Special Issue:
Performing Arts Psychophysiology Through the Lifespan
The present mailing brings you a double issue, containing both the Fall and Winter issues of *Biofeedback*. In the calendar year 2002 the *Biofeedback* magazine experienced several unavoidable publication delays. This situation developed in spite of repeated efforts of our volunteer authors and production staff, and the double issue brings us back on schedule.

The largest part of the magazine is devoted to a Special Issue on Applied Psychophysiology through the Life Span. The double issue allowed us to include a large number of articles on this Special Issue topic. We had an unusual number of submissions and wanted readers to have them all.

I extend special thanks to our Guest Editor Marcie Zinn, PhD, who has gathered an extraordinary collection of authors who bring together their own musical gifts and interests with their interest in scientific psychophysiology. I also thank each of our authors and the AAPB production staff headed by Publications Manager Michael Thompson.

The Association News and Events Section includes messages from AAPB’s President Paul Lehrer and President-Elect Lynda Kirk, advance information on the AAPB annual meeting in Jacksonville, Florida in March 2003, as well as other Association news.

Proposals and Abstracts are now invited for special issues on: *Mind/Body Pediatrics* for Spring 2003, and *Complementary and Alternative Medicine for Fall 2003*. The editor also welcomes proposals for future special issues of the *Biofeedback Newsmagazine*. We also welcome proposals for additional special issues on topics in applied psychophysiology.

This issue’s cover by Mark Zinn, MM, PC, NCTM

The articles in this issue reflect the opinions of the authors, and do not reflect the policies or official guidelines of AAPB, unless stated otherwise.
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Marcie Zinn, PhD, NCTM

Active sEMG Training Strategies for Chronic Musculoskeletal Pain – Part Two
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Brief Report: The Mozart Effect: Implications for Seizure Control

AAPB NEWS AND EVENTS

From the President
From the President-Elect
AAPB’s Annual Meeting Planned for Jacksonville, Florida

ABOUT THE AUTHORS: PROFILES OF CONTRIBUTORS

About the Authors
Abstract: Music and the arts have played an important role in the evolution of all human cultures. Current research shows many positive effects of music on human beings, including the “Mozart effect”—improvements in cognitive performance and EEG measures while listening to Mozart. Musical performers suffer many physical and psychological symptoms related to their training, the stress of performance, and repetitive motion. Applied psychophysiology has many clinical applications alleviating symptoms related to artistic performance. Applied psychophysiology, biofeedback, and neurofeedback are also useful tools for enhancing the creativity and performance of artists.

Background
From the earliest recorded history, music has been a part of all cultures. In fact, that observation is probably a factor in the assertion that music may be a type of innate behavior response in humans, which may have in turn led to the assumption that music is a form of language. While this article is not intended to argue ‘music as a second language,’ the point to be made is that music, or at least music appreciation, does appear to be, in some way, innate or hard-wired. Do you recall the tune you sang as a kid with the words, “you ca-ant catch me,” or more simply, “na, na-na, na, na?”

All children, in every culture around the world, sing that same tune (Bernstein, 1973). This brings me to my second point that throughout history it has been recognized that music affects us in many ways. For example in the earliest recorded history, music was an integral part of religious ceremonies. In ancient Rome, music was seen as a force capable of altering human thought and behavior. The Greeks developed the Doctrine of Ethos, which was about the moral qualities and effects of music, and Aristotle wrote that the type of music one listens to makes one into that type of person. The study of the effect of music on behavior extends into the present, where studies are being done about music facilitating healing and other things important to human beings. The Brief Report in this issue on the Mozart Effect, for example shows that exposure to Mozart music can enhance performance on spatial IQ measures, improve spatial temporal reasoning, and change the EEG. It is clear that, through the ages, many humans agree about the effect of music on the listener or the human being.

Optimal Performance and Clinical Treatment of Artists
This special issue is devoted to exploring current applications of applied psychophysiology, biofeedback and neurofeedback in the performing arts. Initially most readers will think of applications which involve enhancing the creativity and performance of artists. Dr. Gruzelier’s article, for example, shows the positive effects of EEG alpha enhancement on musicians. However, there are also a wide variety of work-related physical and psychological symptoms secondary to the strains of artistic performance. This special issue will explore many of these work-related complaints common in the arts, and examine current applications of psychophysiological therapies.

Music and the Performing Arts: Negative Effects on the Artist
What are the effects of performing music on the human being? In his 1713 book, Diseases of Workers, Bernardino Ramazzini, the father of occupational medicine, a professor of medicine of the Universities of Modena and Padua in the late 1600s and early 1700s, described diseases of musicians as ‘diseases of tradesmen.’ From the early 17th century, various musicians were writing about ‘pain and stiffness’ associated with playing a keyboard instrument (harpsichord, then piano). More recently, David Sternbach has declared the practice room to be a hazardous work area.

The cover of our special issue is meant to depict what it says; performing arts across the lifespan. It is still too early to stop quoting the statistics about musicians; the ICSOM study reporting that 76% of the musicians surveyed routinely perform with pain severe enough to affect performance. From the same study, we know that there is a high incidence of performance anxiety (25%), depression (17%) and insomnia (14%). Many other studies report similar results. After reading the article by David Sternbach, these rates seem rather underreported. Clearly, musicians are in trouble, that trouble is hardly understated, and applied psychophysiology already has the knowledge base to supply a missing sector in performing arts healthcare.
Performing Arts Psychophysiology

This issue is devoted to Performing Arts Psychophysiology! With this issue, we hope to accomplish three things: first, to offer material that will hopefully be useful to the psychophysiology practitioner, second, to illustrate that children in the arts are mostly neglected, and third, that neglect has far-reaching effects. Performing Arts Psychophysiology, unlike better-established subspecialties, does not yet have a strong empirical basis. Outcome research is a great idea but, regrettably, a few years away. Therefore, the literature now is by necessity somewhat anecdotal, and makes, shall we say, a few leaps here and there. This is just the state of affairs right now in this very new paradigm.

The Effects of Musical Training. During my college years when I was training to be a classical pianist, I (Dr. Zinn) simultaneously ran the gamut of obtaining music teaching training. I sought and received training from many schools of thought about how to teach piano. What I noticed over and over was the propensity of people in the arts to demand adult responses from some children and justify making a child practice long hours so that the child can go on stage. I often thought of the Barnum & Bailey Circus of the early century, when people with unusual disabilities were put on display. Of course, the people were convinced that it was special for them, and maybe it was. In this case, the audience wants to see the smallest child go on stage and play an adult piece or recital. No one has seemed concerned about the effect of the coercion on the child. I personally know one such person who, when he was 7, was shown (taught largely by rote) the Chopin e minor piano concerto so that he could make his ‘debut’ at age 9. He ended up graduating from Juilliard and having a very prestigious career. However, he deeply resents what was done to him in the name of a ‘debut’ and what followed it. He still had to go through the process of learning how to learn music; and most of all, he says he never had a childhood.

Much more often, however, I saw people in the arts making judgments about children’s abilities (or lack thereof) based on how the children conducted themselves in private lessons. Over and over again I saw, and see to this day, teachers and others in the arts drawing conclusions about a child’s ‘motivation’ and ‘talent’ simply because the child does not adequately practice. Of course, this situation can and does go on for years, resulting in years of piano study with very little progress. It is no wonder that so many adults say that they disliked piano and that they are not good at it.

Ethics and Performing Arts Applications. Dr. Striefel’s article about the ethical considerations of helping people without enough training hits at the heart of what may be the largest problem in the arts. While this may seem simplistic, Dr. Striefel does a tremendous job of telling us why it is not simplistic; why it behooves everyone to reflect on one’s own competence level and examining one’s own motives before ‘helping’ another person. Music teachers are competent in aspects of the instrument and the music, but largely are not competent in how to package and deliver that information to young children. Dr. Brandonbriner (1998) provides an excellent discussion as to the problems in the teaching studio, vividly describing what Dr. Striefel’s admonitions ‘look like’ in practice. It is no wonder that simply changing teachers is a known risk factor for physical injuries that, in this context, are highly associated with stress-related problems (Brandonbriner, 1998).

Perhaps more importantly, however, Dr. Striefel makes the biofeedback practitioner more aware of what he or she is dealing with. It is true that no client is alike, but given the current state of affairs in private teaching, and given that the client may have participated in the arts as long as he or she can remember, the client’s background will be widely varied and a great deal of the developmental history of the client will likely be relevant.

Stress and the Artist. The next article by David Sternbach illustrates incredibly well the sources of stress for artists. This excellent article speaks for itself, providing an essay of what many of the problems are outside of the performance itself. David has recently founded the Center for Arts and Wellness at George Mason University in Virginia. This center is fully integrated into their music program there, which currently offers music degrees through the doctoral level. This fully integrated program is the first of its kind, and hopefully more will follow.

Cognitive Development and the Performing Artist. Dr. Schleser’s contributions are twofold. He first offered us his knowledge about cognitive-developmental levels of children. Since early music training appears to have such far reaching effects—increased anterior corpus callosum size, increased spatial ability, and other effects—a thorough understanding of how children think is now more important than ever. The article illustrates the similarities and differences between the different developmental levels and promises to close some gaps in our understanding.

The second contribution of Dr. Schleser illustrates the value of using knowledge gained in other environments. At first glance, there doesn’t appear to be much in common between a weight lifter and a classical violinist. His observations and clinical judgment can serve as a template for the use of other seemingly unrelated protocols for performing artists. This article can serve as a kind of pilot for future efforts in this potentially prolific area.

Muscles Disorders in Performing Artists. In performing arts, perhaps the surest ‘career-ender’ is a focal dystonia. Focal dystonia (‘musician’s cramp’) is the loss of voluntary motor control of individual limbs. Unstable fingers, involuntary extension and/or flexion or even cramping of the whole hand are the most common signs. Focal Dystonia is, in most cases, completely disabling for the artist and usually ends the professional career. As a result of tireless research, Dr. Taub has created a treatment for focal dystonia. To date, this treatment has a very large success rate. He has founded the Taub Therapy Clinic and Constraint Induced Laboratory at the University of Alabama at Birmingham. CI Therapy consists of a family of therapies, which have in common the teaching of the brain to “rewire” itself following a major injury such as stroke or traumatic brain injury. The practical importance of Dr. Taub’s work cannot be overstated.

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**PROFESSIONAL ISSUES**

**Ethics and the Performing Arts**

Sebastian “Seb” Striefel, PhD

**Abstract:** Biofeedback and other applied psychophysiological interventions can be useful for enhancing the skills of those in the performing arts. Such interventions would generally fall into a combination of peak performance and clinical areas. For performing artists with psychophysiological problems that interfere with their performance and thus, potentially their livelihood, the issues more closely parallel those generally addressed by biofeedback and applied psychophysiological interventions. AAPB members are expected to adhere to the ethical principles and practice guidelines and standards in all of their professional activities. They are also encouraged to reexamine the moral and ethical reasons for what and how they conduct their professional activities.

**Introduction**

Biofeedback and other applied psychophysiological interventions have many potential applications for helping those in the performing arts of dance, music, theater, and the visual arts. Such applications would generally be for a mixture of medically or mental health diagnosed problems and for other somatic problems which can be effectively dealt with via applied psychophysiological applications. Other applications would be for enhancing specific skills or even for achieving peak performance in the specific performing art.

Those wishing to acquire skills in the performing arts need someone to teach them the necessary skills. Some individuals learn about the performing arts while they are in elementary and high school and continue to acquire their knowledge and skills well into young adulthood. Teachers in the performing arts generally fall into two categories, those that are certified by the state as teachers, and thus regulated, and those who decide to teach performing arts but are not certified as teachers by the state, and thus unregulated. Those certified by the state are largely in areas like band, choral instruction, dance, and theater, if working in school systems. The remainder of teachers will be in areas where they can be voluntarily certified, e.g., music teachers for orchestra, piano, and for private lessons for all instruments, can seek certification by the Music Teachers National Association. Similar voluntary certifications exist in other performing arts areas. To date, no local, state, or national certification requirements exist and most instruction in the performing arts is unregulated.

A person who has some skills in a performing art may wish to enhance those skills by acquiring the ability to perform at his or her peak. If he or she has studied with an unregulated instructor who has limited competence, he or she may well have a set of skills which will exhibit the knowledge limitations of the instructor. For achieving his or her peak the “artist” may seek the services of a professional who uses biofeedback, relaxation training, and other applied psychophysiological skills.

**Problem Areas**

Clients coming to a biofeedback practitioner to gain assistance for enhancing their skills in a performing art may be suspicious of the practitioner’s motives, reluctant to get involved, or even fearful because of their previous experience with performing art instructors. Children who wish to become a master of a particular performing art, such as music, must have more training than that available through the regular school system. As such, they must move into the realm of private instructors. There are no required minimal standards for private instructors in the performing arts, and the caveat “buyer beware” becomes very relevant. There are some voluntary certifying agencies, e.g., the Music Teachers National Association (www.mtna.org/index1.htm), but many private instructors do not join such groups and thus children are at potential risk.

Some private instructors are certified teachers. They may or may not understand learning theory, child development, the particular performing art, and the many other areas relevant to teaching the specific performing art. It all depends on the state in which they received their teacher’s certification and the requirements of that state, e.g., the New Jersey Department of Education has an extensive core curriculum for the visual arts with content standards (www.state.nj.us/njded/cccs/06artintro.html). It is not known if teachers abide by this type of standards when working as private instructors. For the most part, private instruction in the performing arts is a home-based business that is unregulated. The level of competence of certified teachers working as private instructors varies, but they are likely to be aware of and adhere to the code of ethics for their discipline, e.g., the National Association of Schools of Music has their own code of ethics and departments of education in universities at least in the United States.
forming art, or to be assigned lessons that are too complex for the child to master on his or her own. It is important for those wishing to acquire skills in a performing art to look carefully at the training, certifications (if any), reputation, and successes of those they consider employing as a private instructor. Biofeedback practitioners working with clients wishing to enhance their performing art skills should try to understand the client’s experience in acquiring performing art skills. One avenue for doing this is to collect a good history about the individual client’s training experience, e.g., the age that he or she began learning a performing art, the number of hours of practice per day, what the instructor and instruction was like, whether the learning experience was pleasant, what he or she liked and disliked about the training, etc. Marcie Zinn at mazzin@performingartspsych.com has developed a history form which she may be willing to share with interested parties.

Biofeedback and Applied Psychophysiology

Individuals who are seeking biofeedback and other support for stress related problems in performance should also look at the training, certification, reputation, licensing, and successes of those they consider employing to help them achieve their goals. Not all members of AAPB are equally qualified to help a client achieve peak performance in a performing art. Members of AAPB are, however, expected to abide by the ethical principles and practice guidelines and standards of AAPB in all of their professional activities even though the AAPB documents do not specifically address the performing arts. As such, those offering services to those in the performing arts should be able to demonstrate competence in that area of service via their own education, training, and experience. They should also have a reasonable amount of knowledge and experience with the specific performing art that they are helping a client enhance. To acquire any additional needed skills the practitioner should seek additional education, training, and supervised experience, and do some reading of relevant information.

Self Examination

Socrates is quoted as saying, “The unexamined life is not worth living” (Denise & Peterfreund, 1992, p. 1). The quote suggests that each individual reflect on how to correctly live a moral life. In like manner, one might say that “The failure to examine and reflect on one’s professional activities can be risky.” So have you reflected on what the moral and ethical principles are by which to live your life or conduct your professional activities?

When we do anything as a professional or as a person, we do it for a reason or more likely for several reasons. For example, we eat breakfast because we are hungry, because it is a habit, or even because we know that we need to eat to have the energy necessary to be productive throughout the morning. We work as professionals because it allows us to earn money to live our lives in a manner of our own choosing, or because we like the work, or even because it makes us feel good about ourselves. Sometimes we have reflected on our reasons (moral, ethical, and other) for how we conduct our professional activities and sometimes we have not. We should probably engage in such reflective thought regularly. To make the right choices professionally, we need to be informed, develop our ability to reason, learn to weigh correctly the pros and cons of specific actions, and learn to be comprehensive in our deliberations (Olen & Barry, 1992). Each of us needs to consider the moral and ethical reasons for doing or not doing something, choosing the correct ethical course of action, and doing what we know we should ethically do (Olen & Barry, 1992).

Doing what is in our own best interests may be in conflict with what is in the best interests of the clients we serve. For example, it might well be in our own best interests to continue to see a client to add to our income even though our services are no longer helping the client, either because the client has achieved the maximum benefits or because the client needs a service we are not competent to provide (e.g., assistance in achieving peak performance in a performing art). It would be unethical to continue to see a client in such a situation, but how do we motivate ourselves to do what is ethically correct, especially if it is unlikely that anyone will “catch us doing wrong”?

Denise and Peterfreund (1992) stated that “We all have beliefs in accordance with which we judge actions and character, our own and those of others, to be right or wrong, good or bad: we have aspirations which we strive to realize; and we have a conception, dim or clear, of the best way to live life” (p. 3). Hopefully during our professional training we have learned to develop our character so that we know and adhere to the highest standards of our profession (Striefel, in press a). It is important to review the various principles of morality that form the basis for conducting ourselves as ethical professionals. Principles like the principle of individual morality, the principle of utility, the principle of fairness, the principle of human excellence, the principle of social justice, the principle of equality, and the principle of natural rights (Olen & Barry, 1992). See also the discussion of such principles by Striefel (2000; in press a & b). Only through honest self examination and continuing education can we continue to enhance our abilities for conducting ourselves in an ethical manner in all of our professional activities.

References


Ethical Use of the Telephone and Voicemail

Sebastian “Seb” Striefel, PhD, Logan, UT

Abstract: There are a number of confidentiality and privacy issues that relate to the use of the telephone and voicemail. They include, but are not limited to, issues related to reaching the practitioner, keeping appropriate records, and confidentiality. By careful planning, training of staff, and the use of appropriate safeguards, the risks associated with these factors can be largely overcome.

Introduction

The telephone and its attached voicemail are the most frequently used pieces of technology for healthcare practitioners. Virtually all healthcare practitioners use the telephone as part of their daily practice activities. Yet the use of a telephone and voicemail are not without some level of risk. Some risks are related to: frustrations associated with being able to reach the practitioner, the failure to keep appropriate records, and violations of confidentiality or infringing on a client’s right to privacy. Each of these risks can be minimized or eliminated with a little care and planning. Ethically, practitioners are expected to take reasonable steps to ensure competence in the delivery of services and to protect their clients and others with whom they work from harm.

Reaching The Practitioner

Problems can start because of frustrating encounters with answering machines, telephone menus, being put on “hold” for long periods of time or anything else that prevents a patient from reaching a practitioner in a timely and easy manner (Melonas, 2002b). The deciding factor in whether a patient files a lawsuit or ethics complaint is often patient dissatisfaction and frustration (Melonas, 2002b; Zuckerman, 1997). Frustration levels are probably higher when a patient is in crisis and has difficulty reaching the practitioner. As such, some risks are higher for those who treat clients with serious problems that can result in crisis, e.g., those with severe depression. It is important to remember that any client can experience an unexpected crisis. What can you do to ensure that clients/patients are not frustrated by your telephone answering process? Clearly, clients prefer to speak to a person rather than an answering machine. Speaking to a person is more personal and allows the client to be reassured that his or her concerns will be addressed in a timely fashion. It also allows the person answering the telephone to make a determination on whether the call represents an emergency that needs immediate attention or whether the call represents a routine, nonemergency matter. Staff who answer the phone need to be given training and guidelines about how to answer the telephone in a professional and courteous manner, how to avoid keeping patients on “hold” for long periods of time, on the problems or symptoms that constitute an emergency and what to do in such situations, and that when in doubt to consider it to be an emergency (Melonas, 2002a). Clerical staff also need to be trained not to give treatment recommendations or clinical advice to patients. Doing so could cause harm to a patient and increase the liability risks for the credentialed, professional employer (Melonas, 2002a). Even trained professionals need to be careful about giving specific advice and recommendation over the telephone. It is one thing to give specific advice to a client who is well known by the practitioner and who has been assessed by him or her; it is quite something else to give specific advice to a new patient or potential patient.

If an answering machine is used because there is no secretary or receptionist the process or menu for what to do should be very simple. Limit the number of choices that the client must make, e.g., “At the beep leave a message and state whether this is an emergency or a routine matter.” If someone is available to answer the telephone if an emergency exists, the message could be something like, “If this is an emergency press zero and wait for the operator. If this is not an emergency leave a message at the beep and someone will get back to you soon.” It is important for someone to get back to the patient in a timely fashion, especially if an emergency or potential emergency exists. It is also important for you to periodically listen to the message on your answering machine to see if it is sending the message and image that you intend to communicate to those who call.

If an answering service is used, e.g., after hours and on weekends, those staff also need to be trained on the factors previously discussed herein. It is even recommended that you periodically check your answering service by calling and seeing how calls are handled, e.g., is the operator friendly and courteous, efficient, etc. (Melonas, 2002b). Practitioners should all have a process for checking their messages routinely after hours (especially if they work with clients where emergencies are likely), a number where they or their backup system can be reached, and a procedure for dealing with emergencies if the practitioner cannot be reached. All of these procedures should have been explained to the client as part of the informed consent procedure. It is a good idea to include information about what to do in an emergency and how to reach the practitioner after hours in a client handout or brochure that each client receives during...
the first session.

Some practitioners take all their messages and return calls only at the end of the day. It could be argued that emergencies should receive more timely attention, e.g., within a few hours. Is that practical? Perhaps messages should be checked between patients if no secretary or receptionist is available so that emergencies get timely attention. Emergencies can occur in any healthcare practice.

The Telephone Log And Client Record

In order to help clients, to do no harm, and to minimize risk it is important to keep a telephone log and or to record each call received from or about a patient in his or her file. Telephone information by or about a client is confidential and is a part of the client’s treatment process. The record should include at minimum the date and time of the call, who called, what the message was, whether the practitioner responded to the message, the content of that response, when the return call was made, and anything else that is pertinent. Melonas (2002a) discussed a case where the outcome of a lawsuit related to a patient’s suicide was settled based on the telephone log and notations made by the practitioner and a receptionist. Careful documentation is an expected standard of care for healthcare practitioners. This documentation applies to telephone calls received and made in reference to or with a client.

Telephone Confidentiality

Protecting client confidentiality is at the core of ethical practice and all AAPB members are expected to maintain client confidentiality and to inform clients as to the limits of confidentiality and to get their consent concerning their understanding of these limits (AAPB, 1995). It can be easy to violate confidentiality when using the telephone. Start by training all of your staff on the importance of confidentiality and on how to maintain it. Zuckerman (1997) recommends that practitioners “Never discuss any kind of confidential matter on a portable or cellular phone. Be aware that they are broadcasting devices and do not have the same protections (legal or technical) for confidentiality that wired phones do.” (p. 306). I know of no documented case where the use of a cellular phone became an issue in a healthcare lawsuit, but that does not mean that there has not been one. Perhaps if one uses a cellular phone that fact should be included as a limit of confidentiality. Digital cell phones are more secure than analog cell phones and cordless phone.

