what the limitations of muscles are, muscle-tendon units, what the limitations of joints are and their range of motion and so forth. I think that there ought to be some awareness of biological variations, that people come in many containers and that not only are the measurements different and the proportions different, but how people operate is different, both based on the anatomy and on the psychobiology, if you will. I think that some understanding in terms of some basic science is critical.

Turon: Interdisciplinary collaborations between performing arts medicine and music education are a relatively recent development in the history of piano pedagogy. **What, if any, risks are involved in training piano teachers as non-medical professionals to help prevent performance-related health disorders?**

Brandfonbrener: Well, I think the risks are less if you train them. In other words, train them to understand what their limitations are. Some of the horror stories you hear is about various pedagogues–well-known and otherwise–taking things into their own hands and deciding they have the training. I think the more training one has in the subject, in a sense, the more conscious one becomes of how little one knows. If the interaction is proper in the interdisciplinary collaboration, then everyone knows everyone else's limits and where they need to call on someone else. It's when you don't know [those limits] that you get in trouble.

Turon: In the earliest stages, it may be possible to resolve physical problems of piano students by correcting flaws in technique or by some other means of self-care. **Do you feel it is appropriate to train piano teachers to help determine when self-care for performance-related physical problems should end, and medical consultation should begin?**

Brandfonbrener: Yes, I think so. Again, I think it's difficult, no matter how unfortunate it is, to come up with rules to cover every situation. And I think that there is an individual variation in terms of the teacher's ability to handle this kind of thing well. But I think a sensitive teacher who has more scientific understanding than the average teacher does now, will know when they have reached the limits of what they can do, or whether they need to collaborate in doing something rather than just refer [a student to a doctor]. I do feel strongly that even if it seems kind of obvious that some over-the-counter medication will do, teachers should hold back. I also feel–this is complicated–but I think that [teachers'] referrals to particular doctors have to be watched. In other words, I have dealt with many students who have said, "Well, my teacher told me to go to her chiropractor, and I have been doing that for six months . . . and here I am." Again, it may be more a function of personality than it is to training or lack of training that compels people to do things such as that–but those things worry me.

Turon: Yes, I see. But you do feel that, if I am understanding you correctly, that the piano teacher can act almost as the middle-man between the student and the physician in guiding the student?

Brandfonbrener: Yes. First of all the teacher can try to analyze–if the student wants this (and it depends on the age of the student),–various factors that may be contributing to the student's problem, and within appropriate limits can try to help with those. But, it's very hard to arbitrarily set limits, because every teacher-student relationship may be very different, too. But, you know, teachers don't have professional liability insurance, although you would think they had better have it, frankly. So I think that common sense is a very good attribute.

Turon: **How important do you feel it is that those who train piano teachers in health-related matters themselves have training in both medical and musical fields?**

Brandfonbrener: Well, I think that they need to have access to those people. I mean, even in my own course that I teach to music students, I bring in other people in areas that I don't feel I'm competent in. I think that a lot of music ed. courses ought to be taught in an interdisciplinary way with using different people in different disciplines.

Turon: So, in your particular situation it's, again, collaborative effort?

Brandfonbrener: Yes.

(Following this was some conversation unrelated to the interview questions.)

Dr. Michael E. Charness Telephone Interview
July 14, 2000

Turon: My doctoral study explores various components of health science which may be important as part of piano teacher training. **As a health-care professional, do you believe that training in prevention education should be part of required curriculum in the overall education of piano teachers? Why, or why not?**

Charness: Yes, because I think the majority of the injuries that we see in pianists are preventable, and that piano teachers are in the best position to disseminate the information that could help prevent injuries.

Turon: Interdisciplinary collaborations between performing arts medicine and music education are a relatively recent development in the history of piano pedagogy. **What, if any, risks are involved in training piano teachers as non-medical professionals to help prevent performance-related health disorders?**

Charness: I think the risks are that they might go too far in trying to be physicians. But I see that as a very minor concern because I don't think there are many piano teachers who would want to take on that role. I think that the information that piano teachers require to prevent risk have a lot to do with time management (which everybody might be able to agree on), and technique (which fewer people could agree on); in basic principles of mechanics; and a very simple understanding of anatomy. And I think that type of information is something that they could convey to their students alone, or in conjunction with somebody who has that experience.

Turon: Yes. By time management I assume you are speaking of pacing of practicing and that kind of thing.

Charness: Yes.

Turon: In the earliest stages, it may be possible to resolve physical problems of piano students by correcting flaws in technique, or by some other means of self-care. **Is it appropriate to train piano teachers to help determine when self-care for performance-related health physical problems should end, and medical consultation begin, and if so, what are the important components of such training?**

Charness: I think it's fairly straightforward–to alert teachers, as well as their students, to certain cardinal symptoms and signs that warrant further investigation by medical professionals.

Turon: **How important do you feel that it is that those who train piano teachers in health-related matters themselves have training in both medical and musical fields?**

Charness: I think that some training in anatomy and mechanics and a little bit of information about performing arts medicine would be useful for people who are training to be teachers.

Turon: So then it certainly would be possible for such a trainer to basically have a musical background, but then to have some supplemental basic medical training?

Charness: Yes.

Turon: Do you have any additional comments that you might like to add concerning the training of piano teachers in health-related issues?

