The *Art* & **Science** of Music Therapy: A Handbook

Edited by
Tony Wigram, Bruce Saperston and Robert West

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Foreword

It may be said that music therapy has a long history, but a short past. Indeed the oldest account of medical practices, the Kahum papyrus, provides an account of the use of incantations for healing, and references to the therapeutic uses of music are continually found throughout eastern and western history. However, the emergence of music therapy as an organised profession has occurred primarily during the past 50 years.

Music therapy has developed as a profession to a greater or lesser extent in approximately 50 countries. In several of these countries (e.g. Hong Kong, Cyprus, Korea, Iceland), there is only one practising music therapist; in other countries, such as the United States, there are more than 3,000 trained music therapists. Although music therapy practice was in existence prior to these times, formal professional associations were formed in the United States, Austria, and Great Britain during the 1950s; in the Netherlands, Argentina, Brazil, Japan, Denmark, Norway and Uruguay during the 1960s; in Israel, Columbia, France, Finland, South Africa, Canada, Australia, Italy, New Zealand, Puerto Rico, and Spain during the 1970s; in Belgium, Switzerland, Poland, Scotland, Hungary and China during the 1980s; and in Greece during the early 1990s.

The rapid or slow development in various countries has been linked with a number of factors, a significant one being the cultural or societal viewpoints regarding the importance of music in general and specific preferences with regard to music. Logically then, music therapy practices have embraced these viewpoints and preferences, and thus music therapy is very distinct and different from country to country.

In addition, there may be complex and even contradictory relationships between these societal and cultural views and the development of music therapy as a science. For instance, in some cultures music is widely acknowledged as a 'healing' medium, and the terms, 'music' and 'therapy' are considered redundant. While this cultural viewpoint may support its widespread use, it may often delay or prohibit its scientific development. Conversely, in societies where music is less embedded in traditional healing practices, its regard as a science may be enhanced.

Of course, numerous other factors have influenced the development of music therapy in different countries, such as specific historical events, various music therapy pioneers, political and financial issues, the organisation of higher education, various health care approaches and definitions of therapy. As these factors are unique to each country, they have provided either a nurturing or unsupportive context for the development of music therapy and have literally shaped its past and present clinical characteristics.

In addition, given the breadth of potential clinical applications of music therapy as a treatment (i.e. as a medical, psychotherapeutic, educational,

rehabilitative, palliative, diagnostic, etc. intervention) coupled with the numerous theoretical and clinical orientations to treatment in each of these areas and prevalence of one or more of these theories in each country, it is relatively easy to comprehend the multiple influences on music therapy which account for its current diversity.

Thus, some music therapy approaches have emerged from psychoanalytic traditions, some from humanistic tradition, some from behavioural traditions, some from special education philosophy, etc. In addition, one or more of these traditions may dominate music therapy practice in a single country, or there may be eclectic or integrated approaches to music therapy in others (e.g., developmental/humanistic, behavioural/medical, etc.).

As can be expected, methodologies for music therapy practice are mildly to vastly different among countries. These have been developed based on a particular theoretical orientation or combination of orientations. Also, for a variety of reasons they may emphasise one or more of the experiences within music (improvisation, reception, composition, performance, activity, combined arts) (Maranto, 1993). Aspects of and requirements for the client-therapist relationship as well as the level, breadth and depth of the therapeutic intervention are likewise related to the theoretical orientation and type of music experience used.

Furthermore, because the types of patients (e.g., medical, psychiatric, handicapped) and the ages of patients who are primary recipients of music therapy may vary in different countries, it is difficult to speculate on whether this phenomenon is the cause or result of a particular theoretical orientation and experience within music.

For the reasons stated above, diversity both in national and international music therapy practice is a distinct reality which is considered both necessary and healthy within the discipline and profession. Thus, diversity is considered a positive outcome of the breadth of music therapy applications and the need for music therapy practices that are relevant to clinical needs within each country. However, such diversity makes music therapy difficult to define, although several definitions are becoming more widely accepted, and several taxonomies of music therapy practice have been published. Continued international dialogue and collaboration particularly through its official international organisation, the World Federation of Music Therapy, will undoubtedly bring about a greater knowledge and acceptance of the diverse practices within music therapy and perhaps offer a distinct paradigm that will embrace them.

At the present, music therapy is seen as both an art and a science. Its practices, although well-developed on a clinical level, have not always yielded to traditional models of quantitative research. Specifically, music itself is difficult to quantify, the music therapy process is difficult to quantify, and their effects on the complex aspects of the human being are even more difficult to analyse in a quantitative manner. Thus, there is a continuous search for models of research that will address these inherent difficulties. For this reason, qualitative research methods as well as combinations of quantitative and qualitative methods may in

the future provide more insight into and documentation of the clinical effects of music therapy.

Research models must be relevant to diversity within music therapy practice as well. Some music therapy methods and theoretical orientations are more aligned with quantitative methodology, e.g. behavioural methods. Within this orientation, overt behaviours (as dependent variables) may be specified objectively and musical stimuli or reinforcements may also be defined in such a manner. Thus, quantitative effects of treatment are more direct and observable, and there is an abundance of literature on these effects. This is certainly not the case however, in attempting to examine the treatment effects of improvisationally-oriented music therapy processes or the effects of music therapy on individuals with psychiatric difficulties, to name just a few situations.

Additionally, in the area of music and medicine, quantitative research is increasing. Specific effects of music therapy on various psychological and physiological parameters have been identified with some consistency. This type of research is necessary to meet the rigorous requirements of the medical community as to the effectiveness of music therapy with regard to medical treatment. However, given the most recent research and theories regarding the mind-body relationship, psychoneuroimmunology, and behavioural medicine, qualitative aspects of the music experience, e.g., the meaning of the music to the patient, the relationship of the patient to the music and the influence of the patient's thinking on physiological processes warrant further investigation using new research paradigms. Implications of the integral mind-body relationship and the influence of music therapy on all parameters of a person's health (i.e., physiological, psychological, social, etc.) must be taken into consideration and examined in all diverse methods of music therapy, not just those in the areas of medicine.

The reader may gain a perspective of the art and science of music therapy as well as its potential for diversity in the present text. In the case studies and research articles contained herein, one can obtain: a keen insight into the variety of theoretical orientations upon which music therapy is based, a description of various experiences within music (receptive, improvisatory, etc.) which are at the heart of the therapeutic process, a sense of the various aspects of the therapeutic relationship which develops through music, and a knowledge of the variety of clinical groups that benefit from music therapy treatment. In addition, the reader can derive a breadth of ideas concerning the diversity of music therapy methodologies, for assessment, treatment and evaluation.

The value of such text is in presenting this diversity in an accessible way for music therapy students and practitioners, as well as for students and therapists from other disciplines. From both its editors and contributors, who represent a broad range of countries and perspectives, the reader is challenged to contrast, compare, and go deeper into the possibilities for music therapy practice, and emerge stimulated and open for new ideas and future potentials.

The diversity of the art and science of international music therapy is at once illuminating, enlivening and thought-provoking. I am honoured to have been

asked to write a foreword for this international forum for ideas and hope that this text will provide the basis for much future discussion.

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Preface

The therapeutic value of music has been evident for centuries, and the last 50 years has seen the development of a music therapy profession. It has now taken its place in the clinical field alongside professions such as physiotherapy, occupational therapy, speech therapy and psychology in the paramedical services provided by health authorities in many countries.

Music therapists are usually first and foremost musicians, and probably for this reason the dominant approach to the field has been subjective and founded in artistic and literary traditions. The medical model of therapy, however, demands scientific evaluation based on rigorous measurement of process and outcome. Therefore, to gain wider acceptance among the medical community, a blending of the artistic and scientific traditions will have to be found - the artistic traditions inspiring the development of treatment methods and science providing a means of finding out which methods work with which clients and in what circumstances.

This book aims to provide a broad overview of the state of the art in music therapy today and to provide a basis from which it can develop and grow into a more effective method of treatment and gain more widespread acceptance among health professionals as a treatment of choice in a variety of conditions, both psychological and physical.

The reader will observe that the range of approaches and client groups is diverse, from controlled studies of the effects of music in augmenting medical treatment to a case study of the use of music therapy with an autistic child. The writing styles of the contributors are similarly diverse and we have undertaken only light editing of the chapters so as to provide the reader with a greater insight into the ways that different music therapists conceive of their work.

Therefore this book contains chapters by many of the world's leading music therapists and should provide practising music therapists and music therapy students with a unique opportunity to learn about the methods used by the individuals who have developed those methods. Music therapy often runs parallel to, or augments, other forms of therapy such as psychotherapy, and this book should be invaluable to clinicians in these other areas who are interested in referring patients to music therapists.

The styles of work, approaches and techniques employed in music therapy may depend on the training and methodological stance of the music therapist, or on the needs of a particular client group. Many of the chapters represent one of the more typical styles of music therapy, the use of active and creative music-making to build a therapeutic relationship between an individual or group of clients, and the therapist. The use of free or structured improvisation in an interactive way by skilled therapists is described in case material in 11 of the chapters. The process by which a client expresses emotional, physical or psychological needs and

difficulties in creative improvisation either on their own, or in dialogue with the therapist forms one of the most common approaches in music therapy.

Receptive forms of music therapy are also well documented, ranging from the use of music in guided imagery, vibroacoustic therapy, and physiologically interactive music to the use of popular classical music to elicit feelings, memories, associations and desires.

Music therapists work with individuals or groups for different reasons. There is a wealth of literature on single case studies, both from a clinical and a research standpoint. While many of the chapters in this book contain individual case examples, four of the chapters focus on group music therapy, and the dynamics of group process.