Care needs to be taken to assure that telephone calls are not overheard by other patients, uninvolved staff, or anyone else that might be close by. White noise generators or radios played somewhat loudly can help muffl sound (Zuckerman, 1997). Sound proofed walls, double wall boarded walls, and weather-striped or carpeted or soundproofed doors can also help (Zuckerman, 1997). Care is especially important if you carry a cellular phone and take calls from clients when you are out and about, e.g., in a grocery store or restaurant. After saying “hello” it is important for you to go to a location where you cannot be overheard. It is also important to ensure that messages retrieved from an answering machine cannot be heard by others, e.g., other patients in the waiting room. How do you ensure that janitorial staff or others who have access to your space do not have access to messages left on your answering machine (Melonas, 2002a)? Do you make sure that when you leave messages for patients, for example on an answering machine or with someone else at there job site, that you do not violate their confidentiality. Melonas (2002a) recommends that you leave only your name, without the “doctor,” a request to call you, and a telephone number.

Providing Treatment Via The Telephone

More and more biofeedback and related services are being provided at a distance using telephone lines in what has been called telehealth or telebiofeedback. The issues related to providing telehealth services are far to complex to discuss in this article and have recently been discussed in great detail elsewhere. See Striefel (2000a & b).

Conclusion

In using the telephone practitioners should consider the choices that they need to make, the ethical and practical reasons for selecting one course of action over another, and the values or ethical principles that explain why certain reasons are more compelling than others and why they should take precedence. You are encouraged to review and revise, if necessary, your telephone and voicemail process and procedures.

References


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Addressing Stress-Related Illness in Professional Musicians

David Sternbach, MM, MSW

Abstract: The health profession has become increasingly aware of the frequent incidence of work-related injuries and illnesses occurring among professional musicians. Although almost all workers run risks of stress-related health problems, performers must work under especially stressful conditions. Musicians must perform before the public; they must perform under the constant critical scrutiny of conductors; and they are expected to perform perfectly. Stressors, some unique to the music profession, some shared with other working populations, can come from the environment in which musicians must work, from psychological pressures, and from factors intrinsic to a performing career. In response to the increasing incidence and awareness of the health problems of professional musicians, music medicine, a new medical specialty, has come into being. Physicians who treat performers can act as resources to educate their patients about work-related stress and to refer them to mental health professionals with appropriate specialty training. Physicians can be instrumental in helping musician patients return to performing careers with a new ability to handle work-related injuries and stress.

Introduction

The new medical specialty—music medicine—has emerged in response to the growing awareness among health professionals of the alarming increase in the amount and severity of professional musicians’ work-related injuries and illness. Symphony and opera musicians have a high incidence of occupationally caused pain, exceeding even most factory workers.

In a 1985 survey of major orchestras, 76% of those responding reported enough pain to seriously affect their performance (Fishbein & Middlestadt, 1987). One study reported that professional musicians die 20%-22% sooner than their counterparts in the general population, and that coronary heart disease accounts for almost 5% more deaths among musicians than in the general population ( Tucker, 1971).

Those embarking on careers as performing musicians are sustained not only by their ambitions and talent, but also by their hopes and expectations for rich and fulfilling creative lives. Only gradually do many come to realize that achievement of their artistic and professional goals may cost them their physical and psychological health. Substantial evidence shows that this is true for growing numbers of performers. Work-related injuries, illness, and psychological problems have reached epidemic levels among musicians.

Sources of Musician Stress

Since everyone who works must cope with both the stress of everyday life and stress in the workplace, what makes musicians a population at special risk for stress-related illness and injuries? Three factors present in the lives of musicians produce a total stress quotient far higher than might result from any one factor taken alone. Together, with the other common, everyday stressors, they create a situation with potentials for overwhelming stress unique to the music profession.

First, musicians perform before the public, facing all of the terrors associated with stage fright. Second, they work under the constant scrutiny of conductors both in rehearsal and in concerts making them subject to criticism at all times, even during public performance. Third, musicians are expected to deliver perfection—note-perfect performances every time, everywhere, and under all circumstances. By contrast, professional athletes playing before the public enjoy a more generous tolerance for error. A major league ballplayer with a .300 batting average may be a star; however, no audience would tolerate a musician who missed 7 out of every 10 notes. Probably no other profession involves the combination of these particular stress factors.

Other challenges face particular groups of performers. Jazz musicians, improvising four to six hours every night, must be endlessly creative. Club date musicians, especially single-engagement players, go to jobs rarely knowing with whom they will be working or even what they may be asked to play. Older players notice uneasily the changing musical styles with which they feel less able to compete with younger players. Studio recording musicians are expected to get it right on the first take; studio time costs money.

The elements of stress for professional musicians lend themselves to classification into three categories: environmental hazards, psychological pressures, and intrinsic factors. These categories extend beyond the sources of stress common to us all in everyday life because music, an overcrowded profession, can be viciously competitive and highly insecure.

Environmental Hazards

Any systematic survey of musicians’ working conditions reveals an extraordinary number of stressors. Psychologist Robert Holt documented nearly 60 types of workplace hazards and stressors and more than 55 types of dysfunctional stress reactions using data drawn from a bibliography of nearly 200 studies on workplace stress (Holt, 1982). Musicians routinely suffer...
exposure to virtually all the hazards enumerated by Holt. Four notorious stress contributors that affect musicians include shift work, changes in workplace locations, changes in supervision, and economic insecurity.

Working hours for professional musicians bear no resemblance to the nine-to-five regularity and predictability that many workers in other fields enjoy. Rehearsals and concerts take place mornings, afternoons, and evenings. Schedules change from week to week. Tour schedules are grueling and disruptive, especially for those attempting to maintain a family life.

Frequent changes and poor conditions in a musician’s work setting also provide a source of stress. Freelance musicians may rehearse, play, and record in three or four different locations in a single day. This typifies their work, week in and week out, throughout their careers. Symphony musicians face new conductors every week during the orchestra season; opera house orchestra players have new conductors every evening. Each conductor presents a different personality and musical style, and makes different demands. Freelance classical, popular, and commercial musicians rarely know who will direct them from one day to the next. Financial insecurity, a fact of life for most musicians, imposes tremendous stress and emotional costs.

**Physical risks.** Beyond these four major stressors, the daily lives of working musicians include many other stressors. Performing is hard physical work, especially for brass players. Davis, telemetering electrocardiograms of musicians in performance, has documented arrhythmias and tachycardias in brass players as well as Valsalva-like responses, and has observed conductors maintain an average increase in heart rate of 89% during performances (Davis, 1985).

Inadequate rehearsal breaks predispose players to over-use and repetitive-motion injuries, especially for players of stringed instruments. A marked increase in musculoskeletal injuries, including carpal tunnel syndrome and focal dystonia, has resulted.

Concert halls may be overheated, chilly, poorly designed. Lights may shine too brightly in television productions or be too dim in theater pits. Backstage areas are often unsightly, cramped, and unsafe. The stage itself may pose hazards. Finally, the old adage, “the show must go on,” exacts high costs in terms of stress.

Musicians, like athletes, are constantly vulnerable to physical injuries. Athletes, especially football players, refer to “the moment”—an injury that can occur at any time and bench a player for weeks, for a season, or for life. With a sprained finger, a bruised lip, or a sore throat, most working people (including well-compensated athletes) can do a day’s work; a violinist, a trumpet player, or a soprano cannot. By the nature of their work, musicians often cannot do anything other than single jobs for which they trained. Any number of physical or psychological problems can derail careers. For example, the career of Leon Fleischer, a concert pianist of international reputation, came to an end when medical techniques of the time could not alleviate muscle cramps in his right hand.

Musicians risk hearing loss and tinnitus. Performers in front of the brass and percussion sections run the greatest risk. Overexposure to high volume amplification systems have made many rock musicians either partially or totally hearing disabled.

**Poor labor-management relations.** Employment conditions for most musicians were uniformly deplorable well into the 1970s. Problem areas included abusive management styles, arbitrary audition procedures, hiring attitudes that excluded minorities and women, non-existent job protection policies, and poor and inconsistent salaries and benefits. Improvements in these conditions for American musicians lagged far behind more enlightened European practices (a disparity this author addressed in articles contrasting American and European orchestra management policies) (Sternbach, 1975, 1977).

Musical institutions, in common with many businesses and industries, have no immunity to the costs of the recent recession. Management turns to the musicians to compensate for declining revenues. They declare bankruptcy, often in mid-season, or continue seasons by extracting large concessions from musicians as the price of remaining even marginally employed.

While contract agreements and enforcement of labor regulations can improve many environmental issues, others are simply facts of performers’ lives to which they must make a satisfactory adaptation if they intend to continue in their profession.

**Psychological Pressures.** Psychological pressures involve the maintenance of ego in response to nonphysical stress factors. Professional musicians must deal with psychological stress as they adapt to the intrapersonal (internal) and interpersonal (external) conflicts inherent to their profession.

**Intrapersonal sources of stress.** Intrapersonal conflicts, challenging the musician’s ability to cope with the anxiety of performing and with self-criticism, pose a major source of psychological stress. Stage fright, a fact of life for nearly all performers, is toxic in ways that can affect life off-stage as well as on. Anticipatory anxiety, the dread of future calamity or failure, can make a musician’s life in the hours, days, or even weeks and months before a critical performance an unremitting purgatory and contaminate life for those around the performer as well.

On-stage anxiety varies from mild excitement, which can serve to enhance performance, to full-blown panic attacks with a host of physical symptoms including palpitations, dizziness, transient limb paralysis, uncontrollable shaking of the hands and legs, sudden memory loss, black-outs, cardiac arrhythmias, and even cardiac arrest.

Post-performance anxiety takes the form of remorse over real or imagined errors. Mental review, a sort of backstairs repartee, can range from an even-tempered appraisal of one’s performance to judgmental processes generating symptoms resembling post-traumatic stress disorder, especially after auditions or competitions in which career aspirations are at stake.

Performance anxiety is not confined to actual concerts. Professional musicians must also endure over-supervision, a known stressor (Steptoe & Fidler, 1987). Their work in rehearsals and concerts takes place under the constant observation of conductors. Studies reveal increased stress for workers
from excessive and intrusive over-managing styles (Smith, 1991). Most office workers or, for that matter, physicians in their consulting rooms, would find it disagreeable to carry out their work with a supervisor overseeing every action, ready to question or overrule every decision.

Performances before the public allow no second chances. When the trumpet player misses a note, everybody notices, and it stays missed. Recordings have conditioned audiences to expect note-perfect performances. As a result, critical standards for live performances have become unreasonable and excessive. Musicians are painfully aware of these unrealistic standards set to measure their performances.

**Interpersonal sources of stress.**

Interpersonal factors include orchestra players’ expressed frustration over lack of artistic control; conductors generally reserve to themselves decisions about interpretation, tempo, and style. The entire issue of managerial style has a more severe impact on musicians than on workers in other fields because of the nature of music’s work. Unless players choose to perform in a disinterested, dissociative manner, emotional sensitivity must play a large part in a performance. This very sensitivity—the seeking for an intimate rapport with fellow players and with the inner spirit of the music—renders musicians more vulnerable. Disrespectful, thoughtless, abusive or offensive verbal styles, often the everyday currency of many conductors, can do much damage at such moments (Sanderling, 1992).

**Intrinsic Factors**

Some aspects inherent in careers of professional musicians create a third source for stress. These include conflict with the cycle of psychological development through which all people must travel, accepting the limitations of one’s instruments and, within one’s self, the drive for excellence, the effort to ward off becoming stale, and inevitable loneliness.

**Life-cycle conflicts.** Psychological development unfolds in stages as we move through life, a process Erik Erikson referred to as “the life cycle” (Erickson, 1980). Each level poses new challenges that require ever more complex reorganizations and integrations of the psyche. Professional musicians must work through not one, but two life cycles, the second one involving their artistic growth through their career. Like the life cycle common to all people, this second life cycle also contains within itself developmental stages. Often the two cycles conflict with one another.

For example, young musicians may have commitments of three, four, or even six hours of daily practice, leaving them little time to develop their social skills. They often miss opportunities to broaden their horizons and nurture other interests on which they can later rely to help them balance the demands of their music career.

The pull of a career often collides with the urge to begin a family, especially for women conscious of the ticking of their biological clock. They must find the time and energy, not only for the many re-entry tasks required in any career, but also to restore their athletic fitness and playing skills.

Older musicians perceive the strength and vigor of their youth slipping away, even as they judge themselves and are judged by others against the very standard of strength and projection they helped to establish when younger. Finally, if they have totally bound up their identity with music, parting from a performing career can seem like the end of life rather than the time for new beginnings and new choices.

**Living with imperfection.** Every instrument, including voice, has its special beauties and limitations. Musicians in a sense “marry” their instruments and must learn how to adapt to the frustrations and tolerate the limitations imposed by the choice they have made.

Striving to realize one’s own image of excellence, to exceed one’s past accomplishments, and to reach new heights create a sense of living a rich and meaningful life. A price, however, accompanies such striving; constantly pushing oneself to the edge of comfort and beyond generates great frustration and anxiety.

The finest artists commit themselves to such tension. Isak Dinesen’s opera singer in Babette’s Feast says, “It is terrible and unbearable for an artist to be encouraged to do, to be applauded for doing, his second best. Through all the world there goes one long cry from the heart of artists; give me leave to do my utmost” (Dinesen, 1985).

Only rarely do professional musicians believe they have realized the totality of their artistic vision on stage. The maturity to acknowledge and accept the gap between artistic vision and the realization of that vision in actual performance takes time to develop and sustain. To best tolerate this life-long process, one needs a strongly grounded ego and a well-rounded, balanced personality to find satisfaction in areas other than as a performer (Lochner, 1950).

In their study years and throughout a career, artists walk a fine line, employing a positive obsessive style, without which excellence is unlikely, while steering clear of a negative obsessive style, which can disable any sustained creative effort by excessive self-criticism and fault-finding.

**Inspiration and isolation.** Musicians require fresh inspiration in their lives to revitalize their commitment, their energy levels, and their creativity. While most people have this need in common, staleness in performers becomes quickly evident, and the consequences of their loss of momentum can readily affect their careers.

Finally, musicians spend countless hours in technical preparation, studying throughout their creative lives to maintain technical skills, learn style and interpretation, and master new repertoire. Performers learn to live with the many hours spent in isolation, but this can result in a sense of alienation and loss of identification with society.

At the time that young performers choose music as a career, they rarely recognize these elements connected with that choice for their fullest implications. To maintain excellence as a performer will always require enormous physical and mental discipline while so many stressors and uncertainties challenge commitment and create self-doubt about one’s chosen career. Moreover, few young musicians are equipped to see or acknowledge the many intrinsic stressors associated with the business of having a performing career.

**Treatment**

Musicians have historically disguised injuries and illness. They will play hurt, play through their pain, both physical and...
emotional, and continue to do so for years. Until the advent of the new specialty, music medicine, they had nowhere to turn for accurate assessment, diagnosis, and treatment of their problems, especially stage fright. The traditional reasons for disguising health problems remain an issue today.

If a player were too candid about a physical condition or about anxiety, might not this information reach the ears of management and the conductor? And then what consequences might ensue for the musician? This is a serious issue for performers who are not in employment covered by contract protection, which describes virtually all free-lance musicians.

Yet another issue in common with our culture’s attitudes toward mental health issues, an onus still attaches in many players’ minds to acknowledging stage fright. This stands in the way of performers locating appropriate treatment, and secretiveness and nondisclosure aggravate anxiety. This is particularly regrettable since we know from many sources, that in groups individuals can find consensus and validation for their personal issues that can neutralize negative, self-accusing, and self-isolated feelings (Yaloum, 1975).

Many musicians do not know that most types of performance anxiety can be successfully treated with a combination of chiefly cognitive and hypnotic approaches. Training in relaxation techniques, stress reduction techniques, and cognitive restructuring, education about the nature of stress, and systematic desensitization and imagery rehearsal, are only a few among many effective modalities that prove helpful to many performers (Benson, 1973; Desberg & March, 1988; Wolfe, 1990; Steptoe & Fidler, 1987).

Long-term analytically oriented psychotherapy does not serve these patients unless the need to deal with deeply embedded issues around early experiences exists. Even in such cases, patients can receive short-term remediation of stage-fright symptoms while dealing with long-term issues. The author has found brief treatment using hypnosis and imagery rehearsal highly effective in reducing stage fright problems to manageable levels, noting that the stronger the performer, the more likely that brief therapy will succeed.

**Physicians’ role in music medicine.** Physicians can respond to the musician patient population through education. They can, in the role of advocates, recommend stress management programs as part of a rehabilitation schedule, directing patients to resources that can enhance their awareness of stress issues and the importance of bringing their lives into better balance.

In diagnosis, physicians should consider referral to mental health professionals to enrich the assessment and diagnostic process of the ill or injured musicians since stress in most likely an exacerbating factor. Especially valuable are psychologists and other behavioral professionals with training in hypnosis, biofeedback, and cognitive-behavioral therapy skills, and past experience with the special problems of performing artists. Their findings and recommendations can benefit the patients when integrated in the over-all treatment plan.[Author query # 1]

Psychological assessment has a clear role in music medicine clinics and inpatient treatment settings. Psychological assessment can measure the severity of patients’ stress as a contributing factor in the presenting problems, and patients’ potential for compliance with a treatment regimen. Short-term individual or group therapy can help patients adjust to the limitations of illness or injury during recovery and reduce the risk of relapse through premature return to playing, or a return to work with the same dysfunctional psychological habits that may produce new complaints.

Even during the primary interview and assessment, physicians can explore with musicians the stressors in their lives and how to deal with them. Of course, this takes time in a busy physician’s schedule. One physician wrote, “At the end of the day, having seen 30 or more patients, with 10 more waiting, do I take 40 minutes to talk with a patient about her anxieties and stress or do I take 40 seconds to write a prescription for Valium (diazepam)?” (London, 1987).

Physicians can work with rehabilitation trainers and psychotherapists to design, with their patients, a rational program of stepped return to work. Treatment of physically injured patients keeps them as active as possible and advocates work hardening methods. The same approach applies to players with anxiety issues.

**Conclusion**

The practitioner who treats performers reaps a professional benefit. The many workplace stressors assailing more and more Americans have long been the everyday currency of the professional performing musician. Musicians, therefore, provide a metaphor for most working people, a warning sign for conditions affecting us all.

As in music, job security in business is becoming a myth. As more people work at home, the issue of isolation that affects musicians in their long hours of practice now affects other workers as well. Burnout symptoms in many occupations indicate that most people can benefit from developing sources for the re-invigoration and the inspiration that musicians must have.

What practitioners learn in treating performers contributes to general practice. Awareness of the role that stress plays in the lives of musicians in directly causing or exacerbating physical illness or injuries can extend to all patients and help to promote the delivery of more complete care. A factory worker, business person, or professional, may be viewed not just as a patient with illnesses or injuries, but also as a patient suffering from performance pressures and stress. Caregivers who treat these psychological symptoms in addition to the physical complaints stand a far better chance of bringing about a healing for the whole person.

The sole difference between musicians as a patient population and the general public lies in the greater number of work-related pressures and greater career consequences for performers with medical problems. Such patients often confront a physician with confusing, intense, and seemingly inappropriate demands. These patients appear more rational and understandable within the context that a particular injury was the source of livelihood and that sustained a career and status as an artist.

The artist-performer, as a unique and sensitive patient, requires equally unique and sensitive approaches. A heightened

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Cognitive Development and Music Instruction: New Implications for Applied Psychophysiology and Biofeedback

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Abstract: The need for the development of different types of health intervention paradigms specific to performing artists has been established, especially within the last 20 years. Research overwhelmingly supports the notion that artists suffer from a myriad of physical, psychosocial and psychophysiological disorders at a rate much greater than the normal population, and many of these disorders have a long-standing etiology. Other evidence demonstrates the cumulative effect of music training on children in terms of neurological development. Recent studies indicate physical changes in the central nervous system as well as changes inferred from neuropsychological testing. Because of the apparent far-reaching effects of music study in childhood, perhaps the time has come to give greater attention to childhood education in the arts.

Cognitive Development and Music Instruction

Every year, over one million American children begin music instruction, but few become competent and continue to play through adolescence and adulthood. One reason for this problem appears to be the lack of fit between the instructional methods and the developing cognitive abilities of young children (Brandfonbrener, 1992; Zaza, 1993). A second issue may be the lack of standardized teaching methods, creating a conglomerate of delivery styles and expectations (Brandfonbrener, 1992). A large number of music teachers and parents have difficulty understanding the differences between children and adults, and further are unaware of the vast differences among children of similar ages in terms of cognition and physical abilities.

Furthermore, private music teachers do not have an educational sequence (a curriculum), despite the fact that the name ‘teacher’ implies some type of planning and development. There is no certification or licensing requirement, and there is currently no curriculum in place in colleges or universities to educate private teachers beyond that of basic pedagogical instruction. Music pedagogy classes are largely in place to provide the teacher with tips on teaching aspects of the music itself, such as surveying instrumental methods and literature. Prospective private music teachers are not required to have education or psychology coursework. As developmental psychologists, we are aware of the major cognitive changes that occur from birth to age 7, between ages 9 and 11, and then onward into the teenage years, which should be taken into account when teaching children (Papalia & Olds, 1993; Hamner & Turner, 1990). We believe that some knowledge of development is necessary to teach children effectively.

Developmental Differences

Preschoolers, or pre-operational children, possess cognitive skills that are unique to that age group. As such, those instructional methods that are largely effective for older children, tend to fail with preschoolers. Classroom instruction fails with this age group because of the necessity of cognitive representation of concepts, an ability they have not yet developed. As such, classroom-type teaching, such as verbal instruction and description, likewise fails. In music instruction, one focus of some types of instruction helps the child represent the music in his or her head; the piece is ‘heard’ cognitively. These children must sing their music in order to recall and reconstruct the music itself. In other aspects of the music instruction, the activities (concepts such as up and down, high and low, etc) must center on movement and objects the child can hold and manipulate for learning to take place. Since music study intrinsically involves movement at the instrument, that fact alone may account for the growing popularity and apparent success of preschool music instruction.
The 5 to 7 Year Shift. An important developmental shift occurs between the ages of five and seven years called the “5 to 7 year shift,” a term coined by Sheldon White (Sameroff & Haith, 1996). This shift is characterized by significant changes in children’s thinking which were described by Piaget as the advancement from preoperational to concrete operational reasoning (Siegler, 1996). During this shift, numerous transitions occur, influenced by changes in neurobiological subsystems, cognition, emotion, and socio-cognition. These changes occur across all situations; peers and families, school, cultural, and ethnic practices. This shift is also said to be a critical period for learning, notably known to improve the child’s ability to acquire second languages.

Some have likened music to a second language but the research fails to support this hypothesis. More accurately, neurobiological (Besson & Schon, 2001) and historical (Grout, 1988) evidence supports the notion that cognitive musical representation (music cognition) may be innate, including specialization for pitch processing (Zatorre, 2001) which may be heritable (Drayna, Manichaikul, Lange, Snieders & Spector, 1969). However, given the vast problems in motor skill acquisition and maintenance in music, it is unlikely that the physical production of music itself is innate (Gerig, 1974). An innate behavior response appears full-blown at birth, is present in every member of the species and is largely not amenable to learning (Bennett, 1982). It is therefore more likely that tailoring music instruction to meet the developmental needs of children during this period would facilitate the acquisition of music making.