Charness: I think the major comment is that where there's been a willingness to do that, at least in my own experience, it's been possible to reach large numbers of students. I don't think anybody has studied whether or not that makes a difference, but the types of problems that pianists develop are so often a consequence of idiosyncracies in their technique combined with poor design of practice schedules, that it should be possible to reach large numbers of those people before they're injured. This is something that I've done now on an annual basis for a while with Juilliard, New England Conservatory, and some other conservatories. It's the kind of thing that I think should develop much more.

Turon: So, in other words, by enlisting piano teachers, you as a health-care professional can see a widening of basic prevention through another member of the interdisciplinary team. Am I understanding you correctly in that?

Charness: Yes. I think the way it's worked is that piano teachers have invited me in to give seminars and help them, and they in turn (and their students) either receive the information or can convey it to others.

Turon: Personally, I'd like to see somewhere along the line a study to put together what all is going on with individuals such as yourself. You mentioned Juilliard and New England Conservatory. I have not yet seen anything in print, but I think it would be interesting to get an overview of those kinds of programs that are going on.

Charness: Basically, I give a talk or two at those places, and I've been doing it for about 4 or 5 years at New England Conservatory, and for a few years at Juilliard.

Dr. Rebecca Clearman Telephone Interview
July 25, 2000

Turon: My doctoral study explores various components of health science which may be important as part of piano teacher training. **As a health-care professional, do you**

believe that training in prevention education should be part of required curriculum in the overall education of piano teachers? Why or why not?

Clearman: Yes, I do believe it should be part of the required curriculum. The reasons are that all musicians need to understand what the long-term effects are of playing on the body. I consider musicians to be small-muscle athletes in that they use their distal (meaning at the ends of their extremities) musculature in sort of marathon ways. And the body is changed by that kind of use, and if you understand what those effects are, it can help prevent injury, both to the teacher who is becoming educated and also [to their students as the teacher] can pass that information on to their students in the future. I think it deepens the general knowledge about music because music is really a fascinating interplay between an animate and an inanimate object–I almost want to say "being" because musicians are very, very attached to their instruments. The more you can know about each instrument–the body's instrument or the musician's musical instrument–the better.

Turon: Interdisciplinary collaborations between performing arts medicine and music education are a relatively recent development in the history of piano pedagogy. **What, if any, risks are involved in training piano teachers as non-medical professionals to help prevent performance-related health disorders?**

Clearman: Well, I think that if they're properly taught, there is very little to no risk. I think the key is in the quality of the training that they receive, and the limits that are part of any medical training when (1) what are the parameters in which it's okay to give advice, and (2) Get real!! Piano teachers and musicians have been doing this for centuries. Why are we acting like it is some new thing? So, it's happening already. Why would education make it worse?

Turon: And I think, if I might insert something, that perhaps education needs to be understood as an ongoing education and involves ongoing collaboration between the two fields.

Clearman: Oh, absolutely! I know when I have taught groups of musicians, they're a very hungry audience. And most of the medical stuff is done for the medical people, which few [i.e., few medical people] treat performing artists because it's not lucrative work. 90 percent of what I do, and maybe 95 percent, is all charity work. And that's fine but [in general] doctors and others find it interesting, but they're not really going to be doing that kind of work. Unless you understand what you're doing, then why are you treating [them]?

Turon: In the earliest stages it may be possible to resolve physical problems of piano students by correcting flaws in technique, or by some other means of self-care. **Is it appropriate to train piano teachers to help determine when self-care for**

performance-related physical problems should end and medical consultation should begin? If so, what are the important components of such training?

Clearman: Absolutely! It kind of gets back to my answer in number two; you have to know the parameters of when enough is enough. I sort of brainstormed a list which would be: If there's an underlying health condition, these can present as performance-related problems. And, in my practice, I've found new-onset diabetes, cancer, peripheral neuropathy, seizure disorder, and all sorts of things that present as a performance-related illness or injury. So, the instructors must know that's always brewing in the background and be thinking about that.

They also need to know that neurologic and musculoskeletal systems both can be damaged if there are inappropriate or delayed medical evaluation and treatment. Pain is one thing. Pain that is not doing any damage is just pain. But pain that says that things have been damaged is something different.

There are also legal and liability implications. In our litigious world that is really, really important. If I were a piano teacher, I would be telling everyone, "Okay, this might be helpful; but remember that I'm not a physician and this is not medical advice." [I'd do it] just so that students wouldn't come back and sue me later.

And then, I think that with some thought and some brainstorming with a core group of collaborators you could probably come up with a list of absolute indications and relative indications for a medical referral. (I thought that was beyond the scope of what I was being asked.)

Turon: I think you're correct, but it's certainly something that can be pursued in the future, no question about it.

How important do you feel it is that those who train piano teachers in health-related matters themselves have training in both medical and musical fields?

Clearman: I really think it's a must from the medical standpoint. I don't think that you have to be good at it. I don't think that you have to be able to play, necessarily, the instrument that you consult on. But I think [that] the process of learning about what it's like to play an instrument, even if you're 45 years old and are going to sit down and try to learn something for the first time, that's a beneficial process. Even if you only spend ten hours in that endeavor, it really, really helps. I think that in the real world, because there was a period about ten years ago when all the hospitals thought, "Oh, arts medicine! We're going to make great money off of this!" And they put in arts medicine clinics everywhere. 99 percent of those have all folded. The hospitals realized: well, we didn't make money here! The people that actually do treat performers tend to have some experience, because you have to love the arts in order to want to do something for free.