The development of assessment procedures has grown alongside the profession in response to the demand that music therapy as a clinical intervention should fulfil this function in medical, educational and social milieu. Four chapters look specifically at assessment from both a diagnostic point of view, and from the requirement to assess the needs a client or group of clients may have for either music therapy or for some other form of intervention. All music therapy approaches contain elements of assessment either during the initial stages of therapy, or as part of sustained treatment, and the many case studies reviewed in this book give some insight into this process from either analytical, medical, remedial, psychotherapeutic, education or purely musical standpoints.

Research is assuming an increasingly important place in music therapy, where the focus can vary from evaluating the outcome of music therapy, to analysing more specifically the significant elements in music and sound and their influence on the therapeutic process. Empirical data is evident in many chapters, but eight chapters concentrated on recording and discussing specialised research. The first chapter in the book gives an overview by means of a meta-analysis of music used in medical and dental situations.

Music Therapy can benefit a wide variety of people, from both clinical and non-clinical populations. The effect of music therapy on a large range of clients with mental or physical illnesses and disabilities is documented here. In addition there are chapters that focus on issues that can affect all of us, such as those on stress and grief counselling. Key words used in the indexing include any chronic or acute clinical conditions mentioned in this book in relation to music therapy intervention, and will enable the reader to use this book as a reference.

This book is part of a series emanating from symposia held annually at the Ciba Foundation in London and organised by the Applied Psychology Research Group based at Royal Holloway and Bedford New College, London University.

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Contributor Details

John Bean trained at the Royal Academy of Music, City of Manchester College of Higher Education and Guildhall School of Music and Drama, London. He was a Professional cellist in a symphony orchestra for eight years and a cello teacher. He is currently a peripatetic music therapist for Special Schools in Leicestershire. He has frequent lecturing engagements in the UK, and also in Europe Switzerland and Spain. He was awarded Churchill Fellowship to investigate music therapy in the treatment of cerebral palsy; Switzerland, 1985.

Ruth Bright has worked in Music Therapy for over 30 years. Her work has involved many populations over a wide range of ages but she is known around the world for her work, lecturing and books about geriatrics and on grief counselling in music therapy. Ruth Bright's reputation extends beyond the field of music therapy; she has served as chairman of the New South Wales branch of the National Association for Loss and Grief, has been President of the Gerontology Foundation of Australia since 1988 and is a long-standing Director of Maranatha, a training group home of Developmentally Disabled young adults. She was founding President of the Australian Music Therapy Association and was President of the World Federation of Music Therapy from 1990-1993. In the Queen's Birthday Honours, 1992, she received Membership of the Order of Australia for services to community health in music therapy.

Alicia Ann Clair is a Professor of Art and Music Education and Music Therapy, the Director of Music Therapy at the University of Kansas, Lawrence, Kansas and a research associate at Colmery O'Neil Veterans Affairs Medical Center in Topeka, Kansas. She is a past president of the National Association for Music Therapy and has served that Association in many other capacities. Dr Clair teaches graduate and undergraduate courses in music therapy and is involved in ongoing music therapy clinical practice research with persons who have dementia, primarily of the Alzheimer's type. Dr Clair's research concerning persons with dementias and with other populations of elderly persons is published widely. She served on the Editorial Boards of the *Journal of Music Therapy* and the *International Journal of Arts Medicine.*

Alice-Ann Darrow is Associate Professor of Music Education and Music Therapy at the University of Kansas, Lawrence, Kansas, where she also holds a courtesy appointment in the Department of Speech and Hearing. Dr Darrow has organised and implemented music education and music therapy programs in the Miami public school system, a cultural arts centre for inner city students, a federal prison, a state psychiatric hospital, and a state institution for the mentally retarded. Related to Dr Darrow's research interest in the music perception of hearing-impaired individuals, she has produced several instructional videotapes. She presently serves on the Editorial Boards of the *Journal of Research in Music Education* and *Update: Application of Research in Music Education.* Dr Darrow

has been the recipient of a research award given by the National Association of Music Therapy.

Steve Dunachie was educated at St Mary's College, Crosby and Churchill College, Cambridge. At present he is Senior 1 Music Therapist at Lea Castle Hospital, Caterham, having qualified from the Guildhall School in 1981. He also lectured at the Guildhall School on the Music Therapy course for two years. In addition to therapy, he is also involved in performing, recording and composing.

Frances Smith Goldberg is a graduate in music from Indiana University and clinical psychology from Lone Mountain college. She is Associate Clinical Professor, Department of Psychiatry and former Director, Rehabilitation Therapies, Langley Porter Psychiatric Institute, University of California, San Francisco. A fellow of the Association for Music and Imagery and a Licensed Marriage, Family and Child Therapist with more than 30 years as a music therapist, she also maintains a private practice and teaches with the Bonny Institute for Music-Centred Therapies and her own Therapeutic Arts Psychotherapy and Training Institute in the United States, Canada, Sweden, Denmark, Germany and Switzerland. Ms Goldberg has published several articles on music psychotherapy, including research on music group psychotherapy and has presented at numerous national and international conferences. She serves on the Editorial Boards of *The Arts in Psychotherapy, Music Therapy Perspectives,* and the *Journal of the Association for Music and Imagery.*

Roy Grant has been a faculty member in the University of Georgia Developmental Disabilities Program since 1972, supervising clinical practicum experiences and internships, developing programs for clients with developmental disabilities, and teaching Principles of Music Therapy in the School of Music. Previous work included adult psychiatric clients, corrections, mentally retarded children and adults, emotionally disturbed children, forensics, and geriatrics in the states of Kentucky, Alabama, and Georgia. He has served on numerous regional and national committees, has served as Council Chairperson and member of the Executive Board and Assembly of Delegates of the National Association for Music Therapy, and has served as president of the regional chapter for two terms. He has published numerous articles and has co-authored three musicals for special education students.

Suzanne Hanser is research scientist at the Department of Veterans Affairs Medical Center in Palo Alto, California. She performed her research in Alzheimer's disease at Stanford University School of Medicine as a Senior Postdoctoral Fellow, sponsored by a National Research Service Award from the National Institute of Ageing. For twelve years, Dr Hanser served as Professor and Chairperson of the Department of Music Therapy at University of the Pacific in Stockton, California. She is currently President Elect of the National Association for Music Therapy. Dr Hanser is the author of the *Music Therapist's Handbook* and numerous articles in stress reduction, cognitive-behavioural approaches to music therapy, and clinical applications of music therapy (e.g. childbirth, dental patients, emotionally disturbed children, nonverbal psychotherapy, etc.).

Margaret Heal Hughes is Senior Music Therapist and Head of the Music Therapy Department for the Learning Disability Care Group of the Forest Healthcare Trust, London, England. She was born in Canada, and holds a B.A. and a B.Mus. from Queen's University (Canada) and a Postgraduate Licentiate Diploma in Music Therapy from the Guildhall School of Music and Drama, London. She is an approved supervisor for the Association of Professional Music Therapists, Great Britain and lectures and publishes on the use of a psychoanalytically - informed approach to music therapy when working with people who have learning disabilities. She is currently completing an M.A. in Observational Studies (Tavistock Clinic, University of East London). She is co-editor of *Music Therapy in Health and Education*, Jessica Kingsley Publishers.

Pixie Holland was a gold medallist of the Associated Board of the Royal Schools Music and a scholar at the Royal Academy of Music, London. She trained as a concert pianist and has accompanied, lectured and performed music for most of her life. She is a freelance music therapist working at various hospitals and day centres and schools. She has also worked extensively with the media and has held several music therapy sessions 'on air'. She is a committee member of the International Stress Management association, and Vice Chairman of the British Society for Music Therapy. She is an Honorary Research Associate of Royal Holloway College, London University, where she is researching "The Role of Music Therapy of The Effective Use of Stress".

Robin Howat holds a BA in music (Exeter University); Diploma in Education (London University) 1980; and a Diploma in Music Therapy (Nordoff-Robbins) 1977. He is currently Head of the Training Course at the Nordoff-Robbins Music Therapy Centre, London. His previous posts include being part-time music therapist at Helen Allison School for Autistic Children (1977-80); St Thomas's Psychiatric Day Hospital with children under five (1980-83); Ravenswood Village with children and adults with special needs (1985-88); Nordoff-Robbins Music Therapy Centre (1978-88).

David John studied music at Cambridge College of Arts and Technology and trained as a music therapist at the Roehampton Institute. Since then has worked in the field of adult Mental Health firstly with patients suffering from a severe degree of mental and physical handicap and since 1985 at Fulbourn psychiatric hospital, Cambridge. His main interest is in working with a psychoanalytic model specialising in work with adults who suffer from a severe degree of mental illness. He is currently a student member of the British Association of Psychotherapists.

Chris Lawes obtained his PhD from Leeds Polytechnic where he was the Dalzell-Ward Memorial Research Fellow. He has since qualified as a clinical psychologist. He is currently working with children and adults with head injuries and neurological problems at the Department of Psychology, Essex County Hospital, Colchester, Essex. Prior to this he worked with people with learning disabilities.

Paul Nolan is the Director of Music Therapy Education in the Creative Arts in Therapy Program and Director of The Creative Arts Therapy Centre at Hahnemann University, Philadelphia, Pennsylvania. He is past Vice-President of the American Association for Music Therapy, a member of the General Advisory Board and Editorial Board for the *Arts in Psychotherapy* a member of the Editorial Board for *Music Therapy* and a member of The Advisory Board of the *International Journal of Arts Medicine.* He has served on numerous committees for the National Association for Music Therapy, the American Association for Music Therapy, and the Certification Board for Music Therapy and has lectured and presented throughout the United States, Canada and Great Britain. His clinical experiences include psychiatric, oncology, forensic, general medical, chronic pain, developmentally disabled, and eating disorders. He has published in the areas of eating disorders, improvisation, music in medicine, Guided Imagery and music, oncology, forensic psychiatry, and education in music therapy and the creative arts in therapy.