Table 1. Attributes of Preoperational Children

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<th>What Many Parents Believe</th>
<th>What Many Music Teachers Believe</th>
<th>What Developmental Psychology Says</th>
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<tr>
<td>Egocentricity, social</td>
<td>The child has little or no empathy, and parents fear that empathy may never develop.</td>
<td>Roughly same as parents, that the child refuses to be empathic</td>
</tr>
<tr>
<td>Egocentricity, perceptual</td>
<td>The child appears to lie and the parent takes action in accordance with his or her own personal belief systems.</td>
<td>Same as parents; believes the child may become a liar, but often cite it as evidence that the child is proof of the next generation being inadequate.</td>
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<tr>
<td>Egocentricity, Perceptual; if a child performs easily</td>
<td>The child has a genetic propensity to not be anxious, and therefore does not need any type of preparation to perform.</td>
<td>The child has good “performance” genes and is probably “talented.” The child will probably always be a good performer.</td>
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<td>De-centering; the nature of error.</td>
<td>Parents believe the child is a perfectionist and fears failure. Parents often project onto the child their own issues surrounding error rather than attempting to see it from the child’s point of view.</td>
<td>Believes the child is a perfectionist and sees it as a necessary part of being a musician. Will project own problems with error and interpret their own problems as the child’s.</td>
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<tr>
<td>Present-time orientation</td>
<td>Parents often fail to notice that the child does not plan and has trouble learning from past mistakes. Will expect a pre- operational music student to go home &amp; practice efficiently, unsupervised.</td>
<td>Music teachers expect all children to carry through their own practice during the week. Often will react to under-practice with criticism and will resent children’s imperfections, interpreting the under-practice as proof of lack of talent or laziness.</td>
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Concrete Operational Children

With the attainment of concrete operational structures (about ages 7 to 11 or 12), the child succeeds with tasks that defeated the younger child (“succeeds” in an adult sense of the word). The concrete operational child comprehends the nature of conservation. That is, certain properties of objects are invariant despite state-changing transformations. For example, the child knows that the amount of water doesn’t change when poured into a differently shaped vessel nor does the total weight of a rock change when it is broken into pieces. In addition, this child is very good at cognitively manipulating and systematically classifying objects in the world, understands that others may have a different point of view, can focus on multiple dimensions, can plan, problem-solve and handle many new things at once. However, the two main facets of their development which differentiate them from their older, formal operational counterparts, is their difficulty in self-regulation and their tendency to think in categories (black vs. white, etc.) rather in ‘shades of gray.’ In other words, they are very capable learners, but need someone there to direct them and aid them in choices of strategies, etc. For complex tasks, such as music, their self-regulation is very poor.

These two groups of children (pre-operational and concrete operational children) live in different realities; they view the world in qualitatively different ways. The young child is not illogical or lacking in logic; rather, the logical rules governing thought are different. Most notably, these children differ in the cognitive processes that have been associated with learning: attention, perception, memory, communication, planfulness, and problem solving. It is important to take a child’s cognitive developmental level into account when teaching the child new information.

Children in these two stages of development understand their world differently, and thus, learn in different ways.

Differences in Strategies and Problem Solving.

The preoperational child does not plan when confronted with problem-solving situations. Salient perceptual features of the situation capture their attention; strategies for systematically categorizing information are not typically invoked. This is a here-

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<td>Egocentricity, social</td>
<td>The child is now able to take the perspective of others, but does so with black-or-white, right-or-wrong reasoning, and makes normal mistakes that are often interpreted as ‘stupid.’</td>
<td>Roughly the same as parents, and expect the child to be able to reason as an adult.</td>
<td>The child can take others’ point of view, but will make reasoning errors due to lack of experience, black-or-white thinking and other problems in logic (no weighting of choices, etc.)</td>
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<td>Ability to plan a sequence of behaviors &amp; carry out the sequence (piano practice).</td>
<td>Depends on parenting style and differs drastically for musical “practicing behaviors;” many parents believe that practicing is a function of ‘talent’ and fail to see the impact that the environment has (e.g., TV on, other children playing with toys).</td>
<td>More so than parents, teachers believe that the talented child will plan &amp; carry out practice and under-practice is largely a function of talent. Blaming cultural changes for under-practice is common.</td>
<td>Concrete operational children know what practice is but largely do not see the relationship of practice and outcome. They cannot grasp the idea of planning something as complex as practice and lesson assignments &amp; carrying them out.</td>
</tr>
<tr>
<td>Nature of error; reactions to error.</td>
<td>Believes the child is a perfectionist when the child becomes upset over mistakes, or believes the child is ‘not cut out for piano’ when the child uses denial to ‘not hear’ the error.</td>
<td>Same as parents, and blame the child’s viewpoint as emanating from a genetic defect. Teachers largely map their own abilities and deficiencies onto the child.</td>
<td>These children know when they make mistakes but have difficulty mobilizing them to correct mistakes. The child will focus on the mistake and ignore other features of the situation, and often will not be able to impel him or herself to correct the error.</td>
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<tr>
<td>Future time orientation</td>
<td>Parent knows that the child thinks in the future and often believes the child sees the future in adult terms (carrying out plans, etc.)</td>
<td>Assumes that if the child is inspired the child will then plan &amp; carry out plans in adult terms. Does not understand the child’s ‘present-time oriented-ness.’</td>
<td>Thinks in future much more than pre-operational child, but still is very much present time oriented. Will understand the process of learning music, but will largely not be able to self-regulate as a function of that understanding (which parents &amp; teachers usually expect).</td>
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<tr>
<td>The largest issue in music practice; 30 min. per week with the teacher, then left to own devices the remainder of the week.</td>
<td>Believes that children old enough to attend school are old enough to oversee practice. This is a major societal ‘blind spot’ and urban legend, but persists. In many households, parents either force the child to practice, or let the child do what he or she wants (not practice).</td>
<td>Music teachers expect all children to carry through their own practice during the week. Often will react to underpractice with criticism and will resent children’s ‘imperfections,’ interpreting the under-practice as proof of lack of talent or laziness.</td>
<td>Have very little ability to oversee and regulate practice because necessary developmental milestones are not yet met; most people fail in music lessons for this reason, when parents &amp; teachers expect adult behavior from a child. Unfortunately, when they do not get that adult behavior, they often infer an imperfection within the child.</td>
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and-now mentality. These qualities should be considered when instructing the preoperational child. That is, integration of multiple ideas at the same time will overwhelm this child. These children should be given specific step-by-step instructions to help them plan their current performance, and they need an adult or a much older child to help them carry out the instructions.

The concrete operational child recognizes the usefulness of strategic behavior. The difficulty for this child seems to be in the directing of this awareness. Situations are attended to in excess, often to the detriment of detail; a clear realization of the use of mnemonic activity must be present in order to provoke the child to use it. These children can benefit from strategies, but may need encouragement and direction as to what strategies are most effective.

These differences highlight the need to individualize interventions in reference to the cognitive status of the child. At least in terms of generalization of training, preoperational and concrete operational children are responsive to different intervention regimens. For preoperational children, it appears to be necessary to deliver strategies in a simple fashion (i.e., rehearsal) and transfer (generalization) occurs to the extent that the strategies the child learns can be directly mapped onto other tasks. Concrete operational children can be more creative with transfer or generalization and can generalize to categories that are fairly different from the original learning.

The differences between these stages are also apparent in musical performance (Zinn & Zinn, 1998). Preoperational children, characterized as egocentric, display little anxiety (as measured by hand temperature) about performance. In contrast, the concrete operational children, who have the ability to see others’ perspectives, show great anxiety (e.g., sweaty palms, decreased hand temperature) prior to a performance because they are aware that other people are watching them and judging their abilities. Formal operational children (roughly ages 11 and older) have adult capabilities to hypothesize about ‘what others may be thinking (and judging)’ but will employ more emotional reasoning than adults. Figure 1 shows hand temperature data taken before a rehearsal, after the rehearsal and just before the recital the next day. Figures 2 and 3 are temperature and EDR data, respectively, taken at 4 different times during 1 group lesson session (performance practice) (Zinn & Zinn, 1999).

![Figure 1. Mean Hand Temperature X Performance Time X Developmental Level, n = 50. (Zinn & Zinn, 2000)](image1)

![Figure 2. Children’s Mean Hand Temperature at 4 Consecutive Group Lesson Performance Times by Developmental Level. Performance times separated by 10 minutes, n = 25 (Zinn & Zinn, 1999)](image2)

![Figure 3. Children’s Mean EDR at 4 Consecutive Group Lesson Performance Times by Developmental Level: Performance times separated by 10 minutes, n = 25. (Zinn & Zinn, 1999)](image3)
Why Should Psychophysiology Be Concerned With Children in the Arts?

There is a significant literature reporting a very high prevalence of psychiatric disorders in adult musicians (Nagel, 1998; Ostwald, Avery, & Ostwald, 1998) including depression, anxiety and somatoform disorders, personality disorders, substance abuse, sleep disorders, psychoses and eating disorders (Cohen & Kupersmith, 1986; Fishbein, Middlestadt, Ottai, Straus, & Ellis, 1988; Ostwald, Avery, & Ostwald, 1998). Zinn and Zinn (2002) have found an extremely high proportion of negative affect, catastrophizing, repressive coping and absorption in a sample of ten groups of professional musicians at five different geographical areas in the United States (see Figure 4). Applied psychophysiology and biofeedback is a profession dedicated to the research and development of clinical applications for mind-body, stress-related phenomena. Thus, under this paradigm, psychiatric or psychological problems will tend to produce stress-related somatic issues in many people.

For instance, applied psychophysiology emphasizes that psychological stress is a very significant risk factor for overall muscle tension (muscular bracing) (Ziporyn, 1984). In her report to the National Committee of Keyboard Pedagogy, Alice Brandfonbrener, founder of the Performing Arts Medicine Association (2002) emphasizes, “… most pain syndromes in the arts do not have tissue disruption or injury. Most pain has to do with myofascial or muscle tendon pain syndromes. CTS [carpal tunnel syndrome] in the arts is indeed rare, despite popular opinion. CTS occurs when the pressure increases in the carpal tunnel but that pressure is primarily due to swelling of the flexor tendons, sheaths, etc., within the carpal tunnel, causing increased pressure. CTS occurs primarily when there is just too much force over time, and is also related to things like obesity, genetics, and pregnancy, i.e. fluid retention. Physical stress, which, in turn, predisposes the performer to physical injury, has been shown in arts research to be the most common cause of injury. And, probably the most common cause of the physical stress is practicing in the face of fatigue (muscles), which would include sudden increase is practicing without proper conditioning; just too much playing—too much overall muscle tension“ (p.1). Coons, Montello, and Perez (1995) found significantly depressed immune responses in musicians who used denial and avoidance coping in musical performance anxiety. Craske and Rachman (1987) found that perceived skill levels in musicians were inversely related to heart rate. David Sternbach (1998) argues that a very significant factor of musicians' illnesses appear to be stress-related, and Richard Lederman (1999), in his address to the Annual Symposium of Medical Problems of Musicians and Dancers, discussed the compelling evidence for the role of the autonomic nervous system in musical performance anxiety and other musicians' stress-related somatic problems. Virtually all of these ANS problems can be aided by applied psychophysiology. It is becoming increasingly apparent that these issues cannot be adequately addressed by standard arts medical procedures.

It is clear that the preoperational child learns differently than the concrete operational child, who learns differently than a teenager or an adult. It is also understandable and unfortunate that many teachers do not incorporate these differences into their instructional system. We hypothesize that the apparent mismatch of expectations for children in music lessons contributes significantly to stress-related physiological symptoms. One final common pathway for sustained psychosocial stress is over-learned muscle tension and that problem alone is a major problem in the arts. We believe that if instructional methods are altered to accommodate the child’s cognitive abilities, young children will have an easier time in music lessons and be less likely to develop stress-related problems. It is our hope that increased awareness of child development in teachers may produce a more curriculum-based instructional system which serves the needs of the child into the teenage and adult years, which may well become a significant factor in training young musicians with less problems than those of the current generation.

References


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Performance. Dr. Gruzelier and colleagues describe their groundbreaking study, bringing QEEG and neurofeedback to the performing arts. To date, no one has conducted such a study and no one has published EEG work with performing artists. Gruzelier and his colleagues found a very strong relationship between alpha/theta training and greatly improved performance ratings. They acknowledge, however, that due to the highly complex set of skills already present in performing artists that significant moderator variables could have been present in the study.

Self-Regulation for Artists in Training. In Dr. Marcie Zinn’s contributions, the goals were to provide evidence for a quick and easy protocol to develop self-regulation skills for children, and to provide a brief synopsis of other seminal publications in performing arts healthcare. Because there are such vast needs in the arts for improved healthcare for all ages, it seems logical to present as much work from others as possible. We all can benefit from taking advantage of the work of other healthcare researchers, even if it is not directly applicable to psychophysiology. Given the large psychosocial component in nearly all arts disorders, applied psychophysiology has much to offer.

Conclusion

Applied psychophysiology for the performing artist is a science in its infancy. Many new applications remain to be developed and those described here will need to be documented with additional research. The Performing Arts Section of AAPB is dedicated to promoting psychophysiologicaly oriented clinical treatment and research in the performing arts.

References


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awareness of the psychological concerns of performing artists will promote more successful treatment. Musicians who present in the physician’s office with a sprained thumb, soreness in the carpal tunnel area, or anxiety are neither hypochondriacs nor hysteres, but simply ordinary human beings experiencing extraordinary stress. They not only suffer from injuries, but also face a perceived threat to the very core of their emotional lives, their social roles, and their identities.

References

The Application of a Sport Psychology Protocol to a Classical Violinist: A Case Report

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Abstract: This is a case study of a 20-year-old classical violinist with a recent history of audition anxiety, precipitated by upcoming auditions at two internationally recognized music schools. A sports psychology protocol, including a sport psychology intake, goal setting, cognitive-behavior therapy, self-monitoring, mental rehearsal and imagery, relaxation, self-soothing, and specific transfer of training techniques were associated with a remission of symptoms which facilitated successful auditions at both music schools. The program, developed for elite athletes, was adapted for this classical violinist. This case study illustrates the feasibility of utilizing sport psychology protocols for performing artists. It also demonstrates use of imagery for problem-solving and coping skills, and for effective transfer of training, as well as ways to assess and help the client maintain arousal without biofeedback equipment.

Despite the diversity of definitions, it is generally recognized that there is a set of psychological skills that elite performers naturally employ to enhance their performance (Solso, 1991). From sport psychology research, we know that these skills are identifiable, they can be learned, and they can be improved through training and practice. This article will describe how specific techniques derived from sport psychology including goal setting, arousal regulation, and directed imagery were utilized with a violin player with music performance anxiety (MPA).

Case Material

This is a case study of a classical violinist with a recent history of stiffness in the hands and neck, negative images that were perceived by the client to be uncontrollable, and music performance anxiety (MPA).

After a 6-week sport psychology protocol and follow-up, the client performed successful auditions at both the Julliard and Indiana schools of music. The program for this client consisted of initial skill training independent of the sport or performance, a goal-setting phase, a practice phase and a transfer phase.

The skill-training phase, which included a mixed autogenic training and imagery technique, was based on Lazarus’ Multimodal Therapy (1976). It included diaphragmatic breathing practice throughout the day and prior to music practice sessions. The practice phase was to expedite transfer of training into the actual music performance using in vivo desensitization. This case study illustrates the efficacy of this type of program for music performance anxiety and promises to provide insight into the nature of stress-related problems of performing artists. It also illustrates MPA as a psychophysiological problem with anxiety as the antecedent and physiological symptoms as the consequence. It demonstrates how careful clinical work can be accomplished without physiological monitoring.
which is not always possible or practical. Chronic anxiety in music performance
(and elsewhere) can be seen as a consistent failure to adequately self-soothe (Clark,
1996). The association between increased, sustained arousal and anxiety has been
shown to disrupt musical performance (Nagel, 1998; Salomon, Schrot & Wright,
1989; Steptoe & Fidler, 1987) and in this context, fear of negative evaluation is
hypothesized to account for a significant portion of the variance in MPA (Gregorich
& Kemple, 1986). The fulliard school is well known by many for its prominence.
However, in classical music, the Indiana school is equally prominent, if not superior,
in its reputation, making this type of threat especially salient.

The client was a 20-year-old never-married male classical violinist who presented
with a recent history of audition anxiety. The anxiety was precipitated by practice
and performance situations regarding upcoming entrance auditions at two major
music schools. During clinical interviews and intake the client had denied chronic
MPA. However, he reported a recent increase in practice (his chin was raw and
abraded from practice), muscular stiffness in his neck and hands, as well as negative,
repeated images including severe memory lapses and inability to recover from the
thoughts, all of which are a part of MPA (Lederman, 1999). A second factor in this
case study is that of injury risk. In performing arts medicine, sudden practice increase
has been shown to be a risk factor for pain and injury (Bejani, Kaye & Behnam, 1996;
Hoppman, 1998; Hoppman & Patrone, 1989), as is practicing in the face of fatigue.
In performing artists, a large portion of pain is myofascial in nature rather than relat-
ted to tendonitis, nerve entrapment or any other type of tissue disruption
(Brandfonbrener, 1991, 2000), but artists tend to continue to play through pain and
often end up with tissue disruption (Lockwood, 1989). This client was at risk
for injury that may have disrupted his career more than not doing well at the
auditions.

The client had reported professional parents who ‘pushed’ the client (and his two
siblings) to ‘succeed in music;’ he was named for a famous composer/musician.
His parents’ divorce had been personally difficult. The private teacher who had
instructed the client for many years was reported to be stern, offering little praise in
lessons and performance. The client denied a history of other physical or psy-
chological problems and denied substance abuse, current or past. He was not over-
weight and reported excellent health.

Session 1. The initial assessment was pri-
marily a structured interview to determine
if his performance problem was due to anxi-
ety or his current ability level. He reported
to have mastered the piece earlier. His diffi-
culty came when he was invited to audition
at two prestigious music schools. It was
therefore concluded that the problem was
primarily anticipatory anxiety. Since goal
setting, self-monitoring, mental rehearsal or
directed imagery, and arousal regulation are
the cornerstones of sport psychology inter-
ventions, these interventions were imple-
mented in a specific sequence. Initially
self-regulation skills are taught independent
of the sport or performance issue to avoid
conditioned anxiety. In this manner, the
actual skill learning is expedited. During
the assessment phase we developed specific
goals for him.

Goal setting is used to assess performance
and develop a specific detailed plan for
attaining goals. Locke and Latham (1985)
extended their work on goal setting to
sport psychology, and arrived at five con-
clusions they feel are applicable to sport set-
tings: 1) specific, difficult goals lead to
better performance than vague, easy goals,
2) short-term goals can facilitate the
achievement of long-term goals, 3) goals
affect performance by affecting effort, per-
sistence, and direction of attention, and by
motivating strategy development, 4) feed-
back regarding progress is necessary for goal
setting to work, and 5) goals must be
accepted if they are to affect performance.

The goals developed for the client includ-
ed practicing a mixed autogenic relaxation
and imagery technique based on Multi-
modal Therapy (Lazarus, 1976), practicing
diaphragmatic breathing throughout the
course of the day and prior to musical
practice.

The client was then instructed in
diaphragmatic breathing and an audio tape
for home practice was made with an auto-
genic induction. The client had selected an
image of himself in the country for the set-
ting and I provided him with visual, audito-
ry, olfactory, tactile, kinesthetic, and
proprioceptive cues (e.g. see the trees, hear
the birds, smell the wildflowers, etc.). Early
sport interventions relied primarily on visu-
cues (i.e. "visualization"), and over the
years, I have observed clinically that differ-
ent activities seem to require different sen-
sory modalities. Activities such as weight
lifting, gymnastics, golf, etc., seem better
effectively through tactile kinesthetic and pro-
proprioceptive cues ("feel the lift," etc.). In the
initial tape, I include images for all senses
and assess afterwards which the client
prefers. I also assess for clarity, controllabil-
ity, and orientation (internal vs. external).

Assessment involves the client describing
the image in detail. The client is instructed
to practice the relaxation/imagery (about
1/2 hour) daily and do 15-20 "quickies" (2-
3 diaphragmatic breaths) throughout the day.
The goal is to help the client develop physi-
cal skills (relaxation, imagery and arousal
regulation) that will be used later during
and between music practices.

Session 2. The client’s adherence to home-
work schedule was reviewed, and he report-
ed 100% compliance. It is typical for elite
athletes and performers to meet or even
exceed this agreement; in my own experi-
ence, they often exceed what is required of
them. During the session, the client report-
ed improvement in imagery clarity and con-
trollability. He reported that he was feeling
greater overall relaxation and well-being.

His response to the autogenic induction
was then reviewed and modified slightly
according to his preferences. A positive
music based image (playing a different piece
successfully) was introduced at this time to
begin training transfer into the performance
situation. He was instructed not to alter his
music practice schedule; to continue using
the tape and continue the "quickies" (the
quieting response throughout the day). The
goal was to strengthen his imagery ability,
to continue to reduce his basal arousal level
and to begin to transfer these abilities into
the performance situation via his imagina-

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Session 3. During this session, the client again reported continued compliance, improvement in imagery skills, and further reduction of generalized anxiety. During this session, more realistic imagery was introduced; the client was directed to imagine playing the audition piece in a private setting with no audience. No directions were given about how well the piece was to be performed in his imagery. After the ‘performance,’ the client reported the image in detail and noted that with the exception of a few rough spots, he had played it “pretty well”. We discussed why he had performed well in his mind, but not rehearsal. He reported rehearsal was associated with the audition and his evaluation anxiety kicked in. We discussed the importance of the audition. It appeared to be more important that he do well to please his parents than for the sake of doing well for himself. The client was then instructed to practice the image and “smooth out” the rough spots in his mind during the imagined performance. For homework, only a tape of the autogenic induction was provided; the client was directed to create his own image. This step was intended to implement transfer of the technique from the therapist to the client for use in the future and with other problems. In addition, the client was instructed to introduce his abdominal breathing into regular violin practice. He was to practice prior to rehearsal, and whenever there was a break in his performance. Previously, if there was a mistake or he was displeased with his performance, he would become angry, stop and begin again, increasing the likelihood of additional problems. The client was instructed to step back, lower his head, do a ‘quickie,’ and clear his mind. At that point, his assignment was to back up to a logical break in his piece and resume rehearsal.