Turon: So, they're personally invested in it.

Clearman: Yes, I think that kind of happens by natural selection. I don't know–you're surveying; maybe you know people who say they don't play or won't admit to ever having played, but I think that it's a must. I think that they should certainly, at a minimum, know what the issues are involved in piano-playing. They must really love music and musicians. They have to know the life-cycle of a musician, what that work entails. And they must have either training or successful experience in treating musicians.

I think if you're a music person who is trying to teach them health-related things, you have to have training in the medical field, or else you're just blowing smoke.

Turon: Do you have any additional comments you might like to add?

Clearman: Well, I'd really like to see your dissertation.

Turon: Thank you. I'm actually kind of excited about it. I was pleased that I had about an 82 percent response rate to the survey. So, I think that reflects the commitment that you were speaking of in performing-arts specialists.

Clearman: You do it for love.

Transcript of Dr. Frank Wilson Phone Interview
June 27, 2000

Turon: My doctoral study explores various components of health science which may be important as part of piano teacher training. **As a health-care professional, do you believe that training in prevention education should be part of required curriculum in the overall education of piano teachers? Why or why not?**

Wilson: The answer is "yes." The real concern, and the real problem–since there can't really be any argument that there is a need for this kind of training–is how to integrate training of this kind conceptually into what is already a very diverse and, I think, a very complicated curriculum in music training. I have been interested in this issue for over fifteen years, have met with educators at virtually every level of training, have both met with and discussed and had as patients prominent music educators and performers in classical piano, and through that experience have learned that there is no agreement within the profession itself as to how one might incorporate such training into the education in any systematic way. It is very clear that there are some places where people have taken an active interest and where attempts have been made to incorporate these principles into training, but that's not a systematic response to the problem.

I think the two major sources of continuing impediment are, first of all, that it is widely agreed that music students already have too much to try to learn that is purely of a musical nature. Secondly, and I think this is a much more profound problem, is that there is no feeling, no agreement, no consensus, within the community of music educators, the professional community of music educators, as to what sort of specific preventive training is needed and what its real goals should be. Part of it is, and I think this was a critique that was made by Joseph Polisi at Juilliard when I spoke with him several years ago about this, that there does not appear to be concurrence within the medical community itself as to what basic principles need to be taught. You can certainly say what the goal would be: the goal would be to prevent injuries. But how you would achieve this goal has not really been successfully articulated at the level of curriculum design. Polisi put it a little differently. He said, "I don't think medicine for performing artists has really sufficiently defined itself that we can take seriously a proposal of this kind." And he said "I think there is still a very high wall between the doctors and the music teachers."

I have also heard from another president of another conservatory that there is a feeling, a very strong feeling (particularly among older teachers), that there is an implied criticism in a movement like this, that teaching isn't good, that there are mistakes being made and so there is a certain amount of defensiveness or anxiety, or in some cases overt antagonism, that what is being suggested by some doctors who come to conferences and so forth is simply nonsense and might be actually harmful. So, I think that if you get underneath this–and I've tried to get underneath it myself over a long period of time–[there is] a real failure to act on what seems on its face to have a great deal of merit as a proposal. You find that there simply is no effective liaison, no effective working relationship between these two professions–the health care profession represented by many different kinds of providers, and the education profession.

Quite frankly, I don't have any idea how that situation could be changed other than simply by evolution . . . as time goes on, and as younger artists come up and are more familiar with these ideas and begin to make changes, the atmosphere will change. I do know that at Juilliard now, the head of the piano department (whose name is Veda Kaplinsky) is a woman who has had extensive training in mechanics of movement, and who has begun very, very slowly to try to introduce some of these principles, not only in her own studio, but to make available at Juilliard lectures on these issues. This kind of a grass-roots or cultural change is probably the way it is going to happen, but it is going to be a very slow process.

Turon: Interdisciplinary collaborations between performing arts medicine and music education are a relatively recent development in the history of piano pedagogy. **What, if any, risks are involved in training piano teachers as non-medical professionals to help prevent performance related health disorders?**

Wilson: I think that the risks are more theoretical than real. I think teachers (at least some teachers) have always been concerned to approach technical problems in a rational way. Sometimes it appears that they know what they are doing, and in other cases it appears that the ideas that they have are perhaps not very well-informed. But that's the situation already, so I think it's really putting another name to something that already exists. Say that there will be an effort to introduce a new kind of approach to teaching that we call the "injury-prevention approach." We're simply saying, really, that there's a new group of perspectives, or, if you will, "players" or "participants" in this discussion. But the problem is how to build a shared experience so that the ideas and the vocabularies really can become essentially a working dialogue between people who are trying to improve the situation.

It is already clear that there are risks because teachers are either failing to observe biomechanical reality or have adopted principles that work for some students but are disastrous for others. I have a number of examples in my own practice of teachers who regularly provide patients. If you ask them about their teaching, they will insist that they are very sophisticated in their understanding of how things work. And they are, but they fail to recognize one of the great dangers (which is also a great danger in medical practice) which is that the thing that makes you most dangerous is what you don't realize that you don't know. So, I think this is really sort of an extension of the first question, and I think that it is important to realize that this kind of approach is already being, at least conceptually, addressed by lots of teachers. And I think that the fact that there are so many courses, or there are so many so-called "techniques" [confirms that observation]. After all, any exercise book is based on the premise that there is a rational way to direct the body, and to organize time in repetitive movement so that playing will get better. The premise in that sort of approach [of] doing Barrere exercises or anybody else's exercises is not a different premise than that which would come from someone, let's say, my background, who has some training in piano–not much, but enough so that I understand what the issues are–but whose suggestions come out of working in a biomechanics laboratory.