Helen Odell-Miller is a music therapist and therapy services manager in the mental health services in Cambridge. She trained in the mid 1970s as a music therapist at The Guildhall School of Music in London, and subsequently completed an MPhil in music therapy research with elderly mentally ill people, at City University in 1988. She has clinical experience with people with learning difficulties, and has now specialised in working with adults with mental health problems of all ages. She has also been involved nationally and internationally with Arts Therapies developments, and music therapy specifically, as an adviser, lecturer, conference delegate and organiser in conjunction with various bodies, e.g. Association of Professional Music Therapists, and Standing Committee for Arts Therapies Professions. She has lectured in and taught music therapy in Canada, the USA, France, Spain, Italy and Great Britain.

Amelia Oldfield completed the Guildhall Music Therapy Course in 1980. Since then she has been working as a music therapist for the Cambridge Health Authority in mental handicap, child development and child and family psychiatry. In 1986, she obtained an M. Phil. degree for a music therapy research project with profoundly mentally handicapped adults. She has published many papers on various aspects of her clinical work and is co-author of the book *Pied Piper - Musical activities to develop basic skills.* She is a past chairperson of the Association of Professional Music Therapists and is now on their advisory council and on the advisory editorial panel of the *Journal of British Music Therapy.* She runs numerous workshops and gives lectures both in Great Britain and abroad.

Mercedes Pavlicevic trained at the Nordoff-Robbins Music Therapy Centre in London in 1980 and worked as a music therapist in Scotland for ten years, first with mentally handicapped adults, and then with adult psychiatric patients and psychogeriatrics. She has also practised privately, with children and adolescents, and with people suffering from cancer. She completed her doctoral thesis entitled 'Music in Communication: Improvisation in Music Therapy' at the University of Edinburgh, Department of Psychology and Music and recently returned to South

Africa to pursue special interests in cross-cultural music communication and in the use of music therapy to alleviate traumatic stress syndrome. She now works at the Nordoff-Robbins Music Therapy Centre in London.

Mary Priestley trained at the Royal College of Music and the Geneva Conservatoire. In 1969 she qualified as a music therapist from the Guildhall School of Music. She also spent two years at the Institute of Group Analysis. For the past 20 years she has practised as a music therapist and trained students from 18 countries in her techniques. She has lectured in the UK and abroad and made many radio and television appearances. She is author of *Music Therapy in Action* and *Analytische Musiktherapi* and has published widely in professional journals.

Penny Rogers obtained her first degree in music from Manchester University where she majored in performance and studied the cello. Following work as a freelance cellist, she obtained her diploma in Music Therapy from the Guildhall School of Music & Drama, London. Since qualifying, she has specialised almost exclusively in the field of Mental Health developing a special interest in work with the sexually abused. Penny's interest in Health Service management led to a post as the District Business Manager for North East Essex Health Authority before her return to full-time work as a Music Therapist. She is currently Research Fellow at City University, London, where she is hoping to obtain a PhD looking at the use of Music Therapy with the sexually abused. She has previously obtained an MSc in Cognitive Neuropsychology from London University. In addition to her research interests, she has been an executive committee member of the Association of Professional Music Therapists for the past four years; played an active role in a number of associated forum, as well as lecturing in Estonia, USSR on Music Therapy in Mental Health.

Bruce Saperston is Director of Music Therapy, Associate Professor of Music, and Head of the Department of Music at Utah State University, Logan, Utah. Prior to his academic appointment, Dr Saperston practised clinical music therapy for 16 years with various populations (i.e. mentally retarded, autistic, emotionally disturbed, multiply handicapped) and supervised the music therapy clinical internships of 48 students. Internationally renowned as a clinician and researcher, Dr Saperston has lectured in Hong Kong and London as well as throughout the United States. Dr Saperston is a member of the Editorial Board of the *Journal of Music Therapy* and has served for several years as a member of the National Research Committee of the National Association for Music Therapy (NAMT). His numerous publications include original clinical techniques and research, and a video documentary of his work, *Music Therapy: Health Vibrations*, was produced by the NAMT as part of a national in-service programme.

Olav Skille trained as a teacher and music teacher and specialised in teaching children with brain injuries. He has worked as a music therapist, teacher and consultant on many projects. He has carried out extensive research, developing and evaluating methods of assessing musical behaviour and for developing vibroacoustic therapy. He has lectured in many countries including

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Henk Smeijsters received a masters degree in social science and a doctors degree in musical science from the University of Nijmegan. He works as a researcher into music therapy at the Music Therapy Laboratory Nijmegen, as a lecturer in music psychology and music therapy at the Hogeschool Nijmegen and the Hogeschool Enschede and as a visiting lecturer at the University of Nijmegen. He is co-ordinator of the five year full-time training course for music therapy at the Hogeschool Enschede, a member of the research group for music therapy of the NVKT, and a member of the board of the Stichting Muziektherapie. He has written various papers in journals and has published several books about music psychology and music therapy.

Jayne Standley is Professor of Music Therapy and Director of Music Therapy at The Florida State University in Tallahassee, Florida from which she holds Bachelor's, Master's and Doctoral Degrees. Prior to her academic appointment, Dr Standley had completed 10 years of clinical music therapy experience in agencies serving mentally retarded clients. An active researcher with emphasis on medical/clinical applications of music, Professor Standley is widely published in the field and is a frequent guest lecturer. She is the 1989 recipient of the prestigious Publication Award bestowed by the National Association for Music Therapy is the author of *Music Techniques in Therapy, Counseling, and Special Education,* and is editor of the *Journal of Music Therapy.*

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Robert West obtained his PhD in psychology from University College London and has since worked as a research fellow at the Institute of Psychiatry, then as Lecturer and Senior Lecturer at Royal Holloway and Bedford New College, London University. He is currently Reader in psychology at St George's Hospital Medical School, London University. He has published many papers on

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John Woodcock studied piano at the Royal Northern College of Music and trained as a music therapist at Roehampton Institute. He has worked in various fields as a music therapist and is currently joint Head of Music Therapy of a Learning disabilities unit and joint course convenor of the P G Diploma in Music Therapy at the Roehampton Institue, London.

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Section 1: The Biological and Medical Effects of Music

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1

Music as a Therapeutic Intervention in Medical and Dental Treatment: Research and Clinical Applications

Jayne Standley

Introduction

If given an option, would most pregnant women elect to reduce the length of labour by an average of two hours? Would the patient in the surgical recovery room choose to awaken from the anaesthesia sooner, with fewer side effects and less pain? Would persons with chronic pain prefer to use less analgesic medication, thereby reducing possible side effects? Would those undergoing consequential medical treatment opt for reduced anxiety during its course? Research shows that music provides the above medical benefits and more, and that most people perceive their preferred music to be relaxing and beneficial to their recovery.

Despite the volume of research demonstrating the value of music in a variety of medical and dental treatments, there is little consensus on which techniques or procedures are most effective. Further, the profession of music therapy is still evolving as a viable component in the array of medical treatments. As medical music therapy develops, its methodology will have to conform to the specifications of the medical model, i.e. *a priori* treatment protocols dictated by specific diagnoses and proven options, predictable outcomes for a known frequency and duration of applications, and systematic documentation procedures to readily identify positive or negative health consequences. A formal summary of the research literature which provides a quantitative synthesis of the available data could assist the evolution of accountable music therapy techniques in applied health practices.

A meta-analysis is a procedure which provides quantitative synthesis of research data through formal statistical techniques. Specifically, it is the application of a variety of formulae to the results of a body of homogeneous research to compute effect sizes, i.e. quantitative summaries of the properties and findings of individual studies. Effect sizes can then be compared and contrasted across multiple variables (Glass, et al., 1984) and these overall results, to some extent, generalised.

The purposes of this chapter are to use the results of a meta-analysis of existing research in music and medicine to identify and authenticate effective

music therapy techniques and to develop these techniques into clinical procedures which meet the criteria of standard medical protocols.

While empirical studies on the effects of music in medical treatment continue to accumulate, by the mid-1980s there existed a sufficient quantity for reasonable and relevant analysis. An initial study screened over 98 references on this topic and identified 30 empirical studies which were amenable to a comprehensive meta-analysis of characteristics and results (Standley, 1986). Recently, additional references published since 1986 were reviewed and analysed, resulting in a pooled meta-analysis of 55 studies utilising 129 dependent variables (Standley, 1992).

Procedures and Results

Studies qualified for inclusion in the two meta-analyses by containing empirical data; by utilising actual, not simulated pain stimuli; by utilising music as an independent variable; by utilising subjects who were actual patients with medical or dental diagnoses; and by reporting results in a format amenable to data analysis. The procedures followed the three basic steps outlined by Getsie, Langer and Glass (1985): 1) a complete literature search was conducted to find all possible members of the defined population of studies whether published or unpublished; 2) the characteristics and findings of the collected studies were identified, described, and categorised; and 3) the composite findings were statistically analysed and standardised effect sizes computed.

Table 1 shows that the resulting estimated effect sizes ranged from 3.28 to.59, meaning that the music condition was sometimes more than three standard deviations greater in desired effect from the control condition without music. Only 4 of the 129 variables had a negative value, indicating that for those dependent measures the music condition was less beneficial than the non music one. (It should be noted that several of these negative results were from studies where other dependent measures showed a positive reaction to music.) The overall mean effect size for all 129 dependent measures was .88. Therefore the average therapeutic effect of music in medical treatment was almost one standard deviation greater than that without music.