Session 4. Client reported increasingly successful mental practice with his error rate going down and self-control increasing over time. He was very pleased and reported a much more relaxed sense of himself. He also reported feeling more in control in rehearsal with the breathing exercise being helpful in managing arousal. However, he also reported continued intrusive thoughts and images concerning the audition. To address this directly, the client was directed to imagine playing his piece for Juilliard faculty. Afterward the ‘audition,’ he appeared pleased. He reported a rather bad performance, but he had finished the piece. During the image, he had stopped a few times, but had used his breathing to relax himself and resume playing. We discussed how he felt after his imagined audition. He was content to have completed his performance. He reported his parents didn’t understand what a difficult situation it was for him, but that he accepted the difficulty himself and it was sufficient that he did accept that fact. Overall, he viewed his performance as a success. The client was instructed to again practice his image, and again smooth out the rough spots in his mind.

Session 5. Client reported further success in smoothing out his audition performance. He also reported success in his actual rehearsal. He felt ready for his audition and felt positive about his likely performance. At this point, most sport/performance interventions would shift to a maintenance phase. However, anecdotal, elite performers have noted that positive imagery is helpful until their actual performance does not meet expectations. At that point, they typically do not have a backup plan in place. I have found that coping imagery is generally more effective than mastery imagery. Coping imagery can prepare the performer for many expected and unexpected problems; it prepares them for the real world where things can and generally do go wrong. As such, I instructed the client to list all of the possible things that could go wrong, i.e., “I will make a mistake,” “I’ll blank out when I get on stage,” “I will begin badly,” etc. At that point, we explored ways to cope, such as breathing and continue playing, smile and breathe until ready, stop, breathe, smile, begin again, etc. The client was instructed to practice worst case scenarios and positive solutions for the week.

Session 6. The client reported initial anxiety with the coping imagery, but as the week progressed, he became more comfortable. He developed even more worst-case images (missed plane, broken string, forgot his violin, etc.) to use with his homework practice. He reported rehearsing well, and feeling “ready for anything”. The client was instructed to continue his imagery and breathing exercises. He called weekly for several more weeks prior to his audition for booster sessions, during which we would review his options when problems arose and how to go about preparing himself for the audition.

After a few weeks, he phoned and told me that both auditions, Juilliard and Indiana, were successful. He was offered admission to both schools and accepted an offer from Indiana. He is now a professor of music at a major Midwest university.

Discussion

Sport Psychology and Performing Arts Psychology (psychophysiology) have many common features. Both have been developed to provide aid for people who are working at the outer fringe of human ability. Sport psychology has addressed the issues of elite athletes, for whom a simple operant conditioning problem may have far reaching implications (Mahoney & Myers, 1989). Like the musician, the situation facing the athlete may have minimal impact on everyday life but could threaten or end the career. The current case study provides an example of how to handle an audition with such high stakes involved. The violinist possessed excellent skills before entering therapy, but needed some work and some other ideas to push him to the ‘top of his game,’ thereby increasing the probability of a desired outcome. In spite of the fact that music is different from athletics, since the problem was neither ‘musical’ nor ‘athletic,’ the intervention was applicable for both. Sport Psychology and Performing Arts Psychology (or psychophysiology) share a second feature. Both attempt to extend the current paradigms in cognition, behavior and physiology beyond the limits for which they were originally developed. Since these procedures have been utilized and tested in Sport Psychology, it is logical that the next step is to implement these procedures for Performing Arts. To the degree that the Sport procedures elicit reliable and predictable phenomena in Performing Arts is the degree to which these procedures are valid. Hopefully, in this manner, unknowns will be significantly reduced, enabling Performing Arts interventions to be developed much sooner with high reliability and especially with excellent internal validity.
Psychophysiology share a third common feature. They both take into account physiological events and monitor and manipulate these events in conjunction with cognition and behavior. Instead of being treated as epiphenomena, physiological signs and symptoms are measured, manipulated and ultimately the client is taught how to ‘read’ his or her own signals, how to interpret them and how to change these internal events in order to effect a greater level of performance. In these venues, control of physiology is paramount in order to carry out the performance, and perhaps most important, are not seen as independent of cognition or behavior.

Sport Psychology and Performing Arts
Psychophysiology ultimately share the most salient common feature of all; that is, emphases on getting the client back into the ‘workplace’ (the track or field, or the concert hall) as soon as possible. In these ‘real’ worlds, there is often too little time for traditional insight-oriented therapies. As in the case of the violinist, people often seek help at the ‘eleventh’ hour and it is the job of the clinician to effect significant change and to transfer that change into the context of the performer. It is not enough to simply relax or challenge irrational beliefs; it must be done when the client is engaging in the actual sport or music performance situation. Reliable transfer of training must be integrated into the treatment package.

The case of the violinist is an excellent example of working with such an individual. He sought treatment just a few weeks before an extremely important audition but participated fully in that treatment. As illustrated by the first author, clients such as these generally work extremely well in a therapy context, conceivably because they are accustomed to working with their coaches and/or instructors for a number of years. The working relationship has been set long before the therapy begins.

Perhaps the single most salient feature of this case study is how the total treatment, including physiological arousal monitoring, was accomplished without the aid of physiological equipment (i.e., biofeedback equipment). It may not always be practical or even possible to ‘hook someone up,’ and good therapist skills can be used to infer different levels of arousal with close behavioral observation. In the real world, we may not have the opportunity to use our equipment and are left to rely on what we know about observations we have accumulated over the years.

Imagery was another modality that was utilized in many ways, including using it to develop ‘plan B’ coping skills. The client was taught to plan for situations that may go wrong and encouraged to develop images that facilitated problem-solving and other coping skills, rather than imagine perfect performances. In both sports and arts, there is a consistent push to giving perfect performances, despite the fact that perfection goes against simple human nature. We all have an ‘error term,’ and we all use it. Therefore, trying to give a perfect performance runs counter to being human. By working with the client with ‘worst-case’ scenarios, the client was sensitized to the fact that there was much that could go wrong. Also, by working with him in ways to deal with the possible error, the client may have felt more in control and thereby reduced his own probability for error. Finally, and most important, the desensitization, arousal management, cognitive coping skills and problem solving skills were accomplished via imagined performances, and were practiced into the actual pieces the client played. The effective implementation of these techniques appeared to aid the client in finishing his ‘unfinished business,’ thereby facilitating his ability to play closer to his own extremely polished performing level.

References


Constraint-Induced Movement Therapy for Focal Hand Dystonia in Musicians

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Abstract: Digital overuse, common in performing musicians, frequently produces focal dystonia. Neuroimaging shows a modification of the representational zones of the digits in the somatosensory cortex. The authors report on the application of a constraint-induced movement therapy to such dystonias. Five musician subjects showed measurable improvement at close of behavioral treatment, three showed further improvement on follow-up, and two musicians resumed concert performances.

Focal hand dystonia is a condition involving manual incoordination that occurs in individuals, including musicians, who engage in extensive and forceful use of the digits. To date, no treatments have been found to be effective. We found, with a non-invasive neuroimaging technique (magnetic source imaging), that musicians with focal hand dystonia exhibit a use-dependent overlap or smearing of the representational zones of the digits of the dystonic hand in the somatosensory cortex (Elbert, Candia, Altenmüller, Rau, Sterr, Rockstroh, Pantev, & Taub, 1998). Digital overuse had previously been found to produce a similar phenomenon in monkeys (Byl, Merzenich, & Jenkins, 1996). Since behavioural mechanisms apparently underlie both the cortical disorder and the involuntary incoordination of movement, it was thought to be possible that a behavioural intervention could be of value in reducing or eliminating these conditions. The procedures employed in the present treatment approach are derived in part from a therapy, termed constraint-induced (CI) movement therapy, developed by Taub and co-workers that has been found to be effective in substantially improving the rehabilitation of upper extremity movement in stroke patients (Taub, Miller, Novack, Cook, Fleming, Nepomuceno, Connell, & Crago, 1993).

Five professional musicians (three pianists and two guitarists) with long-standing symptoms were studied; they had previously received several treatments without success. The current therapy involved immobilization by splint(s) of one or more of the other digits for 1.5-2.5 h daily (depending on patient fatigue) over a period of 8 consecutive days under therapist supervision. The patients subsequently continued practicing the exercises with the splint for one hour a day at home in combination with progressively longer periods of repertoire practice without the splint. Patient status was quantified with two measurement instruments: a dexterity/displacement device which continuously recorded digital displacement during metronome-paced movements of two fingers (spectral analysis of the records provided information concerning the smoothness of the movements before, during, and after training); and a dystonia evaluation scale (DES) in which the patients rated how well they were performing (without the splint) movement sequences and passages from their repertoire that had tended to generate dystonic movements in the past.

All patients showed improvement without the splint at the end of treatment. The DES scores are given in Figure 1. The ratings on the scale range from: 0=dystonia as bad as at its worst, 1=slightly improved, 2=moderately improved, 3=almost normal, and 4=normal. A one-way analysis of variance followed by post-hoc Scheffé tests revealed that pre-treatment scores were different from post-treatment (t[4]=5.2, p<0.01) and 1-month follow-up (t[4]=7.2, p<0.01) scores. The results on the DES were confirmed by the clinical evaluation of the treating neurologist and by the findings from the dexterity/displacement device obtained in the laboratory. The spectral power of the movements of the fingers of the dystonic hand in the band of the paced frequency showed an increase in the
smoothness of those movements after treatment (p<0.01). After treatment, the one patient who was non-compliant regressed after 9 months; three patients showed additional improvement into the normal or almost normal range; and one showed no reduction in a substantial therapeutic effect. Two of the musicians have resumed concert performances.

References


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Biofeedback Abroad: Erik Peper Conducts Training Programs in Taiwan and Hong Kong

Dr. Erik Peper, President of the Biofeedback Foundation of Europe (www.bfe.org), recently taught an in depth training program at the National Taiwan University Hospital and a workshop at the University of Hong Kong Faculty of Medicine department of Psychiatry. Shown in the photos are the class at National Taiwan University Hospital including Jason Chi-lun Rau M.D., attending Physician Department of Physical Medicine and Rehabilitation. Not shown in photos is Drs. Peter W.H. Lee Department of Psychiatry who co-coordinated the workshop in Hong Kong. Dr. Peper is a past President of the Association of Applied Psychophysiology and Biofeedback and an international authority on biofeedback and has published numerous books such as Healthy Computing with Muscle Biofeedback, and Breathing for Health with Biofeedback, and was the behavioral scientist of the U.S. Olympic Rhythmic Gymnastic Team; He is Director of the Institute for Holistic Healing Studies, Department of Health Education at San Francisco State University, and is co-producer of Healthy Computing E-mail tips. (Healthco@SFSU.edu)
Temperature Training with Children Using Breathing and Heart Rate Techniques

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Abstract: The purpose of this study was to teach abdominal breathing techniques to piano students. Participants were trained to raise their hand temperature with abdominal breathing techniques. A significant effect of temperature training and a significant inverse relationship between change in temperature and developmental level was found. In regression analysis, developmental level was the best predictor of temperature before training, and developmental level plus experience in piano predicted post temperature. The results support the notion of training children to reduce physiological stress levels with abdominal breathing techniques, and that cognitive developmental level may be an important consideration.

Stress, Childhood and Music Education

It was once thought that children experience very little stress. Their life was seen by many as protected, relatively carefree and safe within the nuclear family with a few isolated transient stressors (Ross, 1997). More recently, especially in the past two decades, adult stress-related medical and psychological problems have been increasingly seen as beginning in childhood (Masterson, 1999; Ross, 1997; Schore, 1997), countering the notion of a carefree childhood. Researchers and clinicians alike have begun to target the sources of childhood stress which appears to persist into adulthood, including sources such as environmental (Johnson-Brooks, Lewis, Evans & Whalen, 1998; Yates, 1982), biological (Porges, Matthews & Pauls, 1992; Schore, 1997), social (Eisenberg, Fabes, Karbon, Murphy, & Wosinski, 1996; La Greca & Stone, 1993), interpersonal (Muris, Kindt, Bogels, Merckelbach, Gadet & Moulaer, 2000) as well as personal (Nelles & Barlow, 1988). Clearly, children do experience stress and a number of them appear to develop stress-related problems.

For children in piano study, it appears that stress inherent in the study of the instrument may be an additional factor (Whitman, 1987). Music students in junior high and high school seek counseling at a significantly higher rate than regular academic students or other gifted students (Robson & Gitev, 1991) and psychiatric disorders represent a significant portion of all arts medical problems with somatization occupying a significant part of the variation in psychiatric disorders (Ostwald, Avery & Ostwald, 1998). As a result of these observations, it has been hypothesized by many arts medicine clinicians that, given the prevalence and intensity of stress-related problems in artists, that certain predisposing factors are likely to be inherent in the study of music in childhood. Virtually all people in the arts studied their instrument or art privately in childhood and into adulthood. It is one of the only professions in which one must be a near professional before entering the freshman year of college.

Additionally, nearly all forms of artistic study require a very high level of creativity, control, precision, speed, endurance, executive functions (memory, perception) and sometimes, strength (Lederman, 1998). Lederman emphasizes that all of the attributes are in control of the central nervous system and further emphasizes the tremendous part that finite CNS reactivity plays in performance. Paradoxically, private music teachers as a group tend to have no training in physiology, psychology, and education, and tend to lack the supervised training that most people tacitly expect from anyone who calls oneself a teacher. To date, no standardized teaching protocols exist; the education process of musicians is practically devoid of empirically validated practices, resulting in a widely divergent collection of ideas, assumptions and reified notions (Brandfonbrener, 1992).

Another source of stress may be simply the stress of making CNS changes. Significant neurological changes appear to be mediated only by having participated in a given type of study. It can be stressful to just concentrate (Mantzicopoulos, 1997), notwithstanding effecting significant changes in cortical representations. Some of those cortical changes which appear to be mediated by arts study are, a significantly larger anterior corpus callosum (Schlaug, Jancke, Huang, Staiger & Steinmetz, 1995), overall musical ability (Slobada, 1993), increased spatial ability (Rauscher, Shaw, Levine, Wright, Dennis & Newcomb, 1997; Rideout & Laubach, 1996) and math ability (Graziano, 1999), a significantly more symmetric representation of the hands in the primary somatosensory cortex of pianists (Amuts et al., 1998) and string players (Elbert, Pantel, Wienbruch, Rockstroh & Taub (1995), significantly larger hand cortical representation in the primary somatosensory cortex over non-pianists (Pantev, Engelen, Candia & Elbert, 2001) and increased focused attention span and decreased noise sensitivity (Crawford & Strapp, 1994). Rendering these large changes requires tremendous concentration.
In keeping with the theme of this issue, I would like to confess a bit of a secret. For me, by far more powerful than any of the many biofeedback and relaxation methods that I have practiced over the years, have been the effects of music. I grew up in a family of musicians, and am still blessed to be surrounded by a considerable number of wonderful classical musicians among family and friends. I myself am an amateur violinist, who periodically (when sufficiently either courageous or foolhardy) performs in public, particularly when I can play in the shadow of one of my more accomplished family members. Listening to music has always been a great source of solace, relaxation, and emotional satisfaction. Even greater effects, however (at least subjectively), have come from playing music.

We all know the saying that “music soothes the savage breast.” Does it, in fact, have a systematic effect on the biological systems in the chest, or elsewhere in the body? Breathing? Heart rate? Data on this are difficult to collect, primarily because people react differently to music, and because music is not one “thing.” Indeed, the power of the arts reside in their ability to speak eloquently to us in various nuanced ways. Not every artist or composer speaks to us with equal power, nor, indeed, does he or she “say” the same thing to us. To listen to music, or to read a poem, or to see a work of art has “meaning” to us only when the artist has a message that reaches us — because of the communicative ability of the artist and/or composer, the thing that the art is “saying” to us, as well as our own receptiveness, sophistication, or even mood. However, this very quality may be what lends art its power — it is the medium by which human beings “reach” each other and influence each others thoughts and feelings. For this reason, throughout the ages, it has been both used and feared by the powerful; and its greatest expressions have survived for centuries. Specific psychophysiological effects have been demonstrated for musical expression of specific emotions (Krumhansl, 1997).

It also can have important effects on behavior. The fields of music and art therapies have produced numerous experimental papers, some fairly well controlled. Indeed, many medical offices and hospitals use music systematically to help people relax during painful or unpleasant medical procedures (Haun, Mainous, & Looney, 2001). The “muzak” industry has its own proprietary research on the effects of music to spur people to buy things. (Did you ever wonder why music is so ubiquitous in shopping malls and stores?) Bus terminals and parking lots even use classical music to make certain “undesirables” uncomfortable, so they will go elsewhere. (I have never understood this application — why should something that attracts me to the place scare others away? But it seems to work.)

Relaxing music has been demonstrated to enhance the relaxing effects of biofeedback under some circumstances (Scartelli, 1986). Singing music seems to have a better effect than listening to it along with relaxation instructions in enhancing pulmonary function, either because of the physical breath training involved, or perhaps because of its greater motivational effects (Wade, 2002).

In my own field of heart rate variability biofeedback, I have often noticed that music that is often referred to as “relaxing” tends to have a particular phrase length: about 10 seconds. This is about the length of a relatively long but comfortable exhalation — a period that can easily be spoken or sung in one breath. Our own research has found that this is a resonant frequency in the cardiovascular system. Breathing at approximately this rate stimulates the baroreflex system, and greatly increases heart rate variability — a strong sign of the cardiovascular system’s adaptive capacity. A recent Japanese study found relatively greater parasympathetic effects produced by classical music, compared to relatively greater sympathetic effects for rock music (Umemura & Honda, 1998).

continued on Page 2A
From the President – Biofeedback and Music

continued from Page 1A

The effect of music on musicians may be different from that of others. Davidson and Schwartz (1977) demonstrated that, while non-musicians tend to involve primarily right-hemisphere activity while whistling a simple tune, musicians involve both hemispheres. I remember seeing a wonderful film made by Evelyn Bird, of the University of Guelph, Canada. In it, she shows that conductors engage in subliminal arm movements while listening to orchestral music — as if they were conducting the music. This is similar to studies by F.J. McGuigan and his students showing that most people tend to use their eyes and vocal cords while thinking. Deaf individuals who use sign language tend to show these effects in the muscles of their arms and hands, but not in the laryngeal muscles. This was an important rationale for progressive muscle relaxation: i.e., if your muscles are completely relaxed, you can’t even think.

Biofeedback and related techniques also has been used to help musicians with various problems. A study by LeVine and Irvine (1984) showed that the performance of violin viola players could be enhanced by biofeedback training to decrease muscle tension in the muscles of the left thumb. Similar findings have been reported for the forearm extensor among violinists (Morasky, Reynolds, & Clarke, 1981), and for muscles of the hands and arms among players of the clarinet (Morasky, Reynolds, & Sowell, 1983) and piano (Montes, Ramon; Bedmar, Margarita; Martin, 1993). LeVee, Cohen, and Rickles (1976) similarly used EMG biofeedback to treat tension in the throat muscles of a wind musician. Performance anxiety has been successfully treated by Jacobson’s progressive muscle relaxation (Grishman, 1989) and the Alexander technique (Valentine, Fitzgerald, Gorton, & Hudson, 1995). However we should note that performance anxiety has a number of cognitive manifestations (Lehrer, Goldman, & Strommen, 1990) that probably need treatment by a more comprehensive program of cognitive behavioral therapy. A study by one of my students (Naimark, 1991) found that depression was even more common than anxiety as a pre-performance tension symptom.

Biofeedback (Schwartz, 1995; Rider, 1987) and relaxation techniques also have been used to treat repetitive motion injuries among musicians. I have reviewed this literature a number of years ago (Lehrer, 1987). However there is still little controlled research on this topic. For those entering this field, I highly recommend a recently published book, Medical Problems of the Instrumentalist Musician, by Tubiana and Camadio (2000).

References


To say that we live in uncertain times is an understatement. The news media is relentless in bombarding us with sound bites and images of bombings, snipers, the economy, corporate scandal, and threats of war.

Such news on a daily basis has a way of absorbing so much energy and attention that our vision can become cramped and narrow. We could easily consider the past 14 months times of crisis. And, in spite of that reality, it is important to remember that times of crisis can also be times of great opportunity.

These crises/opportunities cause me to reflect on my personal vision of the future of AAPB. I wholeheartedly believe that in light of the way our world has changed since September 11, AAPB’s voice as the advocate for self-regulation and applied psychophysiology is more relevant than at any time in our almost-35-year-old history. Our current challenge is to implement strategies that will educate and deliver our services to a public that is hungry for self-regulation. But what if that public doesn’t know what we do? What if that public doesn’t have access to what we have to offer? What if there aren’t enough of us trained to adequately “serve” the public?

Let me give you an example that both saddens and heartens me. Last year I (along with Sara Harper) testified for the inclusion of biofeedback in Texas House Bill 1624. If passed, this bill would mandate insurance companies to pay for the treatment of acquired brain injury. After being told early on that we didn’t have “a snowball’s chance in hell” of getting our bill passed at all, the Texas Brain Injury Bill is now law. Both biofeedback and EEG neurofeedback are covered treatments under this new precedent-setting legislation.

Officials and members of the Texas Brain Injury Association were present during the hearings and after hearing our testimony, they became curious about what the heck biofeedback was and what it could do. As a result, I was invited to give an address at their annual conference in August.

The sad part of this story is that most of the folks in attendance had never even heard about biofeedback before my talk. The very few that had heard about biofeedback had very outdated or inaccurate ideas about what it was. One woman told me, “Oh, I thought biofeedback was relaxation tapes.” Not to disparage the utility of relaxation tapes, it saddens me that people really don’t know what we have to offer with our myriad biofeedback tools and modalities.

The part of this story that heartens me is that the Brain Injury Association’s response to my Power Point presentation was overwhelmingly positive. They were excited. They were hopeful. They were pumped about the applications and the two case studies I had presented. They wanted more of this amazing stuff called biofeedback. Their “paradigm of possibility” had suddenly expanded.

Some of the attendees were angry that their doctors and healthcare givers had not informed them that biofeedback was an option. Many asked, “Why don’t more doctors know about this?” The only honest answer I had was that there are relatively few of us biofeedback practitioners and we haven’t gotten the word out as well as we might.

This brings me back to my vision for AAPB. Like wonderful art that, for whatever reason, is not seen or heard or read or experienced, the great loss is to the potential audience that missed it. So it is with biofeedback. We must get the word out and make our services available to more of the public. This is a key piece in the equation of “E+M=A” (Education plus Marketing equals Access).

Carl Jung said, “We cannot change anything unless we accept it. Condemnation does not liberate, it oppresses.” My intention in choosing the topic of this column is not to condemn or blame, but rather to accept that we have a great opportunity before us. To that end, our Board has been working to mobilize a marketing committee. Please share with me your suggestions (lkirk@austinbiofeedback.com) for getting the word out. Let us follow the words of Mahatma Gandhi: “BE THE CHANGE YOU WANT TO SEE IN THE WORLD.”
AAPB's 34th Annual Meeting will be held in Jacksonville, Florida from Friday, March 27th through Sunday, March 30th. Pre-Meeting Workshops will be held on Wednesday and Thursday prior to the meeting, and on Sunday afternoon. The scientific and social parts of the meeting begin Friday, March 28th and end at about noon on Sunday.