So to abbreviate the answer, the risks are really no different, the risk is that you will get it wrong, and that you'll give people information which they'll either misinterpret or which they will slavishly follow to a bad result.

Turon: In the earlier stages, it may be possible to resolve physical problems with piano students by correcting flaws in technique or by some other means of self-care. **Is it appropriate to train piano teachers to help determine when self-care for performance-related physical problems should end, and medical consultation should begin?**

Wilson: Yes, it is certainly appropriate to do that and I think it's really just a matter of shifting the criterion point. I think if the situation gets bad enough, any music teacher

will say, "You know, I think maybe you had better go and see a doctor." The question is, should that suggestion be triggered at an earlier stage than it often is now. And also, I think that the threshold for making that recommendation is a sliding threshold depending upon what is available. If the pianist and the teacher are working in a community that doesn't have anybody with any experience, then the doctor may not be helpful either. It is really critical that there are experienced medical people available. If the community has already got a working arrangement, as for example exists in a number of large cities–certainly it exists here in the Bay area, it exists in Chicago, in Philadelphia, and New York, and so forth–then it makes sense to take advantage of that kind of help, and to suggest taking advantage of it, simply because it is available. And I think that will happen naturally.

But it certainly can't hurt to have teachers aware that certain kinds of problems may imply something that really does require an earlier evaluation than you would normally want to obtain. And by the way, I must say that there's another issue here, and that issue has to do with cost of doing this kind of thing because there are places, and I think a good example of that is Eastman, where there is a health service that is staffed by people who have lots of experience working with young musicians. So it's not a problem to get a piano student who's studying with Nelita True, for example, (not that her students get into trouble), but I mean if she had a student and she thought there was something wrong, she could get them in to see somebody across the street in the student health service whom she can trust. But there are other places where, as I mentioned in the last question, there may not be anybody; and if there is somebody, the cost may be very high. Consultations with experienced physicians in New York City are very expensive, sometimes prohibitively expensive, so that for many musicians (and [especially] if they don't have insurance or if they are a student and their health plan coverage and their college medical service doesn't have anybody who is there) then effectively it may not work.

I just had a phone call yesterday from a parent of a young man who is studying at the New England Conservatory [who] is having some problems and was seen by the health service there. They basically told him, "No, you don't have any problems." Now, he's stuck with the same problem and the family doesn't have any insurance, and the boy is out here for the summer. So I mean, there are many, many twists and turns to just practically getting somebody [i.e., an injured student] hooked up with somebody [i.e., a qualified medical professional] and getting a favorable result.

Turon: Yes, and it is again refreshing to hear that realism. A lot of times when you read the literature, that doesn't come out. But for us who are not in the metropolitan centers, those are very, very real issues and especially, [as you were] mentioning, the need to intervene early, and the delays that can come about as a result of those issues–these can make a big difference.

Wilson: I think that there's also a somewhat hidden bias in my own perspective, and that is I see lots and lots of people as a percentage of my total practice that come from other cities. I am just reminded that there was another phone call last week from a mother of a student who was studying in Arizona who said that her daughter is having a very severe RSI problem and they seem to have exhausted the resources that are available locally. She has been to a number of people, she is not better, and she is desperate for help. She got our name and called me and we're trying to figure out what to do. And of course, that puts us in kind of a difficult situation because, yes, we can certainly easily do an evaluation. We've got a very experienced team here with a very high success rate with problems like this. This person will have to go back to the same place, and we may not be able to find someone there to work with her over a period of time. That's another dilemma. Hopefully, as the level of sophistication rises generally across the country, it will be easier and easier to find people that you can trust. But it always is a really frustrating problem for us, and we tell people who come and people who call us "Can you stay for a few weeks?" And they say, "How am I going to afford to stay, and how are we going to pay for this because our insurance isn't going to cover it," and on and on and on. After a while you think you're better off just saying, "You know, you can come and we have to tell you what we think, but we have to warn you realistically that there may not be a way to get around this problem." And that can be very discouraging for us and for the families, particularly when these are younger students. The family has a very bright and promising youngster that they've already invested an enormous amount of not only money and time in, but upon whom they've attached great hopes. And it can be just absolutely devastating when this kind of thing happens, and they suddenly feel that they have run into a brick wall, and they don't know what to do. I've seen several patients who've come from other cities whose parents are physicians and they're received so-called "ideal care," but it hasn't been ideal care at all. Sometimes it can be a difficult diplomatic issue; it can be amazingly complicated.

Turon: Just backing up for one point, you mentioned this student from Arizona, I believe, and the need to be able to send him back to someone you trust. I assume you are speaking of therapists in particular?

Wilson: Exactly.

Turon: And that's part of a triangular situation.

Wilson: It's really interesting, I'm always happy to get phone calls from people in Los Angeles because it's interesting, there don't seem to be–although I know that there are doctors down there, and I know some of them who do see musicians–there doesn't really seem to be an organized program there, and because Los Angeles is geographically so large, that it's often not practical to get people to a particular physician. But on the other hand, there is a group of physical therapists, there are several groups of physical therapists, with whom we have a lot of experience and regular contact, and we know

what they do and we know that they know what they're doing. And so we feel very good about making referrals of that kind. Sometimes it's easy, but most of the time it's not.