Table 1. Mean music effect size for each dependent variable analysed

Reference	Dependent variable	Effect size
Bob	Podiatric Pain	>3.28
Ammon	Paediatric Respiration	3.15
Oyama et al.	Pulse-Dental Patients	3.00
Monsey	Use of Analgesia-Dental	2.49
Martin	EMG-35 Min. of Music	2.38
Gardner & Licklider	Use of Analgesia-Dental Pts.	2.36
Oyama et al.	Blood Pressure-Dental Pts.	2.25
Rider	Pain-(*Debussy*)	2.11
Siegel	Medication-Paediatric Surgery	2.11
Martin	EMG-26-30 Min. of Music	2.10
Schuster	Distraction-Hemodialysis	2.08
Rider	EMG-(*Entrainment*)	2.03
Chetta	Observed Paediatric Anxiety	1.97
Cofrancesco	Grasp Strength-Stroke Pts.	1.94
Rider	EMG-(*Metheny*)	1.90
Tanioka et al.	Cortisol-Surgical Recovery	1.80
Bonny	Perceived Anxiety-Cardiac Pts.	1.77
Budzynski et al.	EMG-Tension Headache	1.76
Budzynski et al.	Pain Intensity-Headache	1.76
Rider	EMG-(*Crystal*)	1.56
Rider	Pain-(*Reich*)	1.55
Rider	EMG-No Music	1.52
Ward	Pain-Debridement of Burns	1.52
Rider	Pain-(*Entrainment*)	1.51
Locsin	Post-operative Pain	1.49
McDowell	Attitude Toward Music	1.34
Tanioka et al.	Adrenalin-Surgery	1.33
Winokur	Relaxation-Obstetrical	1.32
Siegel	Pulse-Paediatric	1.28
Tanioka et al.	Anxiety-Surgery	1.28
Schieffelin	Crying-Debridement	1.23
Bonny	Pulse-Cardiac	1.22
Martin	EMG-18-25 Min. of Music	1.22
Roberts	Intracranial Pressure - preferred vs sedative music	1.21
Jacobson	Perceived Pain-Dental	1.19
Rider	Pain-(*Metheny*)	1.16
Bonny	Perceived Pain-Cardiac	1.15
Spintge & Droh	Choice of Epidural Anaesthesia-Surgery	1.12
Sanderson	Preoperative Anxiety	1.02

Epstein et al.	Migraine Headache	1.00
Winokur	Length of Labour-Childbirth	.99
Goloff	Perceived Satisfaction	.98
Levine-Gross & Swartz	State-Trait Anxiety	.98
Winokur	Use of Medication-Obstetrical	.98
Froelich	Verbalizations	.97
Rider	Pain-(*Crystal*)	.96
Rider	Pain-(No Music)	.96
Shapiro & Cohen	Pain-Abortion	.96
Gfeller et al.	Helplessness-Dental Pts.	.94
Staum	Walking Speed-Stroke Pts.	.94
Staum	Gait Improvement-Stroke	.94
Rider	EMG-(Preferred Music)	.91
Hanser et al.	Observed Childbirth Pain	.90
Sanderson	Pain Relief-Surgical	.89
Crago	Relaxation-Open Heart Surgery	.88
Crago	Pain-Open Heart Surgery	.87
Scartelli	EMG of Spasticity	.85
Behrens	Exhalation Strength	.83
Hoffman	Blood Pressure-Hypertension	.83
Locsin	Blood Pressure-Surgical	.82
Kamin et al.	Cortisol-20 Min. after Extubation	.80
Tanioka et al.	Cortisol-1 hr. of Surgery	.75
Brook	Pulse-Obstetrical	.73
Brook	Neonate Apgar Score	.73
Lininger	Neonate Crying	.72
Shapiro & Cohen	Pain-Abortion	.71
Caine	Neonate Weight Gain	.71
Schneider	Pain-Paediatric Burn Pts.	.70
Curtis	Contentment-Cancer Pts.	.67
Kamin et al.	Cortisol at Anaesthesia	.67
Roberts	Intracranial Pressure - preferred music vs silence	.67
Burt & Korn	Perceived Effect-Obstetrical	.66
Chapman	Neonate Hospitalization	.65
Curtis	Perceived Cancer Pain	.63
Frank	Anxiety-Chemotherapy	.63
Codding	Perceived Childbirth Pain	.59
Epstein et al.	Pain Intensity-Headache	.59
Rider	Pain-(Preferred Music)	.59
Sanderson	Pain Verbalization-Surgical	.58
Caine	Neonate Hospitalization	.56
Locsin	Pulse-Surgical	.56

Sanderson	Blood Pressure-Surgical	.55
Brook	Cervical Dilation Time	.52
Goloff	Physical Comfort	.51
Rider	EMG-(*Reich*)	.50
Sanderson	Analgesics-Surgical	.50
Ward	Pulse-Burn Pts.	.50
Roberts	Blood Pressure - preferred music vs silence	.49
Ward	Perceived Pain-Debridement	.48
Corah et al.	Autonomic Sensations-Dental	.47
Frank	Emesis Intensity-Chemotherapy	.47
Crago	Music Listening-Open Heart	.45
Kamin et al.	Cortisol-15 Min. after Incision	.44
Sammons	Music Choice	.44
Bonny	Blood Pressure-Cardiac	.42
Crago	Sleep-Open Heart Surgery	.42
Kamin et al.	Cortisol-10 Min. Before Anaesthesia	.42
Spintge	Epidural Anesthesia	.42
Crago	Anxiety-Open Heart Surgery	.41
Burt & Korn	Use of Analgesia-Obstetrical	.39
Metzler & Berman	Pulse-Bronchoscopy	.39
Frank	Nausea Length-Chemotherapy	.36
Burt & Korn	Amount of Analgesic-Obstetrical	.35
Bailey	Perceived Anxiety-Cancer	.34
Clark et al.	Perceived Anxiety-Obstetrical	.34
Clark et al.	Perceived Pain-Obstetrical	.33
Frank	Emesis Length-Chemotherapy	.33
Rider	EMG-(*Debussy*)	.33
Crago	Analgesic-Open Heart Surgery	.30
Roter	Perceived Benefit-Patients	.28
Lininger	Neonate Crying - instrumental vs no music	.26
Roter	Perceived Benefit-Families	.26
Livingood et al.	Perceived Anxiety-Families	.23
Owens	Neonate Movement	.19
Lininger	Neonate Crying - vocal vs instrumental music	.15
Chapman	Neonate Movement	.14
Clark et al.	Perceived Length of Labour	.14
Clark et al.	Childbirth Attitude	.10
Schuster	Blood Pressure-Dialysis	.10
Owens	Neonate Crying	.06
Caine	Neonate Relaxation	.05

Roberts	Blood Pressure - preferred vs sedative music	.03
Owens	Neonate Weight	.02
Siegel	Respiration-Paediatric	.01
Frank	Nausea Intensity-Chemotherapy	.00
Tanioka et al.	ACTH Level-Surgery	-.17
Corah et al.	Anxiety-Dental	-.39
Crago	Hospitalization-Open Heart	-.51
Caine	Neonate Formula Intake	-.59

N= 129 Overall mean effect size of music = .88

After each study was evaluated and categorised according to its unique characteristics and a value on a linear scale of effect was calculated for each dependent variable incorporated, then multiple comparisons were made, i.e. subjects' diagnosis, age or sex; type of experimental design or sample size; and independent or dependent variables.

Since a primary concern of a meta-analysis is the acceptability of generalised results based on the soundness or inherent bias of research procedures as judged by peer review, studies were compared on this issue. The analysed variables proved to be primarily from published (N=77) vs. unpublished (N=52) sources. It was found that published sources which were not refereed yielded the same effect size (1.0) as published refereed studies. Unpublished, refereed studies, such as theses and dissertations undergoing stringent faculty review, were few in number and yielded the smallest effects (.69). It was concluded that music results included in the meta-analysis were neither biased by the publication/referee process nor inflated by the lack thereof.

A secondary concern about the viability of the research included for analysis was the impact that design variables might have had on reported results. Studies which used a research design with experimental and control groups were in the majority and yielded a much more conservative effect (.70) than did those using subjects as their own control (1.14) or those with post-test measures only (1.14). It was concluded that research included in the pool for analysis seemed to be of predominantly sound procedure and design with a tendency toward conservative measures of the effect of music. Subsequently, multiple comparisons of study demographics, including sex, age, presence of pain, type and frequency of dependent measures, diagnosis, and type of music, were conducted and are summarised in Tables 2, 3 and 4.

Table 2. Meta-analysis results: generalisations from the research literature about the use of music in medical treatment

SEX	Women (ES=.70) respond to music with somewhat greater effect than do men (ES=.57)
AGE	Children and adolescents respond with greater effect (ES=1.12) than do adults (ES=.86) or infants (ES=.47).
PAIN	Music has greater effect when some pain is present (ES=.95) than when it is not a usual symptom of the diagnosis (ES=.70), though music seems to become less effective as the pain increases.
TYPE OF DEPENDENT MEASURE	The most conservative measure of music's effect is patient self-report (ES=.76) while systematic behavioural observation (ES=.94) and physiological measures (ES=1.0) result in relatively equivalent effect sizes.
DIAGNOSES	Music is less effective when severe pain is a usual symptom or the diagnosis has serious implications. Effects vary widely according to diagnosis. Effects are greatest for dental patients and those with chronic pain, i.e.migraine headaches. Minimal effects are reported for obstetric, coma and cancer patients.
MUSIC	Live music presented by a trained music therapist (ES=1.10) has a greater effect than does recorded music (ES=.86).
DEPENDENT MEASURES USED	Effects vary greatly according to the specific dependent measure used . Greatest effects are reported for respiratory rate, EMG, amount of analgesic medication, and self-report of pain. Smallest effects are measured by length of labour in childbirth, amount of anesthesia, days of hospitalization, and measures of neonate behaviour.