This year's meeting is shaping up to be both highly interesting for everyone interested in psychophysiology and biofeedback. There will be plenty of fun mixed in. You can get an idea of the content from the theme - "Beyond the Bounds of Biofeedback". We have invited an internationally known group of speakers who are going to tell you about their latest discoveries and about how biofeedback blends with many other techniques.

Our invited speakers include:

- **Herta Flor, Ph.D.** – Will speak on a new type of biofeedback for pain based on training two-point discrimination ability as well as other recent discoveries. Dr. Flor obtained her B.S. in Psychology from the University of Würzburg in Germany in 1977 and her Diploma in Clinical Psychology from the University of Tübingen in 1981. She was a pre- and postdoctoral Fellow at Yale University and completed her PhD with Niels Birbaumer at the University of Tübingen in 1984. She is currently Professor of Clinical and Cognitive Neuroscience at the University of Heidelberg and works at the Central Institute of Mental Health in Mannheim, Germany. Her research interests include chronic pain, anxiety disorders, behavioral medicine, learning and neural plasticity.

- **David Shapiro, Ph.D.** – Will discuss his seminal work on effects of mood, social stress, and coping styles on blood pressure in everyday life, its implications for risk and treatment of hypertension, and the current state of behavioral treatment of hypertension. Dr. Shapiro received the PhD in 1953. First at Harvard, in 1974 he became Professor at UCLA where he directs the Psychophysiology Laboratory. He is known for contributions to psychophysiology, biofeedback, and behavioral medicine and has been honored by AAPB, SNR, American Psychosomatic Society, and Society of Behavioral Medicine.

- **Richard Gevirtz, PhD.** - Will speak on his recent work conditioning trigger point activity to decrease pain and other recent discoveries. Dr. Gevirtz is a professor in the Health Psychology Program at the California School of Professional Psychology at Alliant International University in San Diego. He has been involved in research and clinical work in applied psychophysiology for the last 25 years. His primary interests are in understanding the physiological and psychological mediators involved in disorders such as chronic muscle pain and gastrointestinal pain.

- **Adam Clarke, Ph.D.** – Will discuss his new work on QEEG studies with ADHD patients. Dr. Clarke completed his Bachelors degree in 1989, Master in Psychology in 1992 and PhD in 1999. Following the Masters, he worked for 4-5 years in a pediatric ADHD clinic. Currently, Dr. Clarke is a Research Fellow at the University of Wollongong, where his specializes in the electrophysiology of ADHD.

- **Peter Kaufman, PhD** – Will tell us about ways to design randomized clinical trials involving behavioral interventions.

- **Sharon Lewis, RN, PhD, FAAN** - Will present an overview focusing on the neurochemical links between the nervous system and the immune system, describing how stress can alter the immune system, and discussing clinical evidence of the relationship between stress and immunosuppression. Sharon Lewis, RN, PhD, FAAN is Professor, School of Nursing and Medicine and Castella Distinguished Professor at the University of Texas Health Science Center – San Antonio and Clinical Nurse Scientist at the South Texas Veterans Health Care System. She is an experienced researcher in the area of biobehavior and immunology.

- **Susan Middaugh, PhD, PT** – Will discuss her work on postural correlates of headache, arm, shoulder and upper back pain. Dr. Middaugh is a professor in the Departments of Anesthesia and Rehabilitation Science at the Medical University of South Carolina where she developed, and directed, the Multidisciplinary Pain Rehabilitation
Program and the Clinical Biofeedback Program. Dr. Middaugh’s research is focused on EMG biofeedback for treatment of neuromuscular and musculoskeletal disorders. She is Past-President of AAPB.

- **Yuji Sasaki, MD, PhD** – Will discuss the multitude of international studies on autogenics – especially as related to respiration.

  Dr. Sasaki is President of the Japanese Society of Autogenic Therapy, Vice-President of the World Council for Psychotherapy, Professor, Komazawa University; Professor Emeritus, University of Tsukuba, and President of the Japanese Union of Psycho-Medical Associations.

- **James Gordon, MD** – Will discuss how well alternative medicine is being accepted by the government and the standard medical communities.

  Dr. Gordon is the Founder and Director of the Center for Mind-Body Medicine in Washington, DC and is a Clinical Professor in the Departments of Psychiatry and Family Medicine at the Georgetown University School of Medicine. Dr. Gordon recently served as Chairman of the White House Commission on Complementary and Alternative Medicine Policy. He also served as the first Chair of the Program Advisory Council of the National Institutes of Health’s Office of Alternative Medicine and is a former member of the Cancer Advisory Panel on Complementary and Alternative Medicine of NIH.

**Symposia already accepted include**

- Alternative healing techniques, optimal performance, hypnosis, new psychophysiological measurement approaches, cross-cultural practices, and EEG mapping.

A major symposia on insurance coding and issues is being organized by Robert Whitehouse, EdD.

**Students**, please note that there is a new award for the best student presentation – a new multi-channel biofeedback system! There are also a number of events especially designed for you including a round table / box lunch where you can get together with other students and outstanding members of the field.

**The meeting is in Jacksonville Florida.** Jacksonville is on the St. Johns river in the northeast corner of the state – near the Atlantic, about 30 minutes from the Georgia border, and three to four hours from Orlando. It has major medical research facilities but, according to some of our members who live there, has a small town feeling. The hotel is located on the river adjacent to a river walk. Many restaurants, shops and a few bars with music, dancing entertainment are nearby. Sounds like a really great place to relax and have some fun. If you would like to check out Jacksonville, visit their website at [www.aapb.org](http://www.aapb.org) for up-to-date information and details.

Your program committee members are: Adam Burke, Paul Lehrer, Vince Monastra, Denise Olive, Fred Shaffer, Rich Sherman, Noland White, and Carolyn Yucha.

Please contact me at rsherman@nutenet.com if you have any questions, comments, etc.

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**Rich Sherman, Program Chair**

See you in Jacksonville!

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### Schedule summary

**Site: Jacksonville Florida**

**Workshops:** Wednesday, March 26, – Thursday, March 27, 2003 and Sunday afternoon, March 30, 2003

**Scientific Presentations:** Friday AM – Noon on Sunday.

**Short-courses:** The short courses are on Friday and Saturday mornings.

**Symposia and Talks:** These are on Friday, Saturday, and Sunday.

**Posters:** Posters will be set up and presented on Saturday.
In response to our certificants and to changing needs of the field, BCIA announces a modification of its Ethical Principles in order to clarify its policy regarding the independent practice of biofeedback.

Because biofeedback is an unlicensed modality employed by many different professions, certification plays a key role in defining competence to provide professional services. BCIA was founded to establish and maintain professional standards for the provision of biofeedback services and to certify those who meet these standards. The question of whether the independent provision of biofeedback should be limited to those with a state license in a health care profession has long been a topic of discussion among BCIA certificants.

In March 2002, the BCIA Board reaffirmed its long-standing policy that the treatment of medical and psychological conditions requires the demonstration of professional competence as defined by local, state, and federal licensing laws. Certificants who are not licensed or credentialed to practice independently must seek appropriate supervision according to applicable laws and professional codes.

The BCIA Board also recognized that there may be biofeedback applications that do not involve medical or psychological disorders and that may or may not be subject to federal, state or local law, e.g., athletic or peak performance applications. BCIA does not proscribe the independent practice of biofeedback for such applications. However, ethical practice requires that the practitioner abide by local, state, and federal laws relevant to their application of biofeedback procedures, as well as to the ethical codes of their profession or occupation.

The revision of the BCIA Ethical Principles accommodates the distinction between biofeedback applications for med-
ical and psychological disorders and other applications of biofeedback procedures. The relevant revisions to the Ethical Principles occur in Section B (Competence) as follows:

BCIA certificants recognize the boundaries of their competence and operate within their level of competence, using only those biofeedback techniques in which they are trained and experienced. They also recognize the proper limitations of biofeedback and inform all concerned parties about the clinical utility of particular procedures, possible negative effects, and whether the procedures are experimental or clinically verified. BCIA certificants remain current on knowledge concerned with scientific and professional applications of biofeedback in those areas in which they practice.

1. BCIA certificants should operate within applicable local, state, and federal laws as well as in accordance with the ethical principles of their profession/occupation. BCIA certification is not a license to practice.
2. The treatment of medical or psychological conditions requires the demonstration of professional competence as defined by applicable local, state, and federal licensing/credentialing laws.
3. It is the responsibility of certificants who are not licensed or credentialed to practice independently to seek appropriate supervision according to applicable state laws and professional codes/regulations.
4. It is the responsibility of BCIA certificants to seek and obtain appropriate training and supervision when providing services in areas in which they are not competent.
5. Misrepresentation of one's qualifications, training, experience, degrees, and/or specialty is a violation of BCIA ethics.

All BCIA certificants upon initial certification, as well as upon recertification, must attest that they have read and will abide by the BCIA Ethical Principles; by all local, state, and federal laws regulating their use of biofeedback procedures; and by their professional codes of conduct. The entire Ethical Principles can be found on the BCIA website; a hard copy may be obtained from the BCIA office.

Andrew Crider, Ph.D.
Past Chair, BCIA Board of Directors
Judy Crawford
Director of Certification

Facts of Life

AAPB is suffering from financial problems, similar to those now faced by most voluntary organizations. We are planning a number of initiatives that could increase membership and revenues, and have already made substantial cutbacks with minimal impact on services and activities. However, these are not sufficient to keep AAPB functional for the long term. For example, our fall board meeting this year was carried out by telephone conference rather than in person, for most board members. Any further cuts will necessitate some uncomfortable cuts: our section and division meetings, our publications, or our publicity, referral, and advocacy efforts. We note that a large part of our budget reflects our staff management and administrative fees. These are less than those of comparable groups, while we receive superior service. Perhaps some of this service could be replaced by increased volunteer activity (perhaps from each of you – are you ready?), but the experience of other organizations suggests that this will not work well.

We realize that the charges must be increased for one particular AAPB service: granting continuing education (CE) credits for AAPB events, a service that is particularly expensive to provide. Accreditation of our programs comes from APA, ANA and CME. The administrative paperwork requires a lot of time from our staff, which impacts AAPB’s budget. We are planning to save some money by computerizing some of this paperwork (including the examinations), but our fees still do not come close to paying the full costs. Please note that our new charges for CE credits will still be below those charged by our various sister organizations: $43 for the entire spring conference (approximately 40 hours). That equates to about $1 per hour of CE. In comparison, APA charges $10 per credit.

Another very large budgetary item can easily be erased if a large proportion of our meeting attendees stay at the convention hotel. If this happens, AAPB does not have to pay for the conference facilities we use during the meeting. This saves us tens of thousands of dollars. Conversely, if we do not meet our “quota” of rooms, we must make up the difference, either by raising fees or by cutting services. To help our members with their personal budgets, AAPB will make special efforts to help put “roommates” together for the meetings. Please take advantage of this service. You will be amply compensated by the enjoyment you will get by staying at the beautiful Adams Mark hotel in Jacksonville. You will be able to easily avail yourself of the early morning and late evening events planned for the meeting, feel literally surrounded by convention events, and have more serendipitous interchanges with colleagues and friends. These, after all, are what make the convention experience both enjoyable and profitable for most of us.

You also will have the satisfaction of having helped your organization continue to survive as a source of excitement, learning, networking, opportunities, and professional support. I am looking forward to seeing you there.

Paul Lehrer
President, AAPB
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The university is located in Denton, Texas just 30 miles north of Dallas and Fort Worth. If you are interested in studying biofeedback and/or neurofeedback and working toward a graduate degree in counseling, contact:

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Valdeane Brown: The Period 3 Approach 4 hrs.

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Nancy White. Ad discount $249 reduced from $269

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info@futurehealth.org www.Futurehealth.org
**Futurehealth’s Winter Brain, Optimal Functioning & Positive Psych Meeting**

**Palm Springs CA Jan 24-28, 2003  www.brainmeeting.com** See other pages for workshop and registration info

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<th>Jan 24 Friday Theme: Eclectic</th>
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<tr>
<td>Evening 7:30 PM Lectures, Panels</td>
</tr>
<tr>
<td>Rob Kall: If you don't kill Your client/patient, you haven't done your job.</td>
</tr>
<tr>
<td>Joel Lubar, Ph.D. Low Resolution Electromagnetic Tomography (LORETA) of Cerebral Activity in Chronic Depressive Disorder</td>
</tr>
<tr>
<td>Corydon Hammond, Ph.D. Update on Treating Opiates.</td>
</tr>
<tr>
<td>George Van Hilsheimer, Ph.D: E.T. Go Home! BF approach to Essential Tremor</td>
</tr>
<tr>
<td>Peter Van Deusen Effective Protocol Selection without OEEG Technology Update: vendors show their new hardware and software</td>
</tr>
<tr>
<td>Ed May a psychophysiological indicator of precognition</td>
</tr>
<tr>
<td>Ken Blum Reward Deficiency Syndrome: Neurogenetic Aspects</td>
</tr>
<tr>
<td>Tom Collura Practical alternatives for remote neurotherapy. How do we reach the home, school, office?</td>
</tr>
<tr>
<td>Sember Fisher The fear protocol. Theory of FPO2 and the implications of new clinical data</td>
</tr>
<tr>
<td>Sig Othmer Dynamic vs. static protocols - The continuing search for balance.</td>
</tr>
<tr>
<td>Sue Othmer Update on frontal &amp; prefrontal training and inter-hemispheric training.</td>
</tr>
<tr>
<td>David Siever The Enigma of Sub-decal Entrainment</td>
</tr>
<tr>
<td>Simultaneous Panels - Rosi, -NCPro, -Brainmaster, Procorp (multiple track, i.e., at same time)</td>
</tr>
<tr>
<td>Naras Rhat, M.D. Reversing Heart Disease: Integrated approach</td>
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</tbody>
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<tr>
<th>Jan 25 Saturday, Theme: ADHD/ Autistic Spectrum</th>
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<tbody>
<tr>
<td>Ed Castro The Neurotherapy Full Court Press. Hershel Tomin Plenary: Brain oxygenation proportionally improves Variables of Attention. David Siever T3 as a Determinant in Distinguishing Chronic Fatigue Syndrome in Identical Twins.</td>
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<tr>
<th>Jan 26 Sunday: Optimal Functioning, Positive Psych.</th>
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<tr>
<td>8:00 AM BCIA EXAM</td>
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<tr>
<th>Jan 27 Monday Theme: Eclectic</th>
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<tr>
<th>Jan 28 Tuesday Theme: Eclectic</th>
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<th>Special Courses</th>
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<tbody>
<tr>
<td>Jan 22-23 Neurofeedback Intro With Joel &amp; Judith Lubar</td>
</tr>
<tr>
<td>Comprehensive training &amp; demonstration course on EEG Evaluation and Treatment of ADD/ADHD, Depression, Anxiety, Addiction, PTSD, Closed Head Injury and Other Disorders provides 16 hours BCIA approved credits toward EEG certification (16 hours).</td>
</tr>
<tr>
<td>Jan 27, 28 Rae Tattlenbaum The Peak Performer's Edge: Integrated Peak Performance Program, a five-part program that includes NeuroFB for physical, logical balance, open focus exercises, inner journey work, mental rehearsal, and coaching. Mon, Tues, afternoon &amp; evenings.</td>
</tr>
<tr>
<td>Jan 23 Foundations of NeuroFB Course with 10+ teachers. (15 weeks) including: Joel Lubar, Sig Ottmar, Anna Wise, Valdean Brown, Paul Swingle, Peter Van Deusen, Rob Kall, John Anderson.</td>
</tr>
<tr>
<td>Jan 23 The Evolution and Current Status of Mechanisms - Based Training Siegfried Othmer, Ph.D., Chief Scientist, The EEG Inst. (6 hr. course).</td>
</tr>
<tr>
<td>Jan 25 Thom Hartmann Attention Deficit Disorder: One Day to Transformation (4 hrs.)</td>
</tr>
<tr>
<td>Jan 28-29 Using Brainmaster 2.0 and Whole Brain EEG Assessment Without Doing QEEG: Tom Collura &amp; Peter Van Deusen starts at 9:00 and after 10:00: last class session.</td>
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</tbody>
</table>

**Hilton Palm Springs Resort** (across from the casino) for discount rates. Mention Futurehealth to get the $129 conference rate. Plus, get a $20 per night room rebate* from Futurehealth for each room night at the hotel. Cost per night is $109, after rebate*, an amazing price for a good hotel in Winter in Palm Springs, where rates can easily exceed $200. Register online at Hilton website http://www.hiltonpalm springs.com/ then click on GROUPS in the bottom left. Then enter the name Winter and the Password Brain. You'll be able to directly book your room at the $129 conference rate, without having to make a phone call. Price includes free tennis, hot tubs open past midnight, parking. *See brainmeeting.com registration rules for rebate rules/details.

**Futurehealth.org 211 N. Sycamore Newtown, PA 18940 215-504-1700 Fax 215-860-5374**
In the evolving field of healthcare, biofeedback, as a treatment and evaluation tool, is playing an increasingly more important role. Biofeedback is used by a diversity of health professionals to treat an ever-lengthening list of conditions. Health professionals such as psychiatrists, psychologists, nurses, physiatrists, physical and occupational therapists and physicians in various specialties have come to use biofeedback, either independently or as an adjunctive technique, with positive results.

The Expert Series is an on-going series of interviews with leading clinicians in the field of biofeedback sharing the insights and techniques they have acquired through their many years of practice.

Thought Technology is very pleased to be part of this educational project. For over 25 years, Thought Technology has been committed to making biofeedback more accessible through innovation in technology and educational initiatives.

The Expert Series interviewed Dr. Robert Nolan.

Dr. Robert Nolan is coordinator of Behavioral Cardiology Research at the University Health Network in Toronto, Canada, and is an accredited member of BCIA. He has chaired conferences on Cardiovascular Heart Disease, led professional workshops and made public and academic presentations.

He is a member of the Canadian Register of Health Service Providers in Psychology, a registered Psychologist with the College of Psychologists of Ontario and a member of both the Society of Behavioral Medicine and the Ontario Psychological Association. He consults regularly to national health care organizations.

"RSA is the natural cycle of arrhythmia that occurs through the influence of breathing on the flow of sympathetic and vagus impulses to the sinoatrial node."

Dr. Robert Nolan
What is Respiratory Sinus Arrhythmia (RSA)?
RSA is the natural cycle of arrhythmia that occurs through the influence of breathing on the flow of sympathetic and vagus impulses to the sinoatrial node.

The rhythm of the heart is primarily under the control of the vagus nerve, which inhibits heart rate and the force of contraction. When we inhale, the vagus nerve activity is impeded and heart rate begins to increase. When we exhale this pattern is reversed. The degree of fluctuation in heart rate is also controlled significantly by regular impulses from the baroreceptors (pressure sensors) in the aorta and carotid arteries. When RSA is enhanced through biofeedback, the goal is usually to reinforce the natural feedback activity of the baroreceptors through our breathing pattern.

Why is heart rate variability such an important factor?
HRV is important because it provides a window to observe the heart’s ability to respond to normal regulatory impulses that affect its rhythm. A primary focus of clinical work and research is in observing or modifying the balance in regulatory impulses from the vagus nerve and sympathetic nervous system. Some researchers are focussing attention on other factors that regulate the heart, such as chemoreceptors, thermoreceptors, and the renin-angiotensin system.

There are several prospective studies that have shown that HRV independently predicts mortality within the initial two years following a heart attack.

Similar research has demonstrated the clinical importance of HRV for patients with other cardiac conditions.

How does age and health affect HRV?
We have good evidence that heart rate variability is affected by several factors such as age and health status. HRV decreases with age. It is also lower among people who have an inactive lifestyle and among those who have medical conditions such as coronary heart disease, hypertension and diabetic neuropathy.

Does age and health affect RSA as well?
That is an important question. Yes, definitely, age and ill health would affect the range that you observe in beat-to-beat intervals related to RSA. For example, after a heart attack or with congestive heart failure, there is a phenomenon called “vagal withdrawal”, which means that the vagus nerve is inhibited from slowing the activity of the sinoatrial node and from buffering the degree of contraction throughout the cardiac tissue (myocardium). This occurs for survival purposes. The important question for biofeedback practitioners is whether or not RSA biofeedback can significantly assist a person in increasing their heart rate variability and overall cardiac health.

A related issue for assessment, treatment planning and evaluation, is that we need to use a different set of HRV norms when we are working with persons who are older or who have a medical condition that affects heart health.

How do you measure HRV?
HRV can be assessed by time domain or frequency domain indices. The time domain measures are based on the amount of time, in milliseconds, in the beat-to-beat intervals of the heart or from the differences between the normal beat-to-beat intervals. Technically, the beat-to-beat interval is defined as the time in milliseconds between normal “R” to “R” waves on an EKG. The standard deviation of the normal RR interval (SDNN) is one of the most important and clinically meaningful time domain measures. The gold standard for time domain measures is to examine a 24-hour assessment of HRV that has been recorded with a Holter monitor. A brief five minute assessment of HRV has also been found to be
clinically valid and meaningful. One essential guideline that biofeedback therapists need to keep in mind is that it is NOT valid to compare HRV estimates that are derived from different time durations, as variability is significantly influenced by the length of the signal that is sampled. Frequency domain measures of HRV provide information on the frequency distribution of the components of HRV using power spectral density analysis. Spectral analysis of HRV is characterized by four main components: the high frequency (HF) component (0.15-0.40 Hz) measures the influence of the vagus nerve in modulating the sinoatrial node.

The low frequency (LF) component (0.04-0.15 Hz) provides an index of sympathetic effects on the heart, particularly when these are measured in normalized units. The very low frequency (VLF) component (0.003-0.04 Hz) reflects the influence of several factors on the heart, including chemoreceptors, thermoreceptors, the renin-angiotensin system, and other non-regular factors. Almost all of the variability from a short-term spectral analysis of HRV is captured in these three components. An ultra low frequency (ULF) component (0.003 Hz) can also be observed in the HRV spectrum analysis of a longer sample. Unfortunately, a clear interpretation of the ULF component is not yet available to us. During the 24-hour recording of HRV, approximately 90% of variability in the heart’s rhythm will be distributed within the ULF and VLF.

Will a client feel better from HRV biofeedback?

When people have more heart rate variability it is because there is a better balance in the ongoing sympathetic and parasympathetic influence on the heart. Generally, people have greater heart rate variability when they are relaxed and when they are breathing in a regular or slow pattern.

In short, HRV biofeedback training appears to offer a more precise method for helping clients to moderate the heightened sympathetic activity that is associated with stress, anxiety, and dysphoric mood.

There have been several small-scale studies that have provided supporting evidence to bolster this hope for HRV biofeedback. At the same time though, we need larger scale clinical trials to firmly establish HRV biofeedback as an evidence-based treatment for reducing negative effects or for improving heart health.

What type of feedback do you give to clients?

In order to do HRV biofeedback training you need to use an EKG module, in which the normal beat-to-beat interval in heart rate can be derived and from which the variation in heart rate (normal RR intervals) can be measured. The respiration module is also necessary to measure the rhythm of breathing and its influence on HRV. It is advisable to use complementary biofeedback modules that assess peripheral vascular activity. A photoplethysmograph (blood volume pulse sensor) and thermistor are quite useful for this purpose. In fact, there is some exciting research that has emerged regarding wave form analysis of the BVP signal from the photoplethysmograph and this new analysis has great potential for enriching our interpretation of HRV.