Turon: **How important do you feel it is that those who train piano teachers in health related matters themselves have training in both medical and musical fields?**

Wilson: Well, I think if you're willing to look a little bit more closely at what kind of training that would consist of, what level of sophistication they have, then I'd say yes, I think that it's crucial. So this is kind of a second discussion off from your first question. If you say yes, which everybody would, then you say yes, but . . . what ought to be in that package? And I think this also is not something that you can say in advance, "You have to be able to do this, you have to be able to do that." I think that's something that the knowledge and confidence in what ought to be involved, what ought to be contained in this kind of training, really needs to grow out of the experience that, so far, we haven't managed to put together. Here again, I think that probably just with time, and with growing experience, with the interest [growing, we will know more]. I mean there are a fair number of musicians that I've seen now who themselves when they decided they can't go on with their careers because they're just having too much difficulty, and they can see that they just simply can't compete with the numbers of other, say pianists, (it's not always pianists, but that's the subject of your survey), but they often will say, "Okay, I can't do this so I'm going to . . . ." and they happen to be young enough, or they may have a disability policy that gives them some sort of support for training in some other field, and they'll want to go into physical therapy themselves, take Feldenkrais training.

I've had one music teacher who is having difficulties, and she was able to get support to become a Feldenkrais trainer. One of the best Feldenkrais therapists that we have in the Bay area is a woman who has a Master's in piano from Juilliard, and sort of converted herself and has become an enormously valuable person to have, because of that perspective. But there have to be more people like that, and there has to be more interaction with people who can interpret from both disciplines. And that's just going to take time, and I think that if I can compliment you on what you are trying to do, I think that as more things are done to raise awareness of the existence of the problem, and to raise awareness in the places where it really counts, to sell the idea to people who are in a position to make curriculum decisions, then the chances are that eventually this is going to happen. But it's not going to happen by people yelling at each other. The last decade of my experience really tells me that there is still an awful lot of yelling going on, or just silently listening in a resentful way and people saying "I hope they'll go away."

Turon: Do you have any other comments you want to add?

Wilson: No, I think a lot of what happens, when I get asked these questions, I sort of sit back and say, "You know, you sounded pretty cranky there." It's really a big problem, but you have to take the same position that you take if you want to [as if] you're hoping

that Russia will become a democratic society. It's going to take a while. And certain people are beyond persuading. They simply have to be allowed to finish their careers and fade away. I must say also, one other thing about this. I think that it's somehow or other a reflection of the way music training is done, and [on] music education, particularly for very talented young people, [the way] it goes in this country. It's been for me a kind of a mildly unpleasant experience which kind of came home to me last week because I was in Colorado and I struck up a conversation with some people who were pulled up at [the] side the road. We were near Moab, Utah, and we were sort of standing there looking at the sheer cliffs of beautiful red limestone and a car came up, and a guy got out of the car who turns out to be a drummer from Guinea. And he was traveling with a companion, and they were on their way to Vermont before going back to Guinea, and we just struck up a very friendly conversation, and at some point it came out that I took care of musicians, and he had a car full of drums. So he pointed to his right index finger and said, "You know, I have a problem with this." He had a pretty badly mangled tip of his index finger which clearly is the result of years and years and years of whacking it against the side of his drums. And he's actually got a fairly big problem. In the course of our conversation, he was practically down on his hands and knees thanking for the suggestions that I made for him, and what I thought needed to be done. I couldn't really solve his problem right there. . . and it sort of reminded me of the exact kind of, the sort of opposite experience with many musicians in the United States, including ones that I simply don't send bills to, because they know that they can't pay. There's an attitude among people, I don't know if it's because they're simply embarrassed, or what it is, but they tend to treat doctors sometimes the way a concert artist will treat a janitor right before a concert . . . that what the doctor does doesn't have anything to do with art, it's just taking care of a minor problem and then they would like him to go away. They really don't want to consider other suggestions that might be made, and they don't want to develop a relationship, they want to get out of there. And it can be a real turn-off to be treated as if you're just kind of an unpleasant necessity. And one really profoundly impressive experience in that regard when I went to a conference that was being held at a summer music camp, and the director of the camp was a very prominent pianist who asked me to see one of the students who was having problems, and I spent about two hours with this young woman. After it was over, I went back to him and said, "I did spend some time with your student, and I do have some ideas. Would you like to hear about it?" He said, "No," and he just turned around and walked away. That really turned me off. It was an eye-opening experience because it was clear that he just wanted me to get rid of this problem, and he didn't personally want to have anything to do with it. Fortunately, when it's that blatant, it's pretty rare. But, I think there is underneath, a kind of feeling that is bred in music training that musicians are, to use the French version of this word, *artistes*–that they're in a very high calling, that they deserve special treatment for that reason. And they often [say] "I have a problem I need you to see right now; this needs to be done right now. I can't pay for it."

Many physicians tell me that some of the best-known artists demand to be seen on

Sunday, then simply ignore the bills that are sent to them. So there is a kind of sense of being terribly common, but I do think there is a kind of reality that often is missing from . . . and this may have to do with the fact that we as a society, when we identify talented young people, we put them on a special track. We isolate them from any day-to-day ordinary concerns, and they really expect to be treated like princes and princesses. Probably it wouldn't hurt for them to know that they aren't.