ES= Effect Size

Table 2 lists the generalisations that can be made from the meta-analysis results about the uses of music in medical treatment. Analyses by sex showed that women reacted more favourably to music than did men, even though obstetric studies with severe ischemic pain represented a large portion of the research on females. Adolescents had a stronger reaction than did adults or children. Infants had the least response.

Across the diagnoses, which are cited in Table 3 in order of music's benefit, it appears that effects were differentiated by issues of severity, including level of pain, degree of anxiety, and prognosis. When pain was the only diagnostic characteristic considered, the effect size was greater (ES=.95) than when pain was not a usual symptom of the diagnosis (ES=.70). Further comparison clarifies the extent to which music specifically alleviates physical distress. When the pain was

temporary (as with dental problems and headaches) and not the 'deep' pain of ischemic muscle tissue (as in childbirth, surgery, or cancer), then music proved to be more effective.

Even though the number of empirical studies using live music was small (N=12), these data do suggest that there is a more pronounced medical impact when adapting the musical event to meet the specific needs of the patient as opposed to results obtained with the use of commercial, pre-recorded selections.

Table 3. Mean music effect size by patient diagnosis

Diagnosis	Mean Effect Size	Variables Analysed
	1.54	8
Chronic Migraine Headache	1.54	7
Respiratory Problems	1.46	3
Chronic Pain	1.26	14
Physical Impairment	1.17	4
Cardiac	1.14	4
Kidney Dialysis	1.09	2
Burn	.89	5
Abortion	.84	2
Surgery	.78	30
Obstetric	.64	17
Coma	.60	4
Families of Patients	.44	4
Cancer	.43	8
Neonates	.24	12

N= 124

Results for specific dependent measures used in more than one study are listed in Table 4 in order of effect size recorded. Respiration rate was first, followed by EMG and amount of analgesic medication used by patients. Again, especially low effects were achieved when infant behaviours were monitored (movement, ES=.17; crying, ES=.30; and weight gain, ES=.46).

Table 4. Mean music effect size by dependent measure and number of variables analysed

Dependent Measure	Mean Effect Size	Variables Analysed
Respiratory Rate	1.58	2
EMG	1.39	13
Analgesic Amount	1.31	7
Pain (Self-Report)	1.16	16
Pulse	1.10	7
Relaxation	1.10	2
Pain (Observed)	1.01	10
Intracranial Pressure	.94	2
Attitudes	.87	7
Stress Hormones	.76	8
Anxiety	.72	12
Blood Pressure	.69	8
Length of Labour	.57	2
Infant Weight Gain	.46	3
Anaesthesia Amount	.36	2
Infant Crying	.30	4
Emesis/Nausea	.29	4
Days in Hospital	.23	3
Infant Movement	.17	2

N=114

Music therapy medical techniques

In this section, the results of the meta-analysis are summarised by the delineation of specific techniques of the use of music in medical treatments. For each technique the following information is provided: the intended function of the music and specific therapeutic objectives, expected results by diagnosis with indication of the duration of music treatment as documented in the research literature, general procedures for utilising the technique effectively, and suggested ways of documenting effects through behavioural, physiological, and self-report means. Some clinical music therapy examples are also provided.

Technique 1. Passive Music Listening (Alone or Paired with Anaesthesia, Analgesia, Suggestion, Relaxation Techniques or Imagery)

Music Function:
To serve as an audioanalgesic, anxiolytic or sedative.
Therapeutic Objectives:
Reduction of pain, anxiety, or stress.
Enhancement of chemical anaesthetic/analgesic to reduce amount of medication required, duration of use, and aversive side effects.

Reduction in length of hospitalisation.

Diagnoses:

Surgery - Music used pre-operatively to reduce anxiety and to reduce amount of anaesthesia required (1/2 to 1 hour); used during surgery, especially with local anaesthesia, to reduce anxiety and mask operating room sounds (several hours); used post-operatively in the recovery room to promote wakefulness and reduce discomfort (1/2 to 1 1/2 hours); used for first 48 hours following surgery to reduce amount of analgesic and aversive effects of anaesthesia (e.g. vomiting, headaches, restlessness, etc.).

Kidney dialysis - Music used to reduce discomfort and serve as a distraction during this frequent, long term, lengthy, uncomfortable (pain, nausea, restricted movement) procedure (2 to 3 times per week for 4 1/2 to 5 hours across months or years).

Burn - Music used to reduce pain and anxiety in hydrotherapy, intravenous fluid therapy, skin grafts, etc. (daily for each medical procedure or as requested across weeks or months).

Cancer - Music used to reduce pain and enhance analgesic effects of medication (1/2 hour twice per day across weeks or months).

Coma - Music used to decrease intracranial pressure (1/2 of each hour, ongoing).

Neonates - Music used with premature or sick infants to promote weight gain, to reduce pain or stress, and to reduce length of hospitalisation (1/2 hour 2 or 3 times per day for 5-6 weeks).

Office Treatments - Music used during stressful office treatments such as dental procedures, abortions, and podiatry treatments to reduce amount of self-administered anaesthesia and analgesia (treatment duration).

Documentation:

Record one or more of the following measures:

Physiological: Blood pressure, pulse, amount of medication used, blood analysis of stress hormone levels.

Behaviourally observed: Overt pain/anxiety responses, time in recovery room, length of hospitalisation, number of anaesthetic/analgesic side effects experienced.

Self-Report: Ratings of pain/anxiety, State-Trait Anxiety Scale (Spielberger et al, 1970), pain/anxiety adjective selection.

Procedure:

Use patient's preferred music and equipment with quality reproduction capabilities.

Begin the music prior to the pain/fear-inducing stimuli.

Use earphones when possible or a pillow speaker as an alternative.

Suggest that music will aid pain relief, comfort, anxiety, etc.

Maintain a pain-free association by not assisting medical staff with pain-inducing procedures, especially when working with children.

Allow the patient to control as much of the procedure as possible: volume, cassette manipulations, starting and stopping music, etc.

Reinforce overt signs of relaxation, co-operation, and verbalisations with no pain or anxiety content.

Technique 2. Active Music Participation

Music Function:
To serve as a focus of attention and/or to structure exercise (tempo, repetition, duration, force, or fluidity).
Therapeutic Objectives:
Reduction of pain from physical movement or muscle contractures.
Increased joint motility.
Increased motor abilities (duration, strength, co-ordination).
Shortened labour using Lamaze childbirth exercises.
Increased respiration ability (capacity, strength).
Diagnoses:
Childbirth - Music used during pregnancy to structure Lamaze exercises and to reinforce focusing of attention (1 hour session per week in 8th & 9th months plus daily practice for 1/2 hour). Used in labour and delivery to focus attention, to structure breathing, and to reduce pain perception (avg. of 8-12 hours). Selected music used at birth to enhance joy in the event. Music and prescribed exercises used after birth to reduce pain from contractures and to help uterus return to normal size while rehabilitating abdominal muscles (1/2 hour per day across weeks).
Chronic Pain - Music paired with appropriate exercises for involved muscles (1/2 to 1 hour per day across days or weeks).
Respiratory Deficiencies - Music used to structure deep breathing exercises or therapeutic coughing to relieve congestion (5 minutes several times per day). Music performance (singing, piano, harmonica) used to structure breathing and enhance lung capacity (1/2 hour per day across days or weeks).
Patients Prescribed for Physical Therapy (PT) - Music used to structure PT regimen for stroke, burn, orthopaedic, cerebral palsied, and paralysed persons (1/2 to 1 hour daily across weeks or months).
Gait Disturbances - Music paired with walking and gait training to increase duration and to improve gait length, width, and rhythm (1/2 to 1 hour daily across weeks).
Documentation:
Record one or more of the following:
Physiological: Amount of analgesic medication used, electromyographic (EMG) muscle response, exhalation strength (spirometer), degrees of movement in joints (goniometer).
Behaviourally Observed: Frequency and duration of exercises, pain-free verbalisations; length of labour in childbirth; overt pain responses; walking distance; gait length, width, and/or duration.

Self-Report: Ratings of improvement, ratings of pain, personal log of exercises completed.

Procedure:

Select exercises appropriate to diagnosis or as prescribed by a physician or physical therapist.

Evaluate patient's baseline capacity for exercise in terms of speed, duration, repetitions, etc.

Select style of music which matches above traits and also desired *kind* of motor movement (i.e. disco music for forceful movements, waltz music for fluid movements).

Model appropriate movements and teach patient to match them to music.

Change music in successive approximations as patient progresses. In this category, patient's music preference is important but is secondary to the music's properties for matching the desired exercise.

Teach focusing (if exercise routine requires it) by pointing out musical elements for which the patient might listen.

Reinforce exercising (see Example 1), pain-free verbalisations, matching the exercise to the music, focusing attentiveness, and overt signs of patient's motivation to succeed or progress (see Example 2).

Example 1

PINPOINT: An 8 year old male in traction with a broken leg is beginning to contract bed sores from limited movement. He refuses to co-operate in using traction pull to increase movement.

RECORD: Patient was asked to use the traction pull and he refused, covering his face with the sheet and replying, 'I'm tired.'

CONSEQUATE: Therapist played and sang a song, then made music contingent upon use of the traction pull.

EVALUATE: By the third session, the patient used the traction pull 100% of requests at a 90^{0} angle to prone position. Verbal and motor responses to music had increased.

Jama King, RMT (1982)

Example 2

PINPOINT: Female (age in mid-60s) had Parkinson's disease and rigidity on left side due to recent stroke. Patient was non responsive during physical therapy and with visitors.

RECORD: No response was noted to recorded instrumental music, live singing with guitar, or placement of music instruments in right hand. Family interview revealed that the patient formerly played the piano.

CONSEQUATE: First session: Poulenc's Piano Concerto for Two was presented prior to physical therapy. Patient immediately opened her eyes and reached for the recorder with her right hand and began answering yes/no questions.