Measures of heart rate variability (HRV) are a reliable reflection of the many physiological factors modulating the normal rhythm of the heart. In fact, they provide a powerful means of observing the interplay between the sympathetic and parasympathetic nervous systems.

A growing number of studies indicate that increased variability in the heart’s interbeat interval is physiologically desirable.

CardioPro is a specialized biofeedback application that provides a sophisticated array of feedback tools for monitoring HRV and Respiratory Sinus Arrhythmia (RSA); it is an effective adjunct to any relaxation and self-regulation training program.

Real-time audio and visual feedback on the standard deviation of the IBI provides an immediate indication of changes in heart rate variability.

A programmable respiration pacer allows the user to define breathing cycles that include inspiration and expiration time as well as breath holding pauses.

The Statistical Report printout of standard calculations* includes power analysis for the LF, HF and VLF components of the HRV spectrum, SDNN, NN50 and PNN50.

CardioPro’s export function for the IBI data ensures compatibility with third-party data analysis software packages.

A true 32-bit Windows™ application, CardioPro offers the best combination of user-friendly graphical interface and powerful features to make it the most competitive software package available for respiration, RSA/HRV biofeedback and research.

* Statistics are calculated as recommended in the Specialist Report on Heart Rate Variability Standards of Measurement, Physiological Interpretation and Clinical Use. Published by the Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology (European Heart Journal 1996; 17, 354-95).

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1-800-361-3651 www.thoughttechnology.com

Technology for Better Health
**Introduction to BioGraph®**

Maximize the full clinical potential of your system in this one-day workshop on BioGraph. Leading clinicians in the field and technically trained experts emphasize hands-on learning in a no stress atmosphere as they guide you in the key processes of customizing your system. In addition to learning the basics of this powerful physiological tool, you will gain the confidence to build clinically relevant screens, protocols and reports that are best suited to your particular needs.

*These courses are approved by the BCIA to provide 7 hours of Category A, accredited continuing education credit for BCIA recertification.*

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**Advanced BioGraph® with Health Professionals**

Take your knowledge of BioGraph® to the next level with the two-day advanced workshop. These workshops are taught by leaders in the clinical field who use BioGraph® on a daily basis. Learn not only how to use the more advanced features but how they are relevant in your practice.

*These courses are approved by the BCIA to provide 14 hours of Category A, accredited continuing education credit for BCIA recertification.*
This workshop will cover the scientific basis of EEG biofeedback training and outline areas in which it is being applied. The main focus is how to use the ProComp+/BioGraph system to do EEG profiles to guide intervention, and to produce both interesting and effective feedback. It includes how to set up 1 and 2 channel EEG biofeedback interventions combined with regular biofeedback (including RSA, peripheral temperature, EMG and skin conductance) and how to combine this with training in metacognition to optimize performance. It will include how to set up screens and feedback for other conditions associated with primary difficulties in focus, concentration, impulsivity, learning and memory. Dr. Thompson will be assisted by her husband, Michael Thompson, a retired physician, past associate professor and author of more than 50 professional publications. He is a former residency training director at the University of Western Ontario.

Lynda Thompson, Ph.D., BCIA-EEG, is a Registered Psychologist with experience in teaching, clinical psychology, school psychology and ownership of learning centers. Since 1993 she has been Executive Director of the ADD Centre, a private service devoted to helping people improve behavior and learning. The clinic also deals with clients who have other disorders associated with poor attention including epilepsy, Asperger's Syndrome, learning disabilities, Tourette's syndrome, closed head injury, autism, mood disorders, and anxiety. Her doctoral dissertation (1979) dealt with self-esteem in hyperactive children treated with methylphenidate. She is co-author with pediatrician William Sears of "The ADD Book: New Understandings, New Approaches to Parenting Your Child," published by Little, Brown & Co. of New York.

This workshop will cover the development of screens for neurofeedback assessment and treatment of disorders for which there is clear published evidence for efficacy. Dr. Lubar will show how to use the ProComp+/BioGraph system in setting up screens, including animations, artifact rejection, setting of thresholds, and use of the statistics to assess performance. The latter will include trend reports over sessions. This workshop will cover the background research for these areas and the current status of their development. The workshop will emphasize the use of the BioGraph software and the ProComp+ for work with feedback and assessment of other physiological modalities including temperature, EMG, skin conductance, respiration, and heart rate. This discussion will include psychophysiological stress profiling. The latter can be illustrated by a protocol which has been developed for stress analysis.

Dr. Joel Lubar received his B.S. and Ph.D. from the Division of the Biological Sciences and Department of Biopsychology at the University of Chicago. He has published more than 100 papers, many book chapters and eight books in the areas of Neuroscience and Applied Psychophysiology. He is a Full Professor at the University of Tennessee. He is past President of the EEG Division of the Association for Applied Psychophysiology and Biofeedback, and was President of the organization in 1996-1997. He is currently President of the International Society of Neural Regulation (ISNR). Joel Lubar is Co-Director of the Southeastern Biofeedback and Neurobehavioral Institute. His major focus of work involves the use of EEG biofeedback for ADD/HD, depression, seizure disorders, Tourette’s and related tic disorders, and certain specific learning disabilities.

Please Note:
ProComp+™ hardware, BioGraph® software & laptops will not be provided. It is recommended that you bring the complete system with a laptop computer to the course.
Introduction to BioGraph Registration

Louise E. Marks M.S., O.T.R.
Jan. 24, 2003 - Sacramento, CA
Jan. 9, 2004 - Boulder, CO

Didier Combatalade, D.C.
Thought Technology Staff
Feb. 28, 2003 - San Antonio, TX
May 9, 2003 - Cincinnati, OH

Frank DeGregorio
Thought Technology Staff
July 11, 2003 - Toronto, ON
Aug. 15, 2003 - Atlanta, GA

Cancellations for any reason at any time will receive credit towards a future course less an administration fee of $50. Thought Technology reserves the right to cancel any course with full refund. Deadline for registration is two weeks prior to the course date.

Name: 

Title: 

Address: 

City: State/Province: Zip Code: 

Tel: Fax: E-mail: 

How did you hear about our workshop? 

Do you own the ProComp+™/BioGraph® system? Yes No 

Workshop Fee
Registration is valid only when full payment is received. Course Fee includes all handout materials and light refreshments. Note: In Canada, federal and/or provincial taxes apply. 

US $125 CDN $185 

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Name on Credit Card: 

Signature of Card Holder: 

For more information
Vickie Gaves
Tel: (800) 361-3651 ext. 135
(514) 489-8251
Fax: (514) 489-8255
workshops@thoughttechnology.com

Participants will receive a certificate of completion from Thought Technology Ltd.
The Introduction to BioGraph workshop (1 day) will cover the basic operation of BioGraph software and the mechanics of customizing display screens and reports. The Advanced workshop (2 days) will teach participants how to use a variety of modalities: EEG (referential and bipolar), thermal, skin conduction, EMG, heart rate, respiration with a primary focus on the construction of appealing, effective display screens and reports based on specific biofeedback and neurofeedback. Additionally, the rudiments of BioGraph protocol development will be covered. Clinical applications addressed will be tailored to participants composition and there will be ample time allotted for hands on experience.

Louise E. Marks, M.S., O.T.R.

The instrumentation workshop taught by Helena Kerekhazi will help students to optimize their usage of BioGraph software. From basic to more sophisticated operations, students will have extensive hands-on practice, benefiting from her 23 years experience of teaching technology to adults at whatever level they have achieved. It will also provide students with opportunities to design and customize their own screens and reports. She will help you design your own screens, customize them to your patients and discuss the most effective protocols for your most challenging clients. Helena will motivate you to feel proficient and comfortable with your system. She also provides consultation in developing a successful clinical EEG biofeedback practice.

Helena Kerekhazi, M.S. Ed.

Dr. Sideroff integrates the training of the BioGraph system with his unique clinical experience, including the psychological basis for stress management. You will learn how to use the individual modalities such as temperature, EMG, skin conductance, respiration, and heart rate, how to combine them to perform a stress profile, and to set up a treatment plan. You will also learn how to use the system to develop neurofeedback interventions for a wide variety of disorders. Both monopolar and bipolar configurations will be learned. The workshop will show you how to develop clinical screens and the use of animation for best results; and how to look at your results, including trend reports. Use of RSA will also be presented.

Stephen I. Sideroff, Ph.D.

Louise E. Marks, M.S., O.T.R., BCIA-C, is a masters level occupational therapist with 17 years experience in the field of applied psychophysiology and biofeedback. She is BCIA certified in both EEG and general biofeedback. Her experience and special interests include anxiety disorders, chronic pain syndromes, elimination disorders, substance abuse, enhanced awareness and personal growth. She maintained a clinical practice in Boulder, CO, supervises biofeedback trainees, develops software (protocols and training screens) for BioGraph users, and consults with healthcare facilities and providers regarding biofeedback related program development.

Helena Kerekhazi, M.S. Ed. is the founder of BioCare, Inc., a clinical neurofeedback practice in Scarsdale, New York. Here she treats ADD; ADHD; learning disabilities; behavioral problems; Tourette's Syndrome; closed head injuries; anxiety; pain and stress; panic attacks; addiction; compulsive disorders; autism; eating disorders; epilepsy; cerebral palsy and other bio-behavioral symptoms, as well as trains for overall peak performance.

Dr. Sideroff is an Assistant Professor in the Department of Psychiatry and Biobehavioral Sciences at UCLA's School of Medicine. He is the founder and former Director of Santa Monica Hospital's "Stress Strategies" center and author of the popular audiotape programs, "Stress Control with Biofeedback" and "Journey into Sleep". He has been involved in neuropsychological and psychophysiological research since 1970. His earlier published research has been in neural control of learning and memory, as well as cardiovascular functioning and conditioned aspects of drug addiction. He has consulted with amateur, collegiate and professional athletes including the US Men's National Soccer team, the UCLA women's golf team and the Nike Women's Beach Volleyball team. He is currently researching the use of neurofeedback in substance abuse, chronic pain, sports, attentional problems, anxiety and depression.
Advanced BioGraph with Health Professionals Registration

Helena Kerekhazi, M.S., Ed.
Mar. 22-23, 2003 - Hartsdale, NY
Nov. 22-23, 2003 - Hartsdale, NY

Lynda Thompson, Ph.D.
Michael Thompson, M.D.
Jul. 12-13, 2003 - Toronto, ON
Aug. 16-17, 2003 - Atlanta, GA

Louise E. Marks, M.S., O.T.R.
Jan. 25-26, 2003 - Sacramento, CA
Jan. 10-11, 2004 - Boulder, CO

Joel F. Lubar, Ph.D.
Mar. 1-2, 2003 - San Antonio, TX
May 10-11, 2003 - Cincinnati, OH

Stephen I. Sideroff, Ph.D.
Nov. 15-16, 2003 - Las Vegas, NV

Cancellations for any reason at any time will receive credit towards a future course less an administration fee of $50. Thought Technology reserves the right to cancel any course with full refund. Deadline for registration is two weeks prior to the course date.

Name: ________________________________

Title: ________________________________

Address: ________________________________

City: __________________ State/Province: __________________ Zip Code: ________

Tel: __________________ Fax: __________________ E-mail: __________________

How did you hear about our workshop? ________________________________

Do you own the ProComp+/BioGraph® system? Yes ☐ No ☐

Workshop Fee

Registration is valid only when full payment is received. Course fee includes all handout materials and light refreshments. Note: In Canada, federal and/or provincial taxes apply.

US $425 ☐ CDN $620 ☐

Method of Payment

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For more information
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Participants will receive a certificate of completion from Thought Technology Ltd.
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clinical practice
using ProComp 2™
with BioGraph®

The ProComp 2™ is a compact, powerful, 2 channel version of Thought Technology’s ProComp+™ encoder, which can be easily worn on a head band or a shirt collar. ProComp 2™ contains a built-in EEG sensor – requiring only an extender cable for EEG monitoring and biofeedback. It also provides a second channel for use with any of the seven available ProComp+™ sensors.

ProComp 2™ is available to owners of the ProComp+™ system. Combine ProComp 2™ with the tried and trusted BioGraph® software and you will have a whole new world of possibilities, all in the palm of your hand!

For more information
call 1-800-361-3651
### 2003 Winter Brain Meeting Registration Details

You can pay by check, credit card or Paypal

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<td>Full Winter Brain Mtg Jan 24-28 Plenary Meeting (includes optimal functioning mtg.)</td>
<td>679</td>
<td>719</td>
<td>749</td>
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<tr>
<td>one Day Intro to EEG Biofeedback pre-conf Jan 23, with at least 10 teachers, including: Joel Lubar, Lynda and Michael Thompson, Sig Othmer, Anna Wise, Valdeane Brown, Paul Swingle, Peter Van Deisen, Rob Kall.</td>
<td>179</td>
<td>189</td>
<td>199</td>
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<td>Optional 10 hr. Workshop package</td>
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<td>245</td>
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<td><strong>Best Deal</strong></td>
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<tr>
<td>Combination Winter Brain 2003 &amp; one day (Jan 23) EEG BF Foundations Course</td>
<td>729</td>
<td>769</td>
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<td><strong>Best Deal for First Timers</strong></td>
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<td>Combination Winter Brain 2003 &amp; one day EEG BF Foundations Course &amp; 10 Hr. Workshop Package</td>
<td>899</td>
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<td>One day registration</td>
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<td>Three day registration</td>
<td>529</td>
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<tr>
<td>Optimal Functioning 1 day program Jan 26, 2003 (already included in Winter Brain Meeting fee)</td>
<td>229</td>
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and focused attention, whether or not it is welcome during any given lesson or performance. While these organizations and changes are providing rationale for some parents to enroll their children in piano lessons, it remains to be seen how the emotional and psychological outcomes will interact with these changes.

Another consideration is the time-honored idea of pushing children, especially if they show early evidence of giftedness (Freeman, 1997). The idea is not new despite warnings from developmental and child psychology and psychiatry about the prevalence of emotional problems associated with it (Hills, 1987). Many of the artists we know of today did not play professionally as children (e.g., Itzhak Perlman, Maurizio Pollini, Vladimir Ashkenazy, Alicia de Larrocha) despite the fact they were identified as gifted and did develop their instrumental skill in childhood. In contrast, other artists such as Ruth Slezynska, Lorin Hollander and Martha Argerich had full practice and performing schedules as children and say that they cannot bring themselves to play as adults. Albeit anecdotal evidence is prevalent for both ‘sides,’ the controversy over whether a gifted child should ‘realize’ all of his or her gifts goes on. Problems inherent in children acting like adults and skipping much of their childhood, however, are supported by research and a number of testimonials. It appears that it is stressful for all children, gifted or not, to do ‘too much’ and many pay a stressful price for it.

There is recent neurobiological evidence demonstrating that new learning in and of itself requires considerably more cortical involvement area than past memory consolidation for children and adults alike, including processes such as visual attention (O’Leary, Andreasen, Hurtiz, Torres, Flashman, Kesler, et al., 1998), encoding of complex visual information (Montaldi, 1998), rhythmic timing (Perhune, Zattore, & Evans, 1998), melodic processing (Zattore, 2001), motor skill activation (Rioult-Pedotti, Friedman, Hess & Donoghue, 1999) and skill development (Smith, McEvoy & Gervins, 1999) with a great deal of prefrontal activation overall (McIntosh, Rajah, & Lobaugh, 1999). It has also been shown that, in child music students, new learning demands a high degree of energy resources (Todorov, 1993). In a study of anatomy of cognitive development, children between 8 and 13 years of age demonstrated an average of 60% greater cortical activation during verbal learning than adults (Gaillard, Hertz-Pannier, Mott, Barnett, LeBihan & Theodore, 2000). Currently the question about whether the effect is due to lack of experience or an under-developed central nervous system has not been answered (Casey, 2002). However, it is clear that children do activate more cortical area than adults for new learning, music study demands more overall activation than other activities (Gazzaniga, Ivy & Mangun, 1998) and we do not yet know how much activation is too much. To the degree that the evidence for adult stress-related medical problems starting in childhood is accurate, it is possible that these sources (new learning) may supply a portion of the variance in performing arts stress-related problems. If children are being called upon to attend, learn and consolidate at the rate of an adult, it may be that those learning situations are producing stress in children (Hollander, 1984).

Biofeedback Self-Regulation for Children

A number of psychophysiological stress management techniques have begun to be used with children in recent years. Breathing techniques have been implemented in the pediatric ward for pain management (Rusy & Weisman, 2000) and in clinical practice (Kajander & Peper, 1998). EEG techniques are well known for the management of attention and hyperactivity and other feedback modalities such as thermal feedback are likewise used for children (Scharff, 2002). The entire Fall 1998 issue of Biofeedback was devoted to biofeedback for children, with an excellent literature review of pediatric biofeedback applications by Culbert & Reaney. In another review article, Culbert and colleagues (1996) describe a number of strengths and weaknesses in doing biofeedback with children, listing the interest level and openness as positive parameters in working with children. According to their literature review, biofeedback has been done for a large number of problems (headache, ANS problems, seizures, impulse control, etc.) for which biofeedback has aided adults.

Enactive attainment, or simply doing what one’s training implies, is one important aspect of self-efficacy. Currently, in pedagogical practice, there is only one teaching method which formally mentions the idea of practicing performing for any reason (the Suzuki method), and that method focuses on the benefits of group instruction rather than the possible benefits of performance practice. While it appears that many teachers are candid about their own observations of music performance anxiety (MPA) among their own students, there is currently very little knowledge available to music teachers to help those students. Movement therapies, such as the Alexander technique and Feldenkrais, have been reported by musicians to offer some psychological relief from anxiety even though there is currently no empirical evidence to support that notion. Nonetheless, these and other ‘therapies’ to assist the afflicted musician appear regularly, with the common denominator being the overt intent of kinesthetic re-education. Paradoxically, many of the discussions in the arts literature about such movement therapies inevitably include a discussion about anxiety reduction and increase of positive affect. It is not known how many private teachers use these techniques in the studio, but we do know that these techniques require substantial training and training cost, which is often not available to the private teacher.

We therefore hypothesized that abdominal breathing may be a quick, inexpensive and ‘user-friendly’ way to help piano students learn to self-soothe for any reason, whether they are in a musical performance situation or in any other stressful situation. Since abdominal breathing techniques are a necessary part of vocal instruction, most instrumentalists are familiar with them and trust the efficacy of these breathing techniques. We believe that breathing techniques may, therefore, be accepted and utilized in private practice (individual instruction) because of the ease and utility, and we hypothesized that children would...
likely be able to learn abdominal breathing more quickly than adults and realize the effects of it more saliently than adults.

**Methods**

**Participants**

Participants were 30 piano students, 8 males and 22 females, from the author’s piano academy. Because the sample was compared between developmental levels, further demographic information is reported by developmental level (i.e., pre-operational, concrete operational and formal operational children) and total amount of piano study by developmental level. See table 1 for the sample demographics.

Participants were notified about the proposed study on a bulletin board for parents. They were given the NIMH biofeedback handout and another handout about how abdominal breathing can attenuate stress. The participation rate was 100%. Parents were asked to sign an informed consent form in behalf of their child or children.

**Materials and Setting**

The J & J I-330 was used for data collection and training. Since actual words often do not have the same meaning for children as they do for adults (Vygotsky, 1978), and because simply describing an event leaves out necessary detail, we utilized observational learning with verbal description, in the child’s words, to teach the child about abdominal breathing and how to go about it. We first constructed a model screen displaying heart rate and breathing rate, to model how to entrain heart rate with breathing. The child was shown the model and instructed to ‘make their screen look like that’ (see figure 1) after verbally instructing the child about what abdominal breathing is (see figure 2). The protocol is very similar to that used by Kajander and Peper (1998).

Hand temperature was chosen as the dependent variable because of its reliability and ease of use. Biofeedback measurement tends to greatly increase internal validity because it does not rely on verbal report and is therefore much more accurate (Gall, Borg, & Gall, 1996). Another feature of hand temperature is its reliability of sympathetic nervous system (SNS) measurement. Capillaries in the fingers receive only sympathetic (excitatory) postganglionic fibers; however, recent evidence indicates that some parasympathetic neurons have been found in sympathetic ganglia, which may indicate an inhibitory influence in postganglionic fibers (Adams, Victor & Ropper, 1997).

Of course, the child should wear loose clothes and be asked to wear them at the time of training.

Explain the protocol to the parents first, with or without the child present. Make sure the parent understands the nature of biofeedback and liken it to a fever thermometer. Most parents have either heard of, or do, abdominal breathing via yoga training. Explain how vasoconstriction works; most parents have also heard of the ‘fight-or-flight’ response. It is important to put the parents at ease because the child will be reacting to the parents’ reactions. You will be reaching the child through the parent.

Allow the child to hold and look at the sensors, and do so while the equipment is on. This desensitization becomes increasingly important as a function of age. The younger the child, the more important this step is. If the child appears afraid, put the sensors on the parent and allow the child to observe.

Ask the child if she has ever had her temperature taken by her mom or dad. Of course, she has, and tell her that this

![Figure 1](image1.png)

_Figure 1. A one-minute screen, depicting heart rate and respiration, used as a model for the participants. They were instructed to ‘make their screens look close to that.’_
(biofeedback) is the same thing. Ask the child whether the fever thermometer hurts. Of course, it does not, and make sure the child understands that the equipment will not hurt, either.

Take your time with the above steps, and repeat them, if necessary.

Attach the sensors in the usual manner. We used the dorsal portion of the middle finger, between the fingernail and the middle joint of the finger.

Ask the child to sit in a recliner and recline, or lie down, etc.

Place the sensors on the child, and then show the child the figure. Tell the child that you want him to ‘make the screen look like that’ (the figure) as much as possible.

We put a Beanie Baby® on the child’s abdomen (which the child kept), and the child was instructed to ‘make the Beanie Baby® go up and down; give it a ride.’ If the child had trouble, we demonstrated again what abdominal breathing is with one hand on our chest, the other on the abdomen, and asked the child to copy us.

The protocol lasted 10 minutes, with continuous hand temperature measurement throughout. We recorded the beginning and the end temperature.

We then conducted two psychological tests to determine the developmental level of the children in the study. Cognitive developmental level was measured to assess differences in hand temperature by cognitive developmental level. We used the standard Piagetian protocol of conservation testing to determine the difference between pre-operational and concrete operational children, and the Test of Logical Thought (TOLT) (Tobin, 1981) for concrete operational vs. formal operational children. The TOLT has a high split-half reliability (.85) and a strong criterion validity coefficient (.80). It measures 5 modes of formal reasoning: controlling variables and proportional, combinatorial, probabilistic and correlational reasoning.