Turon: It's interesting to hear that perspective, from the doctor's viewpoint . . . that's something that may not be voiced outside your inner circles. It makes sense; I had just never thought about it.

Wilson: Fortunately, if it were true all of the time, nobody would do this. Everybody would just say, "So much for you." But, it is amazing how often they come, they want your stuff, they want your ideas, help and solutions, and they don't say thank you.

Turon: Wow!

Wilson: When you really say, "I don't want to send you a bill for what I would normally charge to spend and hour and a half with somebody," and then . . . when it's over, it's over.

Turon: That's amazing to me because I just personally . . . .

Wilson: Well, I think you live in a part of the world where social graces are a little higher.

Turon: Perhaps, I don't know. But I do know that I, for one, am very appreciative of the work that's being done. I recognize the lack of resources–financial resources–among most musicians, and the dedication that it takes among physicians such as yourself.

Wilson: One of the reasons I think that physicians like musicians is because they recognize that they're good because they work. There is an awfully lot of work involved in becoming a musician, and we appreciate that. But, I think, a little humility goes a long way.

Turon: I would agree with that.

Wilson: And I think there are doctors that are often very ungracious and who feel like they walk on water, too. I know a few of those. This is not entirely a one-sided thing.

Turon: No, I'm afraid not.

APPENDIX H

FIVE ESSENTIAL CURRICULA

Five Essential Curricula

The following lists compile topics taken from the literature which relate to the five categories of instruction constituting the "essential curricula." The lists are not meant to be comprehensive, nor do they imply that all topics are of equal importance. Some of the topics duplicate categories of instruction found as choices in the questionnaire.

Postural Alignment

1. Normal spinal curves
2. Static posture vs. dynamic posture
3. Sitting posture
4. Posture and movement
5. Posture training techniques (e.g., the Alexander technique)
6. Visual factors
7. Muscular balance and postural adaptation
8. Postural faults (e.g., rounded shoulders)
9. Hand and arm positions which place pianists at risk of injury
10. Postural retraining

Research in performing arts medicine shows a strong relationship between postural defects and performance-related disorders. Although traditional piano pedagogy addresses proper posture and position at the piano, there is some indication that piano teachers cannot define correct posture physiologically. Teachers may benefit from training in posture and related topics as taught from the perspective of specialists in

physiology and movement. Understanding the relationship between improper postural alignment/playing positions and muscular imbalances and specific disorders may also contribute to stronger motivation to ensure efficient posture and movement.

Early Warning Signs

1. Sustained, or chronic pain
2. Fatigue or lack of endurance
3. Weakness in the hands or forearms
4. Tingling or numbness
5. Heaviness
6. Clumsiness
7. Difficulty opening and closing hands; stiffness
8. Lack of control or coordination
9. Cold hands

Performance-related disorders often develop slowly, sometimes over a period of years. The likelihood of full recovery is much greater when disorders are caught at an early stage of development than when they progress to more advanced stages. The traditional weekly piano lesson provides an ideal opportunity for the teacher to monitor the physical development of the student and any preliminary indication of pathology. Training in distinguishing between problems which can be resolved at the piano or some means of self-care and problems which indicate the need for medical consultation is imperative for the teacher helping to guide the student toward long-term health.

Risk Factors

1. Intrinsic factors
2. Extrinsic factors
3. Hereditary predispositions
4. Psychophysiological factors
5. Technique
6. Practice habits
7. Posture
8. Conditioning
9. Environment

We have more data concerning factors which place pianists at risk of injury than we have of the actual causes of injury. Understanding what those risk factors are can contribute toward the teacher taking a more proactive role in injury prevention. Controlling these factors may be a more natural extension of traditional pedagogy than instruction in health disorders, and therefore less likely to be resisted by teachers or students. On the other hand, it is important for teachers to understand the scope of the many factors which may collectively place a student at risk, since a large percentage are not directly related to playing the piano.

Pacing of Practice Sessions

1. Taking breaks (spaced practice vs. mass practice)
2. Timing of important performances/juries

3. Alternating activities
4. Varying material
5. Limiting number of repetitions, especially with awkward passages
6. Avoiding of sudden increases of practice time or intensity
7. Maintaining the instrument (i.e., the piano) in good working condition
8. Mental practice
9. Avoiding practice when overtired
10. Allowing for an adjustment period with changes of teacher, repertory, or technique

The proper pacing of practicing, like instruction in risk factors, is a natural extension of piano pedagogy. One contribution of research from performing arts medicine is to provide data which may give more exact guidance in matters such as knowing how long to practice before taking a break and how long to practice difficult passages. It is also important to inform teachers of practice-related factors which exhibit particularly strong correlations with incidence of injury, such as abrupt increases of amount and/or intensity of practicing.

General Physical Conditioning

1. Aerobic exercise
2. Stretching
3. Strengthening
4. Breathing
5. Mental health

6. Vulnerabilities and contraindications (e.g., weight-bearing on wrists)
7. Muscular balance
8. Physiological warm-ups (i.e., warm-ups away from the instrument)
9. Cool-downs
10. Maintaining lean body weight
11. Cardiovascular conditioning
12. Overall muscle tone

Research clearly supports the view that prevention of performance-related health disorders cannot be accomplished solely by proper instruction in playing the piano. Instruction in general physical conditioning is an important part of prevention, but is not as natural an extension of pedagogy as instruction in practicing. Helping the piano teacher to understand the relationship between overall physical condition and greater physical ease and comfort in performance may help to implement this widening of the traditional role of the teacher/mentor. Instruction in general physical conditioning may also contribute towards greater encouragement of overall fitness and physical education.