Subsequent sessions: Piano music was played for 1 minute prior to PT to arouse the patient, who was then told that music would be contingent upon her eyes being open and her attempting physical movement.

EVALUATE: Patient's awareness responses (open eyes and physical movement) increased to 2-3 minute intervals throughout PT sessions after 1 month. Verbal responses also increased. Patient was discharged to a long-term care facility.

Dawn Ferrell, RMT (1984).

Technique 3. Music and Counselling

Music Function:
To initiate and enhance therapist/patient/family relationships.
Therapeutic Objectives:
Reduction of distress/trauma/fear related to terminal or serious illness or injury to self or significant others.
Acceptance of death, permanent disabilities, or scarring. Enhancement of effective interpersonal interactions in times of distress.
Management of illness and personal affairs, i.e., selection of treatment options and making personal or family decisions.
Diagnoses:
Patients or families in distress, including those with traumatic injuries or illness, permanent disabilities or disfigurement; terminal prognoses; hospitalised children; organ transplant patients, etc. Music used to initiate and maintain counselling interaction (1/2 hour daily across days or weeks).
Documentation:
Record one or more of the following:
Physiological: Amount of analgesic or sedative medication used, blood pressure, pulse, stress hormone levels.
Behaviourally Observed: Verbalisations free of distress or fear, actions implementing decisions, overt signs of distress/fear, family interaction patterns.
Self-Report: Ratings of attitudes such as satisfaction/contentment, diary of feelings, attitude scales.
Procedure:
Use live music listening or participation to offer *opportunities* for pleasure, reminiscence, verbalisation, closeness, etc. Use song content for initiating discussion (see Example 3). (The therapist's presence and warmth are crucial, so the use of earphones or the patient listening to music alone are contraindicated.)
Identify source of any patient distress by listening or by watching patient reactions.
Help patient identify decisions that can or must be made, all possible options, consequences of each option, preferred option, and actions to implement selected option (see Example 4).
Serve as an advocate for the patient or family who has made a firm decision about the course of treatment by being supportive and giving assistance in communicating with the medical staff.
Teach effective interpersonal relationship abilities, i.e. positivism, avoidance of guilt for self or imposition of guilt on others, openness in stating feelings, avoidance of blame.
Assist terminally ill persons who wish to get closure on some aspect of their life, such as drafting a living will, selecting music for the funeral, recording a song to leave to a loved one, etc.
Assist permanently disabled persons to identify and develop assets and abilities.

Reinforce reality-based (acceptance) verbalisations and those free of blame, bitterness, guilt, regrets, etc. Also reinforce verbalisations about the present rather than the past.
Provide music and leave the room if the patient is uncommunicative. Continue offering opportunities for communication during later visits.
Example 3.
PINPOINT: A 15 year old male with terminal abdominal cancer and paralysis of lower extremities was referred for counselling due to depression and failure to co-operate with other therapies, including homebound instructional programme.
RECORD: In the initial interview, patient was moody, withdrawn, and non communicative until the guitar was presented. Immediate interest was then displayed.
CONSEQUATE: Patient was given guitar lessons to increase interest, motivate co-operation, reduce loneliness.
1st Day: Patient learned 2 chords and sang several songs. He asked how much a guitar costs.
3rd Day: Patient was loaned a guitar and folder of songs for use in the hospital, and given a focused attention musical listening task for use when in pain.
2 Weeks: Patient's eye contact and verbalisation increased, while great motivation to learn more about guitar and singing was demonstrated. He reported the focused music listening helped him cope with pain. The patient was also reinforced for plans to do more school work.
3 Weeks: Guitar lessons were continued. The patient also revealed he had fear and tension when given shots for nausea from chemotherapy. He was given relaxation techniques and recorded music to listen to during those times. Patient was discharged.
5 Weeks: The music therapist visited the patient's home to continue guitar lessons. Patient reported excitement over guitar and interest in school work via homebound instruction. The music therapist talked with his family about a guitar as a Christmas present.
8 Weeks: Patient was re-admitted to the hospital and guitar lessons were continued. Patient played a Christmas concert for the medical staff and patients on the paediatric ward and was excited by their reaction. He received a guitar for Christmas.
Next 6 Months: Patient was periodically re-admitted for chemotherapy. Guitar lessons were continued at home and in the hospital.
9 Months: Patient was constantly in the hospital, too ill for schoolwork or playing the guitar. The music therapist visited daily and played and sang for him. Counselling for acceptance of death was intensified.
13 Months: Patient was in ICU semi-comatose but continued receiving MT visits.
14 Months: Patient died. The last MT session had occurred the prior day.
Sue Sanderson, RMT (1984)
Example 4.
PINPOINT: A 21 year old male, paraplegic as result of trauma, was in need of counselling for depression and decisions about long-term care.
RECORD: Patient was asked in the initial interview to describe one good thing that had happened to him that day. His response took 5 minutes to formulate, with frequent interruption of eye contact, use of vague comments, and switching of topics.

CONSEQUATE: Pop/rock music was added to the patient's weight training during PT using some of his personal tapes from home. Relaxation routines to music were conducted after PT sessions. Finally, a discussion was held each day of 'good things' and 'bad things' happening and options for long-term care. Patient was reinforced for positive, motivated verbalisations and for decisions communicated to the music therapist.
EVALUATE: The patient chose a plan for long-term care and became very motivated in PT. He was able to verbalise 'good things' that happened to him each day. Patient was discharged to a long-term care facility.
Dawn Ferrell, RMT (1984)

Technique 4. Music and Developmental or Educational Objectives

Music Function:
To reinforce or structure learning.
Therapeutic Objectives:
Prevention of developmental regression due to hospitalisation.
Increased academic learning.
Diagnoses:
Hospitalised children (birth to 18 years) and their families
Music used as reinforcement for attentiveness to educational tasks, as reinforcement for learning, and as a structure to provide academic information.
Music activities used with family members to teach parents the importance of helping children maintain developmental milestones and avoid regression (1/2 hour daily across days).
Documentation:
Record one or more of the following:
Physiological: Not applicable.
Behaviourally Observed: Number of academic tasks completed, correctness of academic work, time spent on task, amount of information learned, incidence of independent self-care (i.e. feeding self, toileting independently, walking instead of being carried, etc.), positive verbalisations.
Self-Report: Log or checklist of independent self-care tasks performed daily.
Procedure:
Use child's preferred music activities to reinforce or structure desired developmental maturity (see Example 5).
Tell child ahead of time the criteria for participation if music is to be a reinforcer. At music time, determine if educational or developmental criteria were met and provide music contingently.
Determine the teacher's specific educational objectives for the child and materials being used, and develop educational music activities accordingly.
Leave activities or music 'assignments' with the child that will structure independence and increase positive interactions with others in the environment.
Invite parents to participate in a music activity with the child. Tell them ahead of time that you will be cueing them to reinforce the child for independence and co-

operation. Leave parents a checklist of age-appropriate developmental milestones which they might reinforce during the hospital stay.
Reinforce children for on-task behaviour, learning, assignments completed, independent self-care.
Reinforce families for positive interactions and for allowing children to be independent.
Example 5.
PINPOINT: A 7 year old male was admitted for asthma and reported as crying all day following several occurrences of medication administered by hypodermic.
RECORD: Patient was hysterical when the therapist entered his room.
CONSEQUATE: The therapist played the guitar and sang one song. The patient became quieter. Music continued and the patient was reinforced for sustained interest and positive responses.
EVALUATE: The patient began to strum the guitar and sing along with the therapist. The music therapy session was terminated after 30 min.
Lawson Miller, music therapy student (1984)

Technique 5. Music and Stimulation

Music Function:
To stimulate auditorily and increase awareness of other forms of stimuli.
Therapeutic Objectives:
Increased overt responses to stimuli (auditory, sensory, olfactory, and visual).
Reduced depression/anxiety due to sensory deprivation in sterile environments.
Diagnoses:
Comatose or brain damaged patients/stroke victims/premature neonates - Music used to elicit physiological and overt responses which are then increased through reinforcement (1/2 hour daily across days, weeks, or months).
Patients in sterile environments (such as burn victims, organ transplant patients and those with contagious diseases) or long term hospitalisation - Music used to reduce depression or anxiety due to deprivation and to increase patient awareness and pleasure (1/2 hour 3 times per week, across weeks or months).
Documentation:
Record one or more of the following:
Physiological: Vasoconstriction (plethysmograph), respiration rate, pulse, blood pressure.
Behaviourally Observed: Overt gross or fine motor responses such as sucking, eye blinks, head movement, mouth movements; auditory responses; pleasure responses, such as smiling; positive verbalisations.
Self-Report: Ratings of depression/anxiety.
Procedure:
For elicitation of response:
Use patient's preferred music, which might be ascertained through family interviews. With infants, lullabies are traditional and effective.