Conservation Testing. Conservation testing was developed by Piaget et. al., to assess a child’s level of conceptual development, or cognitive developmental level (CDL). Pre-operational cognition is characterized by the organization of concepts into family types, while concrete operational thought is driven by abstract conceptual thinking (Vygotsky, 1978). Conservation is the awareness that two objects are equal and remain equal despite changes or alteration in perception of those objects (Papalia, Olds & Feldman, 2002). Preoperational children cannot conserve, while concrete operational children can conserve. The test yields a score ranging from 0 to 6 points for each child, providing a continuous measure of CDL. A score of 6 is required to be considered concrete operational. There is presently no battery of conservation tests and no reliability or validity quotients (Sattler, 1992) and therefore the test is more of a screening instrument than a psychometric test.

Data Analysis

Data were analyzed using SPSS, version 11 software (SPSS, Inc., Chicago, IL). The research question, to ascertain whether abdominal breathing techniques would be useful to lower physiological arousal (stress) in children who study piano, can be answered in two ways. First, a repeated measures analysis of variance was used to determine whether the group means differed pre and post-training; to evaluate the effect of breathing on hand temperature. The result was significant, $\eta^2 = .633$. We then conducted another repeated measures ANOVA using CDL as a between-measures variable, controlling for gender and number of months of piano study. The overall test was significant, $\eta^2 = .301$ (moderate effect size). Multiple comparisons revealed a significant difference between pre-ops and formal ops ($p = .011$) and between concrete ops and formal ops ($p = .127$). The Bonferroni adjustment for multiple comparisons was used to correct for multiple comparison error rate (see Figure 3).

Univariate ANOVAs were then employed to evaluate the difference in temperature within each developmental level. The pre-operational children’s hand temperature post-test was different, $\eta^2 = .635$, $p = .484$ (see figure 3).

Multiple Linear Regression Analysis. While an analysis of variance is used to compare two or more means to determine whether there is a significant difference between them and a repeated measures design compares those sets of means on sev-
eral occasions, this research technique does not allow one to assess the relationship between a dependent variable and an independent variable, or a dependent variable and several independent variables. Backward stepwise multiple linear regression was chosen to identify the best combination of variables in the study for prediction of hand temperature after biofeedback training. In backward stepwise regression all the independent variables are initially entered into the regression equation. Then, the impact of the removal of the single independent variable that reduces the $R^2$ by the smallest amount is determined. That process is continued until all remaining variables are significant (i.e., removal of any of the primary variables would cause a statistically significant reduction in the $R^2$). This process minimizes the interaction between independent variables and therefore identifies the best combination of variables for predicting the dependent factor or outcome.

We therefore conducted three backwards stepwise multiple linear regression analyses (MLR), using the participants’ hand temperature after the training ended (post-temp) as the dependent variable in the first analysis, the hand temp before training in the second analysis and the change in hand temperature pre to post in the third analysis. For the independent variables, amount of time in piano study, CDL, and gender were entered into each regression equation. MLR yields coefficients that reveal the degree of relationship between the IV’s and the DV, and it indicates the importance of each IV.

When each regression analysis was run, several regression equations were produced. In the first analysis, post hand temperature was the dependent variable. An equation was produced in which all independent variables predicted the children’s hand temperature post-training, $F(3,26) = 9.244, p = .000, R^2 = .52$. However, gender was a weak predictor and eliminated from the analysis. The second equation (gender eliminated) was significant, $F(2,27) = 12.493, p = .000, R^2 = .48$ (see Table 2) with CDL and months of study as strong predictors.

In analysis #2, the same predictors were retained with pre hand temperature as the dependent variable; three equations were produced. Equation #1 was significant with all three predictors, $F(3,26) = 4.692, p = .010, R^2 = .35$. In this equation, gender and months of study were weak predictors (see Table 3), with months of study being much weaker than gender. Equation #2 dropped months of study, $F(2,27) = 6.991, p = .004, R^2 = .34$. Equation #3 retained only developmental level as a strong predictor, $F(1,28) = 10.667, p = .003, R^2 = .28$ (see Table 3).

Analysis 3 produced two equations, using the same predictors as the other analyses with the change in hand temperature as the dependent variable. Equation #1 was not

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**Table 2. (Analysis 1). Standardized Beta Coefficients, t-test Results, Bivariate and Partial Correlations of the Predictors with Post Hand Temperature.**

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Standardized Beta Coefficient</th>
<th>t</th>
<th>Pearson Correlation</th>
<th>Partial Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Months Study</td>
<td>.355</td>
<td>1.981</td>
<td>-.201</td>
<td>.362</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.p = .058)</td>
<td>(.p = .144)</td>
<td>(.p = .058)</td>
</tr>
<tr>
<td>CDL</td>
<td>-.828</td>
<td>-4.556</td>
<td>-.635</td>
<td>-.666</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.p = .000)</td>
<td>(.p = .000)</td>
<td>(.p = .000)</td>
</tr>
<tr>
<td>Gender</td>
<td>.192</td>
<td>1.381</td>
<td>.317</td>
<td>.317</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.p = .179)</td>
<td>(.p = .044)</td>
<td>(.p = .179)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model 2 (gender eliminated)</th>
<th>Standardized Beta Coefficient</th>
<th>t</th>
<th>Pearson Correlation</th>
<th>Partial Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Months Study</td>
<td>.320</td>
<td>2.000</td>
<td>-.201</td>
<td>.364</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.p = .056)</td>
<td>(.p = .144)</td>
<td>(.p = .058)</td>
</tr>
<tr>
<td>CDL</td>
<td>-.421</td>
<td>-4.785</td>
<td>-.584</td>
<td>-.413</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.p = .000)</td>
<td>(.p = .000)</td>
<td>(.p = .000)</td>
</tr>
</tbody>
</table>

---

*Figure 3. Means of the sample by developmental level and time of testing. The two times were separated by ten minutes. The means are adjusted for months of study and gender.*
Table 3. (Analysis 2). Standardized Beta Coefficients, t-test Results, Bivariate and Partial Correlations of the Predictors with Pre Hand Temperature.

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Standardized Beta Coefficient</th>
<th>t (sig.)</th>
<th>Pearson Correlation (sig.)</th>
<th>Partial Correlation (sig.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Months Study</td>
<td>.132</td>
<td>.636 (.p = .530)</td>
<td>-.257 (.p = .085)</td>
<td>.124 (.p = .530)</td>
</tr>
<tr>
<td>CDL</td>
<td>-.561</td>
<td>-2.667 (.p = .013)</td>
<td>-.525 (.p = .001)</td>
<td>-.463 (.p = .013)</td>
</tr>
<tr>
<td>Gender</td>
<td>.256</td>
<td>1.591 (.p = .124)</td>
<td>.352 (.p = .028)</td>
<td>.298 (.p = .124)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model 2 (months of study eliminated)</th>
<th>Standardized Beta Coefficient</th>
<th>t (sig.)</th>
<th>Pearson Correlation (sig.)</th>
<th>Partial Correlation (sig.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDL</td>
<td>-.475</td>
<td>-2.985 (.p = .006)</td>
<td>-.525 (.p = .001)</td>
<td>-.463 (.p = .013)</td>
</tr>
<tr>
<td>Gender</td>
<td>.260</td>
<td>1.633 (.p = .114)</td>
<td>.352 (.p = .028)</td>
<td>.298 (.p = .124)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model 3 (months of study and gender eliminated)</th>
<th>Standardized Beta Coefficient</th>
<th>t (sig.)</th>
<th>Pearson Correlation (sig.)</th>
<th>Partial Correlation (sig.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDL</td>
<td>-.525</td>
<td>-3.268 (.p = .000)</td>
<td>-.525 (.p = .001)</td>
<td>-.463 (.p = .013)</td>
</tr>
</tbody>
</table>

Table 4. (Analysis 3). Standardized Beta Coefficients, t-test Results, Bivariate and Partial Correlations of the Predictors with Difference in Temperature.

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Standardized Beta Coefficient</th>
<th>t (sig.)</th>
<th>Pearson Correlation (sig.)</th>
<th>Partial Correlation (sig.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Months Study</td>
<td>.485</td>
<td>2.151 (.p = .041)</td>
<td>.088 (.p = .323)</td>
<td>.389 (.p = .041)</td>
</tr>
<tr>
<td>CDL</td>
<td>-.602</td>
<td>-2.633 (.p = .014)</td>
<td>-.302 (.p = .053)</td>
<td>-.459 (.p = .014)</td>
</tr>
<tr>
<td>Gender</td>
<td>.071</td>
<td>.407 (.p = .687)</td>
<td>.140 (.p = .230)</td>
<td>.080 (.p = .689)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model 2 (gender eliminated)</th>
<th>Standardized Beta Coefficient</th>
<th>t (sig.)</th>
<th>Pearson Correlation (sig.)</th>
<th>Partial Correlation (sig.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Months Study</td>
<td>.488</td>
<td>2.201 (.p = .036)</td>
<td>.088 (.p = .323)</td>
<td>.389 (.p = .041)</td>
</tr>
<tr>
<td>CDL</td>
<td>-.618</td>
<td>-2.787 (.p = .010)</td>
<td>-.302 (.p = .053)</td>
<td>-.459 (.p = .014)</td>
</tr>
</tbody>
</table>

In this equation, gender was a very weak predictor (see Table 4). Equation #2 dropped gender, $F(2,27) = 4.018$, $p = .030$, multiple $R^2 = .23$. In this study, piano students may benefit from stress reduction techniques that involved simple abdominal breathing. Several lines of evidence support our premise that the information presented in this study reflects the notion that piano students may benefit from stress reduction techniques that involved simple abdominal breathing. First, we found a large difference between the two times of hand temperature measurement, before training and ten minutes later (post training) for the entire sample. When we controlled for gender and the length of piano study experience and divided the sample by CDL, we again found what was expected. We found that preoperational children have the least amount of physiological stress of the three levels (measured by hand temperature) and that, in this sample, benefited the most from the training. Concrete operational children were next, also benefiting from the training. The formal operational children benefited least, or not at all, as seen by the decrease in hand temperature during training.

Our data both supports and aids in explanation of developmental theory. Preoperational children tend to focus on one aspect of a situation and neglect the other aspects. They also are unable to take on another person’s point of view (egocentrism). Because of these attributes of their cognition, this age group cannot hypothesize about what others may think, and they can really only concentrate on one event, in this case, making the Beanie Baby® move up and down. Even though preoperational children can attribute causality, they cannot mentally represent concepts. Using the Beanie Babies® rather than just telling

Discussion
them to ‘move their belly’ with their hand on it may have made the process more understandable and easier for them. Their inability to decelerate (think about what others may think) predicts that wondering about others’ thoughts would not generate any anxiety in social situations.

Concrete operational children, in contrast, can represent concepts cognitively and can hypothesize about what others may be thinking. They can think logically, but not abstractly. They may be better able to respond to ‘making their belly go up and down’ than their preoperational counterparts. Socially, their anxiety is more driven by others’ perceived expectations than what others may think. They respond to rules and whether or not they perceive themselves to be following the rules. The change in their hand temperature was significant, their temperature was lower than the preoperational children. It is likely that one possible cause was their perception of whether they were doing things ‘correctly.’

Formal operational children have the cognitive capacities of adults, but typically lack the experience to moderate those capacities. They were able to carry out the breathing and we did not measure the degree to which they were doing so. However, their low hand temperature before they started suggests that they likely felt uncomfortable in this social situation, and they may be habituating to chronically elevated stress levels seen in some adults. While they benefited least in this study, they stand to benefit the most from this important skill.

Studies such as this, which attempt to begin to identify potential risk factors that may predispose people to stress-related symptoms, are not new. In the current study, gender was unlikely to be related to the associated stress-related problems in children in piano study. We assume that the number of months in study is related in some way to their ability to control their stress levels, but additional investigation of this important variable is required. Currently, there is no information in the performing arts literature that explains this phenomenon.

This study was also designed to assess the relationship of hand temperature at both times of testing. Several findings within the study warrant elaboration. We found that CDL was the only viable predictor of hand temperature before training. Amount of time in piano study was a very weak predictor of pre-temp. This can be explained by the previous explanation of CDL. In this sample, younger children have warmer hands, which may be a partial function of their cognitive capabilities at different levels. Generally, the younger the child, the less they are affected by other’s reactions, and social relationships have been shown elsewhere to mediate stress reactions in adults.

When we used gender, amount of time of piano study and CDL as predictors and post hand temperature as the outcome, gender was once again a very weak predictor. The final regression model retained CDL and amount of time in study, since these were both strong predictors of post-hand temperature. Supporting this conclusion was the strong correlation between CDL and months of study, and the strong partial correlations, partialing out the effects of the other two predictors. The main change between this and the former model was the time of testing for the hand temperature (post); the relationship in this study was mediated by the months of study as well as CDL. Amount of prior piano study appeared to have an effect on the children’s ability to change their hand temperature. Other evidence indicates that pianists have experience-dependent cortical and CNS changes. Perhaps this effect could be another ‘ability,’ i.e., the ability to vasodilate in the periphery as a function of piano study.

Another, more plausible explanation is that expectancy effects and conditioned emotional responses. These students know the experimenter well and this finding may reflect that. This important finding suggests that the ability to change hand temperature is likely easier to learn in the presence of people the child knows and trusts. It could, potentially, serve as another teaching ‘tool’ to help students maintain optimal arousal.

In the final regression analysis (analysis #3), we once again used the same predictors with the change in hand temperature (absolute values) pre to post, as the outcome variable. Once again, months of study and CDL were very strong predictors of the change in hand temperature during train-

ing, indicating that CDL is an important factor, as well as amount of prior piano study.

These preliminary results from our laboratory on 30 children who participated in this study indicate that abdominal breathing may be a quick, low-cost and efficient way to help children deal with stress and that children can learn this important skill with a small amount of training. This training could be introduced into the private studio via college music curriculums, potentially reaching thousands of young piano students. Finger thermometers could be used instead of expensive biofeedback equipment, and the Beanie Babies® (heavier than stuffed animals & stay in place better) are also very low cost. It appears that heart rate/breathing entrainment training itself may not be necessary in a pediatric population but may be more useful for approximately age 12 and beyond.

A serendipitous finding was that piano study, in and of itself, might somehow cause CNS changes that result in the participant’s ability to vasodilate. While it was an unexpected finding, taken in the context of current evidence citing the strong relationship between music study (often piano study) and CNS changes, it comes as only a moderate surprise.

Chronic, stress-related disorders consume a great deal of the health care resources both in the general population and in performing arts. Therefore, music instructors may wish to prioritize early stress management training, possibly as a part of the lesson. A better understanding of stress-related problems in children may necessitate a change in our approach to piano study, for example, defining optimal learning states that allow better neural networks to be built. This in turn may provide better musical and overall health outcomes.

Conclusion

We found that children learn hand temperature control very easily and the ease of learning the skill may be related to piano study experience. The effects of gender did not appear to be an issue in this type of learning. Additional research is needed to determine long-term relevance of the findings in this study.
References


AAPB would like to thank Thought Technology for their generous support of this special double issue. See their insert in the center of the magazine.
Enhancing Music Performance Through Brain Rhythm Training

John H. Gruzelier, MA, PhD, London, UK

Abstract: Few musicians would think of calling on a neuroscientist to improve their performance, but research from Imperial College London indicates that in the not too distant future such approaches may be commonplace. Over the last three years we have provided conclusive evidence, through collaboration with our conservatoire neighbors at the Royal College of Music, that learning to elevate slow brain rhythms produces remarkable improvements up to 50% in some students on music performance, especially artistry.

Introduction

With support of the Leverhulme Trust, two studies over consecutive years have shown that the ability to enhance a slow rhythm in the brain which oscillates between 4 and 8 cycles per second, termed theta, has been associated with improvements in music performance. Experts found improvements in interpretative imagination in performance, musicality, emotional conviction, stylistic accuracy, and in music performance overall. The students were in their second to fifth years at the conservatoire.

In collaboration with Tobias Egner, a PhD student, student volunteers at the RCM underwent ten half-hour sessions in which their brainwaves were monitored and auditory feedback was given through headphones. They listened to sounds such as waves crashing on the shore, a babbling brook and high versus low pitched gong sounds, with the instruction to maximize the hearing of some sounds more than others. The sounds were paired with brain rhythms. They soon learned to elevate the theta rhythm over the alpha rhythm by what is largely an unconscious process. Before the training program began, and again after the ten sessions of training, the students gave a music performance under stressful conditions in front of a video-camera and before a panel of judges from the RCM. These were then sent to expert musicians external to the college to be rated on scales evolved from the examination procedures of the Royal Schools of Music. The judges were kept in the dark about whether the video clip they were rating represented performance before or after neurofeedback training. The ratings showed that neurofeedback improved performance overall, and this was due to improvements in interpretative imagination, musicality, emotional conviction, and stylistic accuracy, all artistic rather than technical aspects of performance (Egner & Gruzelier, 2002). Ratings were done independently, and were found to be reliable across raters.

The music performance judges were also blind to which training procedure the students underwent, for in fact neurofeedback was just one approach among several examined in the project. The Leverhulme funded curriculum initiative aimed to explore the potential of a variety of strategies for music performance enhancement, and involved a number of professionals, all coordinated by Aaron Williamon at the RCM. Keeping the judges “blind” is a necessary requirement for determining whether any improvement in performance was attributable to neurofeedback or to other factors such as expectancy or practice. Also of scientific importance was the requirement that students were randomly assigned to the various procedures. The procedures included mental skills training which involves analyzing both performance and practice habits in order to set up a structured plan for improvement, as well as learning relaxation techniques. Physical fitness training was introduced, based on the premise that fitness would alleviate performance anxiety and so improve performance; aerobic training sessions were monitored with physiological sensors. In the second year of the project the Alexander technique was introduced. This posture-based approach is practiced in conservatories world wide for the improvement of bodily posture and anxiety. Importantly, additional neurofeedback procedures were also compared, ones which train higher brain rhythms involved in processes such as sustained attention, which have claimed benefits for children with attention deficit hyperactivity disorder (a randomized controlled trial of neurofeedback for ADHD is just being initiated, funded by Cerebra a charity for the brain injured child, in our laboratory).

None of these other approaches at the RCM benefited performance according to the judges’ ratings. This is not to say that mental skills training, physical fitness training and Alexander training are not important in assisting musicians. Simply our two studies undertaken over the past two years, which involved schedules of training over two consecutive terms, did not disclose improvements in music making as a result of these approaches. Most likely longer training is necessary, perhaps without the pressure of upcoming conservatoire examinations. Whatever the reason, there is no denying that slow-wave neurofeedback training did work in this context, and is a highly efficient and robust way of enhancing the artistic aspects of performance.

What did the students think of neurofeedback training? Because of the logistics
of the project this is largely an unexplored issue; the expert ratings were not available until six months after training. The neurofeedback-musical process is essentially an unconscious process. Clues could be gleaned from a methodologically exacting phenomenological analysis. Student quotes included “it lets my mind breathe,” “completely cleared my head,” “my mind is unburdened,” and “in control but you’re not aware of it.”

The writer, when first experiencing alpha-theta training in the USA, groggy with jet-lag, felt much better afterwards, a transformation only too evident to workshop participants at the time. Unpublished research in the US has shown that crack and cocaine addicts successfully kicked the habit as a result of training, underscoring the “feel good” substrate of the theta training process.

We have recently returned from giving a 10 day training program involving neurofeedback, mental and physical fitness training programs, and master classes at the Swiss Italian conservatory on Lake Lugano in Switzerland. The experiential aspects of neurofeedback training were monitored throughout what could only be a truncated course of four sessions. Without exception the 20 students were enthusiastic about the subjective effects of each session of alpha-theta training. When they let go and stopped analyzing the process, the feel good response was immediate. Some spontaneously were able to combine with their music practice the feel good response arising from associations between theta and waves on the beach.

The magnitude of the improvements on the rating scales in the talented RCM students averaged increases of up to 17%. In some students these were as high as 50%, which translated into professionally significant improvements. This statistic, coupled with the relative ease of training, opens up exciting possibilities not dreamed of before in the performing arts. There are, furthermore, implications for the process of creative flow in general, aside from more worldly issues of simply feeling good. Of course a host of questions are raised and remain to be explored, but here psychologists may offer something really useful for the world of music conservatories and music performance at large. Neurofeedback training becomes part of the curriculum at the Royal College of Music, London, this academic year.


References


This article has been accepted for publication in *The Music Forum*, the *Journal of the Music Council of Australia*, October, 2003, reprint permission granted.

AAPB would like to thank Thought Technology for their generous support of this special double issue. See their insert in the center of the magazine.
Abstract: Psychophysiology is new to the performing arts, and as such, there are only a small number of articles published to date that deal with psychophysiology and artists directly. This report provides an annotated bibliography on performing arts medicine. The bulk of the information comes from studies, clinical reports and presentations published from an arts medicine point of view. Therefore, caution should be exercised in interpreting this data; future studies may alter any conclusions drawn from it.

Psychophysiology for Performing Artists is concerned with any aspect of the etiology of an artist’s medical problems with psychological or psychiatric co-morbidity. Physicians who specialize in Performing Arts Medicine know that a significant portion of their clientele appear to have a sizeable stress-related component in their disease. Some physicians discuss it at length, citing that the most common problem appears to be emotional stress, and the problems appear to be both primary and secondary to the presenting problem. They report that the patients’ disease has a significant stress-related component, and that other problems then appear as a result of having that particular disease or problem.

In the following I provide an annotated bibliography of publications on performing arts medicine, and on the physical and mental health of artists. Clinicians who are new to, or wish to review, the subspecialty of Performing Arts Psychophysiology may wish to consider the following sources.

I have also included some EMG feedback studies that are directly related to musicians, and some other studies that use psychology in some form in the study. In the final analysis, however, it will be up to the psychophysiologist to integrate these diverse studies into treatment and further research.

General References


This book is an excellent and practical manual for arts medical specialists and anyone else interested in arts medicine. It contains chapters about the evolution of arts medicine, common etiologies, then many other chapters about problems and treatments. There are 2 chapters about psychological and psychiatric problems, as well as a chapter about legal issues. It is meant to be a concise and accessible manual for physicians who see an artist as a client and contains many points relevant to psychophysiology. It is a ‘must have.’


An excellent review of upper extremity problems with medical therapies currently in use, the article discusses just about every problem there is, including some I had not heard of. It includes discussion of medical therapies currently in use to aid these problems.


This article provides a very good overview of the psychosocial problems in performing arts. It has a flow chart that is meant to aid the reader to organize the different factors in arts’ medical problems.


As the name implies, this article was meant to be a discussion of college students, comparing majors and non-majors with survey questions. The questions would likely be very valuable to anyone who wishes to begin to see arts clients. The authors are articulate and provide an excellent literature review.


Here is another excellent survey, articulating psychological problems of music students. A 50-item checklist is published as a table in the article.


The author surveyed 162 performing musicians and found a significant relationship between adaptive and maladaptive musical performance anxiety. Findings include high levels of anxiety with avoidance of using coping strategies to manage
the anxiety. A scale was constructed in this article and the items are published in the article, along with references to other scales constructed for performing artists.


This particular issue of MPPA is another source that anyone who wants to begin to see artists as clients may want to consider owning. The entire issue is devoted to treatment outcome data, a great synopsis of focal dystonia, an article about 1000 musicians with hand and upper-extremity problems and three articles which publish very comprehensive physical and exam forms. There are also two proposed standardized medical history forms. At the end is a complete index of volumes 1-10 of the entire journal. It may be one of the most succinct and complete sources that we have found.