APPENDIX I

CATEGORIES OF INSTRUCTION

Table 31.–Terminology: Categories of Instruction

Category of Instruction	Essen (%)	Benef (%)	Irrel (%)	Inapp (%)	No Opinion (%)	No Resp	N
Terms of orientation	30.6 (11)	38.9 (14)	13.9 (5)	11.1 (4)	5.6 (2)	–	36
Terms of movement	52.8 (19)	30.6 (11)	2.8 (1)	11.1 (4)	2.8 (1)	–	36
Terms of relationship	19.4 (7)	27.8 (10)	11.1 (4)	11.1 (4)	30.6 (11)	–	36
Names of bones	8.6 (3)	45.7 (16)	14.3 (5)	17.1 (6)	14.3 (5)	1	35
Names of muscles	11.1 (4)	47.2 (17)	8.3 (3)	16.7 (6)	16.7 (6)	–	36
Terms of dysfunction	27.8 (10)	38.9 (14)	2.8 (1)	25.0 (9)	5.6 (2)	–	36
Terms describing symptoms	22.2 (8)	52.8 (19)	2.8 (1)	19.4 (7)	2.8 (1)	–	36
Associated fields	5.6 (2)	16.7 (6)	33.3 (12)	19.4 (7)	25.0 (9)	–	36

Table 32.–Concepts and Principles of Anatomy and Physiology

Category of Instruction	Essen (%)	Benef (%)	Irrel (%)	Inapp (%)	No Opinion (%)	N/R	N
Musculoskeletal system	27.8 (10)	50.0 (18)	5.6 (2)	11.1 (4)	5.6 (2)	–	36
Nervous system	16.7 (6)	58.3 (21)	5.6 (2)	8.3 (3)	11.1 (4)	–	36
Vascular system	11.4 (4)	37.1 (13)	14.3 (5)	11.4 (4)	25.7 (9)	1	35
Upper quarter	30.6 (11)	47.2 (17)	5.6 (2)	8.3 (3)	8.3 (4)	–	36
Soft tissue – microanatomy	2.8 (1)	13.9 (5)	38.9 (14)	19.4 (7)	25.0 (9)	–	36
Design of bones, joints, muscles	16.7 (6)	38.9 (14)	11.1 (4)	5.6 (2)	27.8 (10)	–	36
Range of motion	30.6 (11)	50.0 (18)	5.6 (2)	8.3 (3)	5.6 (2)	–	36
Muscle classifications	14.3 (5)	57.1 (20)	8.6 (3)	5.7 (2)	14.3 (5)	1	35

Table 32.–Continued

Category of Instruction	Essen (%)	Benef (%)	Irrel (%)	Inapp (%)	No Opinion (%)	N/R	N
Modes of contraction	13.9 (50)	38.9 (14)	19.4 (7)	5.6 (2)	22.2 (8)	–	36
Soft tissue – adaptation	16.7 (1)	52.8 (19)	13.9 (5)	8.3 (3)	8.3 (3)	–	36
Physiology of exercise	31.4 (11)	51.4 (18)	5.7 (2)	5.7 (2)	5.7 (2)	1	35
Biomechanics	48.6 (17)	45.7 (16)	2.9 (1)	2.9 (1)	0.0 (0)	1	35
Ergonomics	50.0 (18)	44.4 (16)	0.0 (0)	2.8 (1)	2.8 (1)	–	36
Kinetics	33.3 (12)	52.8 (19)	5.6 (2)	5.6 (2)	2.8 (1)	–	36
Postural alignment	69.4 (25)	27.8 (10)	0.0 (0)	2.8 (1)	0.0 (0)	–	36

Table 33.–Common Performance-related Health Disorders

Category of Instruction	Essen (%)	Benef (%)	Irrel (%)	Inapp (%)	No Opin (%)	N/R	N
Characteristics of disorders							
Carpal tunnel syndrome	38.9 (14)	50.0 (18)	0.0 (0)	0.0 (0)	11.1 (4)	–	36
Cervical radiculitis	30.6 (11)	41.7 (15)	8.3 (3)	13.9 (5)	5.6 (2)	–	36
Cubital tunnel syndrome	30.6 (11)	41.7 (15)	8.3 (3)	11.1 (4)	8.3 (3)	–	36
DeQuervain's tenosynovitis	33.3 (12)	44.4 (16)	5.6 (2)	11.1 (4)	5.6 (2)	–	36
Double-crush syndrome	13.9 (5)	30.6 (11)	19.4 (7)	25.0 (9)	11.1 (4)	–	36
Focal dystonia	33.3 (12)	47.2 (17)	5.6 (2)	13.9 (5)	0.0 (0)	–	36
Ganglion cysts	25.0 (9)	52.8 (19)	2.8 (1)	13.9 (5)	5.6 (2)	–	36