Use pillow speaker so that music source may be moved in space for maximum stimulation.
Combine music with pleasurable multi-stimulation activities which include physical stroking, moving visual stimuli, pleasurable olfactory stimuli, and other auditory stimuli such as patient's name and family voices.
Watch for and identify overt responses. If no overt responses occur, use physiologic measures to determine any response to selected stimuli.
Discontinue non-contingent stimulation when response begins to occur. Give selected stimulus, wait until patient emits response, then reinforce immediately with other multi-stimulation activities.
Pair eliciting stimulus with verbal command so that patient will begin to respond to the human voice.
Begin moving the patient's body in an overt response timed to coincide with any physiologic events that are apparent.
Continue with these procedures and lengthen the chain of events to which the patient will respond (see Example 6).
For reducing deprivation:
Use patient's preferred music.
Combine music with age-appropriate multi-stimulation activities, such as looking at slides or pictures to music, reminiscing about memories related to smells (e.g., flowers, vanilla flavouring, lemons, etc.), or touching a variety of surfaces (e.g., velvet, sandpaper, or fur). Use variety of puppets and toys with children. If sterile conditions prohibit use of real materials such as these, use guided imagery techniques with music to imagine multi-sensory events.
Reinforce pleasure responses and creative thinking (imagination).
Example 6.
PINPOINT: A 13 year old male automobile accident victim appeared comatose and failed to respond to stimuli following prefrontal lobotomy.
RECORD: The patient responded inconsistently with upper extremity movement to a variety of music stimuli after 5 to 10 second delay.
CONSEQUATE: The patient was presented with a variety of music stimuli paired with verbal commands and all responses of any type were noted and reinforced by verbal approval and stroking. As the patient began to respond consistently, music and commands were varied and visual stimuli were added. Progress was noted in all response modes.
EVALUATE: The patient was discharged after 4 1/2 months with vastly improved abilities to respond. His final statement to the music therapist was, 'music makes me happy.'
Dawn Ferrell, RMT (1984)

Technique 6. Music and Biofeedback

Music Function:
To serve as reinforcer or structure for physiological responses.
Therapeutic Objectives:
Increased awareness, self-control, and monitoring of physiological state.

Diagnoses:
Epilepsy - Music used to reduce frequency of seizures by inducing relaxation as reaction to stress or prior to fatigue (total of 5-6 hours across days or weeks).
Coronary - Music used to lower blood pressure, heart rate, tension responses (total of 5-6 hours across days or weeks).
Habituated Tension Responses - Music used to lower blood pressure, lower stress hormone levels, and to relax muscle tension (total of 5-6 hours across days or weeks).
Migraine Headaches - Music used to reduce frequency through relaxation responses to stress rather than tension responses (total of 5-6 hours across days or weeks).
Poor Circulation - Music used to increase blood flow to extremities through temperature measurement (total of 5-6 hours across days or weeks).
Documentation:
Record one or more of the following:
Physiological: Blood pressure, pulse, vasoconstriction, stress hormone levels, EEG waves, EMG muscle tension, temperature (internal and peripheral), seizure frequency, migraine frequency, etc.
Behaviourally Observed: Overt signs of relaxation, verbalisations free of content about stress.
Self-Report: Log of relaxation practice and incidence of physiological problem, ratings of improvement.
Procedure:
Use patient's preferred music.
Use headphones if possible.
Pair music with selected biofeedback procedures for specific physiological problem. Non contingent background music may be used to enhance patient's ability to relax or contingent music may be used as reinforcement for patient maintaining desired physiological response.
Transfer ability to relax from the biofeedback clinic to other locations through the use of procedures that can be paired with music in any setting (home, work, car, etc.).
Reinforce relaxation, desired physiologic state, and positive verbalisations about improvement.

Technique 7. Music and Group Activity

Music Function:
To structure pleasurable and positive interpersonal interactions.
Therapeutic Objectives:
Reduction of depression/anxiety due to isolation.
Increased pleasure and feelings of well-being.
Diagnoses:

Patients capable of joining a group and desiring to do so, especially children and persons with long-term hospitalisation - Music used for pleasure, group interaction and to reduce stress of hospitalisation (1 hour twice per week, ongoing).
Documentation:
Record one or more of the following:
Physiological: Pulse (self-monitored).
Behaviourally Observed: Pleasure responses, such as smiling or laughing; positive verbalisations free of 'illness' content; time spent in group and out of hospital room.
Self-Report: Ratings of pleasure or feelings of well-being.
Procedure:
Use variety of age-appropriate activities that maximise time in music. Match types of activities to areas in which they are conducted, i.e. quieter activities in areas for the seriously ill.
Identify meeting space for group which is deemed by staff as being compatible with medical routine, i.e. not disruptive.
Combine focused listening and participation activities to reduce fatigue.
Give patients name tags which they might label and attach, then refer to each by name.
Perform live music for audience pleasure, taking requests if possible.
Invite patients, visitors, staff, volunteers, etc. to participate.
Feature medical personnel and staff in music 'solos' such as playing the kazoo or spoons or leading group singing.
End session with relaxation/guided imagery to music to reduce discomfort and prepare patients for rest. Suggest patients try similar techniques at night when falling asleep.
Reinforce pleasure responses, 'non-sick' verbalisations, music participation, spontaneous contributions to musical activities, and musical talent of participants.

Other Reported Techniques

Other music therapy techniques have been reported in the medical literature, though not yet in a format amenable to or sufficient for meta-analysis. Foremost among these is music paired with vibrotactile stimulation to increase the awareness of comatose patients (Grundy, 1990) and to enhance physical therapy objectives (Skille, Wigram, and Weeks, 1989). This technique would seem to have great potential for medical treatment and further research is warranted.

Music Therapy Programs for the General Hospital

Patients in hospital settings are extremely diverse in age, medical diagnosis, and treatment. These differences range in magnitude from those who are terminally ill to others hospitalised for a 'rest' or to women giving birth and considered to be participating in a 'wellness' event. Patients also differ in length of stay, prognosis, and responses to the illness. Medical treatment is, therefore,

very individualised with ongoing documentation of effect often determining its course. Benefits, both medical and psychosocial, must be readily observable as contributing to each individual's recovery. This meta-analysis has shown that music therapy services in the medical setting can include specific objectives relevant to the medical diagnosis, treatment protocol, and discharge timeline.

The music therapy discipline will continue to develop and document viable techniques through its reliance on an aggressive research program. As research continues, future meta-analyses may provide the definitive answers we still seek: What type of music is most effective and is this differentiated situationally or by diagnosis? Can principles of composition which predictably and reliably structure physiological entrainment be developed? When and how is the presence of a qualified music therapist crucial and different from the use of recorded music stimuli provided by other professionals or the patients themselves?

Whether or not these answers are achieved quickly, there is substantial documentation to show that music techniques in current use make a distinctly positive and therapeutic difference in the treatment of persons with medical problems. Such benefits are authenticated both in the research literature and in the awareness of medical professionals who cite the increased humanisation brought to health care through the addition of music and music therapists.

Note: Portions of this paper have appeared previously and are included here by permission (Standley, 1986; 1992)

2

The Effect of Music, Vocalisation and Vibration on Brain and Muscle Tissue: Studies in Vibroacoustic Therapy

Olav Skille and Tony Wigram

In considering the effect of music and the elements that constitute music, and in fully understanding the processes involved in music therapy, the physiological effect of sound on the body should be taken into consideration. There have been many exciting developments in the last two decades in the use of sound and sound technology in treatment techniques. Although this is not a new concept, and history has thrown up evidence both in past civilisations and in different cultures in the use of sound as a means of treating physical disabilities and pain, it is only in the latter part of this century that developments have occurred resulting in the use of such treatments as ultrasound (Forster & Palastange, 1985) and interferential therapy (Savage, 1984), a form of low frequency electrical stimulation. At the same time that these developments were occurring, the growth of music therapy as a form of treatment mainly concentrated on the use of music and improvisation in interactional work with people with communication disabilities. It has been by the building of a relationship through music by means of musical interaction that music therapists have been able to demonstrate breakthroughs in achieving both physical, emotional and cognitive response from people who had seemed inaccessible to other forms of intervention. This was evident in the work of Juliette Alvin (1975, 1976, 1978) and Nordoff and Robbins (1971, 1977) with handicapped children and adults, and subsequently by many music therapists trained in these approaches in England, the Americas, Europe, Canada and Australia; although the approaches differ in terms of the means of developing interaction with clients through music, the ethos that music therapy is a process involving the perceptual, cognitive and intellectual response of individuals to music is common. However, it has also been realised that whereas music achieves an intellectual response when listened to, music and sound also cause a significant and frequently measurable physical response when sound waves enter the body. The appreciation of music, and the emotional impact of a particular piece may also stimulate a physical reaction - it may be one of elation or depression, sadness or happiness. The components of a sound or combination of sounds, in particular their pitch, volume and timbre, will have a significant physiological and biochemical effect on the body. Muscular energy will increase or decrease depending on the rhythm, and breathing will accelerate or change its regularity. Fatigue can be reduced or

induced and voluntary activity may be increased. In addition, a marked variable effect on heart rate, blood pressure and the endocrine function is produced, and changes in metabolism and the biosynthesis of various enzymatic processes may be induced. These and further physiological reactions to sound and music were investigated and summarised by Dr Benenzon, a music therapist and psychiatrist working in Argentina (Music Therapy Manual, 1981).

The idea of vibroacoustics (VA) developed out of a conversation between Skille and Juliette Alvin in London in 1968 while discussing the common denominators of music - the culturally independent variables of the effects of music on human beings. They agreed upon the basics: Such effects must be described using quantitative parameters, and not by using the usual qualitative evaluation of music.

They isolated three so-called universals of music. Three specific principles involved were highlighted:

1. Low frequencies can relax
2. Rhythmical music can invigorate
3. Loud music can create aggression

and, of course, the opposites of these universals may create the opposite effects.

The conversation started a process of research and development, until in 1980 the first so-called 'Music Bath' was built. Skille was then working in a day centre for multiply handicapped retarded children. The theoretical speculations were then ripe enough to be tried out in practical work.

Physical problems presenting to a music therapist working with cerebral palsy clients will often include flexor or extensor muscle spasm; the dichotomy in a treatment process involving interactional work is that, whereas one can see a development in the responsiveness of the individual to the therapist, the increased level of activity will often stimulate a spasm. Looking at ways of reducing the high muscle tone created by this spasm, there is evidence of the effect of mechanical vibration (Stilman, 1970, Carrington, 1980) where a motor within an object or on a base unit will set up a physical vibration that is indiscriminate in terms of frequency. In the early 1980s work began to look at the effects of low frequency sound on high muscle tone and spasticity. The idea of using a pure sinusoidal tone at a low frequency has been known for thousands of years, and in primitive cultures instruments and sounds were used to treat psychosomatic disorders. (In Shamanistic music, physical vibrations were often used.) With more specific problems in mind, the possibility arose of finding a specific range of frequencies that could be coupled with relaxing, unrhythmic music to produce an effect directly into the body of physically handicapped people (Skille, 1982a; 1982b; 1985).

Our first patient was an 8 year old, spastic girl with contracting spasms and Skille did not do the observations himself because of the possible bias, being the inventor of the new method. One of the other teachers did the observations and,

after only three minutes, he observed a marked reduction of the spasms. The reduction of spasms were later used to include movement facilitating exercises during the treatment session.

This initial success led to further empirical research and in 1982 the first articles of the 'Music Bath' - now called vibroacoustics (in Finland: fyysioakustiikka - Physioacoustics), were published in Norway, Sweden, Finland and Denmark.

The first attempts in using vibroacoustic therapy were conducted in Norway in 1980. The method was then tentatively named the 'Music bath' and 'low frequency sound massage'. The music bath is trying to create an environment whereby the body is 'bathed' in sound and vibration. During 1981/82 several test units were built in Norway, where there are over 200 units at present in daily use. Further developments have led to research projects in Finland, England, Germany and Estonia. The process of vibroacoustic therapy was described at the first International Symposium for Music in Medicine in Lüdenscheid in 1982. The equipment (patented on a world-wide basis) consists of a bed/bench or chair with several built-in loud speakers. This is connected to a signal unit with six channels containing a cassette player which can run various tapes.

The process of vibroacoustic therapy involves lying a client on the bed so that the sound is being transferred by air directly to the body of the client. Sound may also be transferred through a mattress or some other means which can conduct the sound waves directly to the body. The body vibrates according to the different sound waves, and at 100 Hz, 2% of the energy is absorbed by the client (Broner 1978). As one might expect, the sound waves also have a substantial effect on the autonomic system.

The pioneers of music vibration

In 1962, Dr H R Teirich wrote an article on therapeutics through music and vibrations. In this article he describes work done by himself, Pontvik and Jaedicke, where music is combined with autogenous training (AT). He describes that this is possible in three ways:

a) with records or tape
b) with 'live' music by the therapist himself
c) by providing patients with vibrational sensations.

He drew on the work of Pontvik (1955) suggesting that transmission of musical vibrations by actual contact between the sound source and patient is a process which has the right to be described as a musical sensation. Therapeutic use of this phenomenon had, until then, only been used in the case of mentally defective deaf-mutes. Teirich gives many examples of how music is enjoyed by patients lying on a couch which permits the sound to enter the body in the back, in the region of the solar plexus. He used four loudspeakers, giving a range of 20 Hz to 10 kHz.

He reports on the use of this instrument on 51 neurotic patients. The patients felt an increased and prolonged sensation of heaviness and warmth, and he concludes that music does not directly lead to 'mastery of life' but that it has at least an alleviating function, which logically follows suitable diagnosis, and that the effect is usually much longer lasting than might be expected.

It seems that these pioneers of music therapy in Europe mainly concentrated their work on auditory reception of music and that they were very fixed on the qualitative aspects of music. The thorough study of the quantitative elements of musical vibrations and their effect on physical functions in man was forgotten.

Alongside the development of the music bed, Olav Skille found it necessary to develop taped programmes that would be varied and effective in treating different problems. Cassette tapes were made up with a mixture of music and rhythmical pressure waves which are in harmonic relation to the music. A pulsed tone is created by placing two tones very close together, i.e. 40 Hz and 40.5 Hz. This rhythmical pressure wave will cause a synchronisation of nervous impulses through the body, including the central nervous system. This comprehensive stimulation contributes to a harmonisation of a body which has come out of phase with itself because of defects or traumas caused by external or internal conditions. This process is influential in treating a number of disorders and handicaps, and this paper describes its therapeutic benefit. The music used is recorded over a pulsed, low frequency tone, and is invariably gentle, improvised and without a pronounced rhythm. Music has been written specifically for this therapeutic process, e.g. an improvisation on the tone E by the Finnish composer, Otto Romanovski. In addition, existing 'New Age' music by composers such as Don Campbell and Steven Halpern has been used. As far as the use of specific tones is concerned, subjective tests have indicated that the most significant frequencies range between 40 Hz and 80 Hz. The lowest frequencies, 40 Hz to 55 Hz will predominantly set up a resonant response in the lower lumbar region, pelvis, thighs and legs. As one moves through the frequency range so the sound is resonated in the more dense tissues of the body in the upper chest, neck and head.

The first years of development in Norway

Through vibroacoustic therapy and by the use of technical equipment which was unavailable in the late 1950s, the work Skille did in 1980-1982 investigated the effects of musical vibrations and it became a field of specialised study. His first studies were done with multiply handicapped children with severe learning difficulty.

The first results showed a remarkably positive effect on spasticity. A study on the effect of a spastic girl aged 12 years, done by a student from a school for nurses, showed an improvement of 7 to 21 degrees in the open angle of three measure points. When the vibroacoustic stimulation was accompanied by movement patterning, the increase was measured to be between 41 and 79 degrees. The study was performed over an 8 week period.

Encouraged by these results, Skille tried the method on other children and other conditions - including autism -and we found new indications leading to other possible fields of use.

In Norway, vibroacoustic therapy concentrated particularly on the benefit of treating people with muscle spasm, pain or pulmonary conditions. Low frequency sound waves had been found to have a spasmolytic effect on muscle tissues. This effect has been used in the treatment of children with cerebral palsy at the Health Centre in Sonjatun and with the pre-school group at Fagerheim School; also at Moan School and Day Centre, Norway. Similarly, it had been used to reduce muscle spasm in patients at Lebenschilfe in Berlin, Germany and Harperbury Hospital, England. Bjerkely School has used vibroacoustic therapy with their multiply handicapped spastic children since 1985 with good spasmolytic effect, as has Österbo Central Institution since 1982. The head injuries unit at Sunnaas Hospital has been using vibroacoustic therapy to reduce muscle spasm in their patients since September 1986.

Users of vibroacoustic therapy consistently report relief of pain. A chief community nurse at Kåfjord has treated patients with rheumatism and at Sonjatun Health Centre, patients with polyarthritis and Morbus Bechterew have been treated since October 1986. All report decrease in pain. In conditions which have an acute phase followed by periods of remission, e.g. rheumatoid arthritis, Morbus Bechterew, use of low frequency sound waves in the acute stage may cause an increase in pain. It should, therefore, be given in the non-inflammatory period and avoided in the acute stage.

Moan School and Day Centre reported relief of stomach and colic pain. Österbo Central Institution reports relief of both muscular and menstrual pain. Therapists treating sports injuries have found vibroacoustic therapy a useful method of relieving pain. In over-use syndromes, low frequency sound waves are reported to relieve pain and reduce the length of the rehabilitation period.

Using the laboratory of the SEAS loudspeaker factory in Moss, Norway, we found that the sound penetration through the body was strongest at 60 Hz, with another, nearly as high, peak at 80 Hz. The sound pressure was equivalent to 0.2 G when an effect of 8V was applied to the loudspeaker.

Musically, these two Hz values are interesting, as we see a harmonic connection between the values. 80 Hz is one octave above 40 Hz and 60 Hz is one-fifth above 40 Hz and one-fourth lower than 80 Hz. It seemed that the physical forces of sound penetration of the human body were following the laws of harmonics according to classical musical theory and the Pythagorean scale. Consequently, the following table may be applied when choice of frequencies is possible.

Table 1: Values for calculating harmonic Hz values from a basic value

	Interval factor	Opposite value
Prime	1.000000	1.000000
Minor second	1.066667	0.937500
Major second	1.125000	0.888889
Minor third	1.200000	0.833333
Major third	1.250000	0.800000
Perfect fourth	1.333333	0.750000
Chr. tritone	1.414214	0.707107
Perfect fifth	1.500000	0.666667
Minor sixth	1.600000	0.625000
Major sixth	1.666667	0.600000
Minor seventh	1.800000	0.555556
Major seventh	1.875000	0.533333
Octave	2.000000	0.500000

When establishing a basic Hz value for a condition, one can use Table 1 to calculate a series of harmonic Hz values, which can theoretically be used for the same condition. We soon found that 40 Hz and 60 Hz were basic values for reduction of spasms. Other basic values followed after empirical work, and the basis for a therapeutic method was laid.

While working with sinusoidal tones alone and music alone, using only one of the stimuli was not satisfactory. The effect of the music alone was too uncontrolled, and the use of sinusoidal vibrations alone was too uncomfortable for the patient (vertigo, nausea, cold sweat and anxiety may occur). The combination of both music and sinusoidal vibrations appeared to be more effective and the unwanted side-effects of sinusoidal vibrations alone were considerably reduced. The range of the vibroacoustic frequency area was set to between 30 Hz and 120 Hz, although there may be considerable effect from sounds beyond this range.

The reason for choosing this range was very simple: below 30 Hz sinusoidal vibrations are mostly felt and not heard. Above 120 Hz the vibrations are more heard than felt. Research on infrasound has also showed negative effects of infrasound exposure to the human organism and therefore I wanted to stay clear of the infrasound range (< 20 Hz).

The range of the human auditory receptors is between 16 Hz and 24,000 Hz, i.e. 10 octaves. The two defined octaves of the vibroacoustic area cover only a tiny fraction of the possible areas, for which we have vibration receptors in our body but it covers the important area where two senses overlap each other - the vibration receptors in our skin and the auditory receptors. The sensitivity of the ear decreases by about 20 dB/octave in the range below 100 Hz. It is impossible to make a division between sound and vibration in this frequency area, as all sound will be perceived by the skin as vibrations and by the ears as sound/music.