Table 33.–Continued

Category of Instruction	Essen (%)	Benef (%)	Irrel (%)	Inapp (%)	No Opinion (%)	N/R	N
Hyperlaxity	36.1 (13)	47.2 (17)	2.8 (1)	11.1 (4)	2.8 (1)	–	36
Osteoarthritis	25.0 (9)	52.8 (19)	5.6 (2)	11.1 (4)	5.6 (2)	–	36
Overuse syndrome	41.7 (15)	38.9 (14)	2.8 (1)	11.1 (4)	5.6 (2)	–	36
Radial tunnel syndrome	11.1 (4)	41.7 (15)	16.7 (6)	11.1 (4)	19.4 (7)	–	36
Tendinitis	38.9 (14)	47.2 (17)	0.0 (0)	11.1 (4)	2.8 (1)	–	36
Thoracic outlet syndrome	30.6 (11)	38.9 (14)	8.3 (3)	13.9 (5)	8.3 (3)	–	36
Trigger finger	30.6 (11)	47.2 (17)	8.3 (3)	11.1 (4)	2.8 (1)	–	36

Table 33.–Continued

Category of Instruction	Essen (%)	Benef (%)	Irrel (%)	Inapp (%)	No Opinion (%)	N/R	N
Processes leading to injury	55.6 (20)	30.6 (11)	8.3 (3)	2.8 (1)	2.8 (3)	--	36
Vulnerable sites	55.6 (20)	36.1 (13)	2.8 (1)	2.8 (1)	2.8 (1)	--	36
Etiology	63.9 (23)	27.8 (10)	5.6 (2)	2.8 (1)	0.0 (0)	--	36
Risk factors	72.2 (26)	27.8 (10)	0.0 (0)	0.0 (0)	0.0 (0)	--	36
Warning signs	83.3 (30)	16.7 (6)	0.0 (0)	0.0 (0)	0.0 (0)	--	36

Table 34.–Preventive Measures

Category of Instruction	Essen (%)	Benef (%)	Irrel (%)	Inapp (%)	No Opinion (%)	N/R	N
Phys.-based technique	57.1 (20)	31.4 (11)	2.9 (1)	0.0 (0)	8.6 (3)	1	35
Pacing	80.6 (29)	19.4 (7)	0.0 (0)	0.0 (0)	0.0 (0)	–	36
Conditioning	69.4 (25)	25.0 (9)	2.8 (1)	2.8 (1)	0.0 (0)	–	36
Warm-ups	57.1 (20)	34.3 (12)	0.0 (0)	0.0 (0)	8.6 (3)	1	35
Cool-downs	47.2 (17)	47.2 (17)	0.0 (0)	0.0 (0)	5.6 (2)	–	36
Stress management	50.0 (18)	36.1 (13)	2.8 (1)	5.6 (2)	5.6 (1)	–	36
Stretching	58.3 (21)	33.3 (12)	2.8 (1)	2.8 (10)	2.8 (1)	–	36
Strengthening	41.7 (15)	36.1 (13)	8.3 (3)	5.6 (2)	8.3 (3)	–	36

Table 34.–Continued

Category of Instruction	Essen (%)	Benef (%)	Irrel (%)	Inapp (%)	No Opinion (%)	N/R	N
Body awareness	38.9 (14)	38.9 (14)	2.8 (1)	2.8 (1)	16.7 (6)	–	36
Nutrition	27.8 (10)	47.2 (17)	8.3 (3)	8.3 (3)	8.3 (3)	–	36

Table 35.–Rehabilitation

Category of Instruction	Essen (%)	Benef (%)	Irrel (%)	Inapp (%)	No Opinion (%)	N/R	N
Treatment protocols	11.1 (4)	44.4 (16)	13.9 (5)	16.7 (6)	13.9 (5)	–	36
Surgical treatments	8.3 (3)	33.3 (12)	25.0 (9)	25.0 (9)	8.3 (3)	–	36
Activities of daily living	33.3 (12)	36.1 (13)	5.6 (2)	11.1 (4)	13.9 (5)	–	36
Absolute/relative rest	44.4 (16)	36.1 (13)	2.8 (1)	8.3 (3)	8.3 (3)	–	36
Work hardening	25.0 (9)	38.9 (14)	11.1 (4)	11.1 (4)	13.9 (5)	–	36
Postural retraining	33.3 (12)	55.6 (20)	0.0 (0)	5.6 (2)	5.6 (2)	–	36
First aid	13.9 (5)	36.1 (13)	16.7 (6)	19.4 (7)	13.9 (5)	–	36
Technique modification	55.6 (4)	36.1 (13)	2.8 (1)	5.6 (2)	0.0 (0)	–	36

Table 36.–Medical Referral

Category of Instruction	Essen (%)	Benef (%)	Irrel (%)	Inapp (%)	No Opinion (%)	N/R	N
Screening	11.1 (4)	44.4 (16)	11.1 (4)	13.9 (5)	19.4 (7)	–	36
Pain grading	2.9 (1)	40.0 (14)	17.1 (6)	8.6 (3)	31.4 (11)	1	35
Consultation indicators	54.3 (19)	37.1 (13)	0.0 (0)	5.7 (2)	2.9 (1)	1	35
Second opinion indicators	27.8 (10)	50.0 (18)	5.6 (2)	8.3 (3)	8.3 (3)	–	36
Medical specialties	33.3 (12)	55.6 (20)	0.0 (0)	0.0 (0)	11.1 (4)	–	36
Performing arts clinics	27.8 (10)	69.4 (25)	0.0 (0)	0.0 (0)	2.8 (1)	–	36
Related therapies	22.2 (8)	72.2 (26)	2.8 (1)	0.0 (0)	2.8 (1)	–	36