An impressive preventive program is published in this article that takes into account research from sports medicine, learning research, occupational medicine and performing arts medicine.


This literature review asserts that many studies to date (1996) had been poorly designed, resulting in a great deal of misinformation regarding psychological issues in music performance anxiety. The author re-conceptualizes the problem as a career-related problem vs. underlying psychopathology of the performer.


Musculoskeletal, neurological, vocal, psychological and other syndromes are discussed along with the difficulties in treating them. A very well-written and detailed article.


Dr. Lehrer and colleagues constructed an excellent assessment tool. The conceptualization of performance anxiety is also very helpful and informative.


This is an excellent review article, clearly articulating the problems for which applied psychophysiology performs at its best. Highly recommended for anyone seeing arts clients, due to the incredibly high incidence of musculoskeletal problems in this population.


As one of the few articles that comes out and discusses psychophysiological issues at length, this excellent viewpoint discusses, among other issues, some of the commonalities and differences between other clinical literature (sport psychology, public speaking, etc.) and performing arts psychology.


Dr. Lederman, an arts neurologist, argues for the usefulness of beta-adrenergic blockers for the difficult symptoms of performance anxiety such as tremor, sweating, dry mouth, cold hands, etc.


This article recommends pharmacotherapy only in some circumstances. It supports, and reviews, various psychiatric and psychological treatments and their usefulness in the arts.


This survey of over 600 musicians found that more than half of the participants experience musculoskeletal problems during playing which lead to endurance, strength, and facility loss. Some treatment options are discussed.

**EMG Studies**


This well-controlled study developed careful baseline information for players who do not have tone commencement (attack difficulties and for those that do have attack difficulties.


The authors utilized EMG to change EMG patterns from a posture resulting in tone difficulties to a posture characteristic of musicians without these difficulties. There is a lot of detail presented, which would make replication very feasible.


This is a well-controlled study comparing fourteen musicians with pain to fourteen musicians without pain. They found site-specific EMG levels in the areas of the reported pain. It appears that site-specific hyper-reactivity plays a role in upper limb pain in musicians.


Overlearned muscle recruitment is a problem for fluent performance and a factor in development of muscle pain and ten-
derness. This study found that EMG feedback can be a useful tool in counter-conditioning muscle recruitment.


Another impressive case study which utilized EMG feedback to reduce muscle recruitment and muscular bracing in the throat of a woodwind player. The results were increased musical proficiency and higher psychological functioning.


This article is another well-done study that indicates the usefulness of EMG feedback for muscle recruitment reduction. The participants were 9 violinists.


A biofeedback group and a control group were used in this study, and the study compared the two groups post-training. This unique study illustrated the tendency of pianists to continue to tense muscles after the keystroke is completed. It also used beginner students through advanced, whereas many studies use only advanced musicians.


This study used 8 clarinet players & accomplished significant reductions in excess muscle tension, resulting in more fluent performance and remission of physical problems that had accompanied the players' tension.

Age-Related Issues of Performers


This article illustrates many of the common problems seen in the aging musician. Most musicians play well into retirement age.


The authors studied 201 students at three music schools in different parts of the United States and gathered interesting emotional and psychological information from the respondents. The age range is college students.


This impressive article discusses subjects that we all talk about but no one writes about—families of gifted children, stage parents, abusive teaching practices, potential risks, and many of the associated problems that linger into adulthood.


Performing artists seeking therapy were higher in all categories of the SCL-90 than psychiatric outpatients and significantly higher than non-patients in all categories. The difference between artists and psychiatric outpatients was significant in the interpersonal sensitivity, depression, paranoia and psychoticism categories.

Psychological and Psychiatric Issues


Performing artists appear to have significant premorbid issues which appear to affect their playing. This article takes a diathesis-stress model into a lifetime point of view. The authors discuss issues which begin early in life (attachment) and carry it well into adulthood. 162 performing artists were tested (33 actors, 26 dancers, 65 musicians and 38 singers) with a battery of tests and questions. 33% of the actors and 47% of the musicians suffered from performance anxiety, and 38% of the dancers were depressed.
FEATURE ARTICLE

Active sEMG Training Strategies for Chronic Musculoskeletal Pain – Part Two

Randy Neblett, MA, LPC

Abstract: Specific surface EMG assessment and training strategies are presented, which the author has found useful in teaching muscular self-regulation to injured workers with chronic musculoskeletal pain. Part One of this article compared an active sEMG approach with a traditional general relaxation approach to biofeedback treatment. An assessment and training model was offered for addressing recovery problems following contractions and for promoting generalization of skills outside of treatment. Part Two of this article presents an assessment and training model for addressing postural imbalance and offers specific training tips to help patients’ gain independence in self-regulating muscle tension.

Posture

Over time people with chronic pain have a tendency to guard and protect against pain by adjusting their posture. Poor postural habits can put strain on joints and muscles and can contribute to pain (Kendall & McCreary, 1983; Wilson, 1990; Middaugh, Kee, & Nicholson, 1994). Also, pre-morbid postural habits, which may not have caused problems before the onset of pain, may become a contributing factor as chronic pain develops, because a weakened and de-conditioned body has limited resources for handling the strain that poor posture creates.

Alignment of body parts and a balanced distribution of weight are critical to good posture (Kendall & McCreary, 1983). When the body is out of alignment and balance, then muscles that could normally rest have to work constantly in an attempt to hold the body upright. You can see this clearly in many people with low back pain who stand and walk with their backs hunched forward. Lumbar muscles are forced to maintain muscle tension to hold up the weight of the torso. Figure 1 demonstrates some common postural problems. This woman’s head is forward of her body, which creates an obvious imbalance. Think of holding a bowling ball close to your body vs. out in front of your body. The further out from your body you hold the bowling ball, the heavier it feels and the more strain it produces. Her neck and upper back muscles must remain contracted in this position to support the weight of her head. The effect of a forward head and slumped shoulders will reach all the way to her lower back as her lumbar muscles work to adjust for the weight imbalance that is created. Her hips are also rolled backwards. Her lumbar muscles are likely contracting and raising the buttocks upward. Lastly, her knees are locked back, throwing her body off balance even more. Figure 2 demonstrates how the lumbar muscles in a normal subject respond to changes in postural balance.

Figure 3 demonstrates balanced posture. Notice how all the parts of her body are lined up. I think it’s important to point out that, in my experience, most human beings don’t look completely straight like this woman. Everyone is built a little bit differently and may need to adjust and align differently to find the most balanced and relaxed posture. Long-term postural problems may result in some muscles being stronger and overly shortened and some being weaker and overly lengthened, which can only be addressed with physical therapy (Kendall & McCreary, 1983).

I have found a cervical to middle trapezius sEMG placement to be helpful in posture evaluation and training for neck, shoulder, and upper extremity pain, especially with sitting. Standing postural training with this placement has tended to be challenging and often frustrating for many patients in our treatment program. For standing, I prefer cervical to upper trapezius or upper to middle trapezius placements. Figure 4 shows a left and right cervical to middle trapezius placement with the chronic shoulder pain patient who was discussed in part one of this paper. He was asked to sit comfortably in a straight chair. A
slumped and head forward posture was evident, which correlated with the elevated sEMG readings shown in the graph. When he was encouraged to sit up straight, his sEMG readings dropped immediately. In addition to postural training in a straight chair, I have found all three of the previously mentioned neck and shoulder placements to be useful when working on posture and ergonomics with patients who work at a keyboard (Figure 5 and 6).

I find that visual inspection is the primary tool for addressing posture. sEMG will not show you how your patient’s posture is faulty. Rather, it can be used to evaluate the muscle bracing that postural problems create and to help guide the patient in becoming most aligned, balanced, and relaxed. Stand to the side of your patient and notice how he is balanced. If he is standing, then look at the alignment of his head, shoulders, hips, and knees. If he is sitting, then notice if his low back is firmly into the back support and see if his shoulders and head are forward. Based on your observation, suggest postural changes and see how the sEMG responds. This

Figure 2. Left and right L3 placement measured with a wide band pass of 20-500 Hz with a normal subject. Thresholds set at 2.0 uv and 5.0 uv to show scale. The four points of elevation demonstrate (1) the result of bending her torso forward about 10 degrees, (2) slumping her shoulders and moved her head into a forward position, (3) rolling her hips backwards, and (4) locking her knees back.

Figure 3. Illustration of balanced postural alignment. Reprinted with permission from New Harbinger Publications: Conquering carpal tunnel syndrome and other repetitive strain injuries: A self-care program (1996) by Sharon Butler; illustration by Jacqueline Entwistle Freeman, p.56. www.newharbinger.com

Figure 4. Left and right cervical to middle trapezius placement measured with a narrow band pass of 100-200 Hz with a patient with chronic shoulder pain. Thresholds set at 2.0uv and 5.0uv to provide scale. The patient was initially sitting with shoulders slumped and head forward. sEMG readings dropped significantly with postural adjustment.
tends to be a trial and error process of matching postural alignment with low sEMG readings. For most patients, I find that raising the chest (Kasman, Cram, Wolf, & Barton, 1998) releasing the shoulders, and/or tilting the pelvis forward are effective for lowering neck, shoulder, thoracic, and lumbar tension when standing. Sitting back into a backrest with proper lumbar support, dropping the shoulders, and “floating” the head are usually effective for lowering neck, shoulder, and upper back tension when sitting. I rarely see lumbar tension when sitting into a backrest. When attempting to correct slumped posture, I discourage the common strategy of pulling the shoulders back because of the obvious muscle bracing that this strategy creates. Instead, I encourage patients to find balance and muscle relaxation by hinging the chest and upper torso up into proper alignment and dropping the shoulders.

It’s important to recognize that posture training and recovery training (which was discussed in part one of this article) are not necessarily separate strategies but are usually happening concurrently. Postural balance is essential for relaxation in most non-reclining positions, and restoring postural balance following muscle use is essential for achieving muscle recovery.

**Training Strategy**

When sEMG readings are elevated upon assessment, my initial goal is to show the patient how to relax the target muscles. There are three ways that I can do this: verbally describing a strategy, visually demonstrating a strategy, and manually facilitating a strategy. Verbal cues for neck and shoulder relaxation might include: “Sit (or stand) up straight and balanced. Let your shoulders drop toward the floor. Let your neck feel soft. Allow your head to float on top of your shoulders like a balloon.” Though it may seem counterintuitive, I find that a relaxation strategy of becoming perfectly still often doesn’t work as well as making very small adjustments, allowing the head and hips to move and float around slightly, and looking for a sensation of body parts feeling unlocked.

Demonstrating different postural adjustments can be a very effective training tool. For instance, you can demonstrate how the shoulders can be pulled upwards or backwards or let loose, how the chest can hinge up and down, how the head can be forward or balanced, or how the pelvis can tilt forwards and backwards. Notice how each adjustment affects the sEMG levels.

I have found that the combination of touch with verbal coaching tends to be the quickest and most direct way to facilitate postural alignment and muscle relaxation. Place your hands gently on the patient’s shoulders as verbal relaxation cues are offered. If the shoulders have difficulty releasing, try “jiggling” them slightly to encourage relaxation. Move the patient’s head in a small circle and suggest “head floating” cues to encourage the neck to unlock. Manually facilitate a chest raise by lightly pushing up and back above the sternum. At the same time, gently push the pelvis down and forward at the sacrum and suggest that the tailbone “drop to the ground.” Obviously you need your patients’ permission before you touch them.

Depending on your training, your experience, and the context in which you are working, you may want to limit or avoid the use of touch as a training strategy. Once the patient has discovered how to release the target muscles into a reasonably relaxed range, then we begin repetitive practice in reaching the relaxation goal. I consider “reasonably relaxed” on my Thought Technology Procomp + system to be generally between 2.0 and 3.5 uV in static postures for the jaw, neck, shoulders, and back and less than 1.0 for the arms and hands. If you don’t have a good feel for what’s relaxed and what’s not on your equipment, published norms might be helpful (Cram, Kasman, & Holtz, 1998; Sella, 2001). In my experience, most patients can achieve the relaxation goals relatively quickly during the first session, usually within a few minutes, with proper coaching. Some patients show more stubborn muscle tension, which can take several sessions to figure out. After the patient achieves consistent success with reaching the relaxation goal, then the emphasis on treatment is to facilitate independence with self-regulation and generalization to real life circumstances. A primary measuring stick to evaluate learning is to see a positive change in baseline measures across sessions.

During training, I suggest two learning
strategies to patients. First, I encourage them to feel in their bodies what they see on the computer screen as muscles activate and de-activate. Many people with chronic pain have difficulty feeling the difference between tension and relaxation (Taylor, 1990; Kasman, Cram, Wolf, & Barton, 1998). Also, my patients often report that positive changes in muscle bracing and posture feel awkward and uncomfortable. A full-length mirror can be a valuable tool for reinforcing positive postural changes (Arena & Blanchard, 1996) and to alleviate patient concerns that the posture change may look funny. Sometimes patients with excessive shoulder tension will report increased pain and a pulling sensation in their shoulders with relaxation. This initial increase in shoulder pain usually reduces relatively quickly as the shoulder muscles get used to relaxing and being maintained at a normal length.

Second, I encourage patients to cognitively define the strategy that is helping them reach the relaxation goal. In my experience, “just thinking about relaxing” often doesn’t work very well. Patients tend to have much better success when they self-coach and remind their bodies specifically what to do to balance their posture and relax the target muscles, such as “I need to stand up straight, drop my shoulders, and roll my hips forward.”

Professional Considerations

As emphasized in Part One of this article, all biofeedback practitioners are obligated to work within the rules of their professional practice act, ethical guidelines, and biofeedback skill set. The context of where and how treatment is provided is potentially important in deciding what kinds of training strategies are appropriate. Knowledge of muscle anatomy and training in the use of sEMG is essential before using strategies that I have described here. When doing active sEMG training, it is important to be consistent with electrode placements and to check your electrodes often during the treatment session for signs of slippage. I recommend again the two book set by Cram, Kasman, and Holtz (1998) and Kasman, Cram, Wolf, and Barton (1998), as a valuable resource for maximizing the clinical use of sEMG. Also, the importance of therapist/patient boundaries cannot be understated, especially when considering use of manual cuing in the training process.

References


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Emerging Trends in Neurofeedback: II. The Challenge of QEEG-Based and NLD-Based Neurofeedback Protocols

Siegfried Othmer, PhD, Encino, CA

Abstract: Historically, the technique of neurofeedback developed around understandings of basic mechanisms. These mechanisms provided a rationale for interventions in neurofeedback in its early years. To this day, most neurofeedback being practiced is still performed according to rationales that can be traced to these early models, and can therefore be considered "mechanisms-based." However, several new trends have emerged in neurofeedback treatment that challenge our traditional conceptions and compel us to expand our model assumptions. On the one side is the emergence of QEEG-based training, and on the other the development of training models based on more general considerations of the brain as a self-organizing, non-linear dynamical system (and referred to herein as NLD-based models). The first installment reviewed the development of a mechanisms-based approach. The present installment reviews how the QEEG and NLD approaches have influenced the author's understanding of mechanisms-based training.

The Challenge of QEEG-Based Protocols

There is a compelling face validity to QEEG-based protocols for neurofeedback. Given evidence of localized EEG anomalies, the temptation to derive a prescription for EEG training is not only understandable but is frequently reinforced with dramatic clinical outcomes that are not matched in individual A/B comparisons with other methods of training. Nevertheless, what may be called the "fundamentalist" position on Q-based training is not sustainable. This position may be characterized by the following propositions:

1. If there is no observable QEEG anomaly, then there is no rationale for EEG training;
2. If there is an observed QEEG anomaly, it should be given priority in protocol selection over other (read mechanisms-based, or NLD-based) considerations;
3. Outcomes may be judged by the degree of QEEG normalization achieved in training;
4. Given the above, the conduct of neurofeedback training without being informed by a competent practitioner prior to QEEG evaluation borders on unethical practice.

The first of these propositions is the most easily countered. In Sterman's original research with reinforcement of sensorimotor rhythm spindles in cats, the cat EEG was presumptively "normal" when training was initiated. (Sterman, 2000) There was no selection for deviation from norms in any event. Yet the post-reinforcement sleep spindle density was dependent on the training contingencies, i.e., on whether SMR-spindle incidence was being rewarded or inhibited. Secondly, in the context of optimum performance training clinicians clearly work with individuals whose EEG falls entirely within the normal range, yet these individuals respond positively to the training. Thirdly, it is apparent that alpha-theta training is not contingent on any deficit in the alpha or theta bands. On the contrary, such deficits probably militate against early success in such training. In the higher-frequency ("SMR-beta") training, a frequency-specificity of response to training is often identified that is not traceable to any observable feature in the quantitative EEG.

Finally, in all of the early work with seizure control, placement on the sensorimotor strip was used irrespective of the locus of the seizure focus, and independently of any observed EEG anomaly. Thus, even when a QEEG deviation was present, it may not have extended to the training site and thus may not have been a factor.

The second proposition (QEEG-driven protocols should have priority) cannot be settled categorically until the relevant studies are done in which specific approaches are explicitly compared. However, from the perspective of mechanisms-based training it appears reasonable to address general disregulations (of sleep, mood, pain, and vigilance) even before specific, more intractable deficits are targeted, such as speech deficits in stroke. Thus, even if localized functional and QEEG deficits are manifest, they may not drive the protocols, at least at the outset. At a minimum, we would argue that this proposition still bears a certain burden of proof. We are aware of one (unpublished) direct comparison of mechanisms-based with QEEG-based training, by neurologist Jonathan Walker (Walker, Norman, & Weber, 2002; Walker, personal communication, September 14, 2002), for a population of head-injured patients. Both approaches yielded better than 80% recovery (by self-report) in more than 80% of the patients. Here no strong preference was shown for QEEG-driven protocols even where the greatest relative advantage would be expected. (Dr. Walker was nevertheless moved to adopt QEEG-based protocols as primary for his subsequent work with the head-injured.)

The third proposition (QEEG normalization serves as a criterion for training com-
the mechanisms-based approach. (The type, by whatever means, is essential even to determination of the appropriate EEG. Individual being trained and may have particular EEG deviations that are specific to the individual. Identifying physiological subtypes that have pal value of cumulative QEEG data is in meeting this criterion.

Principals in the field. At the present state be “manualized,” and subscribed to by them. Ideally, the QEEG protocols should bear substantial similarity among all of the field and receive a protocol design that holds true: It should be possible to submit a approach is mandated, the following should in that venture cannot be presupposed.

The final proposition (that QEEG-driven training is ethically mandated) lacks the obvious clinical and research foundation. Absent such support, these standards could only be imposed upon our field by regulatory fiat. Is it timely to impose such structures upon the field, and is a consensus emerging for this development? It is not unreasonable to ask that before such an approach is mandated, the following should hold true: It should be possible to submit a quantitative EEG to several authorities in the field and receive a protocol design that bears substantial similarity among all of them. Ideally, the QEEG protocols should be “manualized,” and subscribed to by the principals in the field. At the present state of maturity, we are clearly well short of meeting this criterion.

Rejection of the absolutist or QEEG position should not be seen as a rejection of the value of QEEG-derived information in the conduct of neurofeedback. The principal value of cumulative QEEG data is in identifying physiological subtypes that have specific EEG training implications. The second important benefit is information about EEG deviations that are specific to the individual being trained and may have particular implications for training. The determination of the appropriate EEG subtype, by whatever means, is essential even to the mechanisms-based approach. (The choice of inhibit band has historically always been informed by EEG data.) In this determination, QEEG data can be quite helpful, although often a more economical appraisal using no more than three to five cortical sites for brief examination may be sufficient. In the case of localized deficits identified in the QEEG, it is generally our preference to proceed for some while with generic protocols before turning our attention to the localized deficits. Thus, even when we rely upon a QEEG for the guidance of training, it is not usually invoked until the underbrush has been cleared, so to speak. We target the general disregulation of arousal, attention, and affect before we turn to more specific deficits traceable to more localized function or dysfunction.

In a mechanisms-based approach, it is typically the reward frequency that bears the larger burden in the training, with inhibits playing a subsidiary role. The training turns out to be very frequency-specific in most individuals, and the QEEG data generally don’t offer much help in this regard. Because the EEG spectral magnitudes are not normally distributed, any EEG deficits are much less likely to be discerned than are amplitude excesses (Kaiser, 2000). Moreover, even if such deficits are identified, they typically are not very narrowly distributed in frequency, and hence cannot identify a target frequency with the precision that we find to be clinically necessary. Hence, the QEEG typically cannot specify a reinforcement strategy directly. It usually does so indirectly, with the help of a mechanisms-based rationale.

Conversely, a QEEG-driven approach tends to be informed largely by the inhibits. The resulting cuing of the brain is indirect. It is an instruction to the brain to “go and sin no more,” leaving the brain considerable latitude to sort out the means of control. The reinforcement strategy, on the other hand, is a much more specific instruction to the brain to exercise a specific regulatory loop, at a specific frequency and at a specific site, in the interest of improved self-regulation. The “augment” strategy, to be optimum, involves a much higher clinical burden to be selected appropriately both in terms of site and center frequency. The QEEG is largely agnostic in this enterprise, and we are more likely to be instructed by functional neuroanatomy prospectively, and by symptomatic response retrospectively.

In the context of the emergence of QEEG-based protocols over the last few years, generic mechanisms-based protocols have evolved by co-opting the new findings into more inclusive schemas, involving particularly the refinement of inhibit and electrode placement strategies. Characteristic QEEG deviations are interpreted in terms of specific failure modes that are then incorporated into a larger basis set of generic protocols. So, while QEEG analysis is becoming more refined, the bar is also being raised with the generic protocols. As a result, there is no longer a clean differentiation possible between QEEG-driven and mechanisms-based protocols. It is to be hoped that the current contention between these two basic approaches will be diffused through the emergence of a synthesis at a higher level of refinement.

The Challenge of NLD-Based Brain Models

The neuro-regulation of cortical and sub-cortical function in the bio-electrical domain can be treated as a self-organizing nonlinear dynamical system (Kelso, 1999). The nonlinearity starts with the generation of the action potential, and progresses to the level of mass action of ensembles of cortical neurons on various spatial and temporal scales. The real surprise is the degree to which we can get away with linearity assumptions, as we implicitly do when we regard each of the EEG frequencies in the spectrum as independent. Nevertheless, the implications of the NLD-based models are instructive for our work in neurofeedback.

1. The neurofeedback challenge brings about a global reorganization of cortical-subcortical networks. (It does not merely remediate specific deficits.)

2. The effects of reinforcement of particular frequencies are non-local both spatially and in the frequency domain.

3. The EEG reflects the overall quality of regulation of the system in its temporal properties (i.e., not only in its stationary features).

The NLD-model focuses us more on brain dynamics than on brain “statics” (Brown, 2002). It underpins the emerging “regulatory challenge” model of neurofeedback in which we gently move the brain out
of the state it had intended for itself, thus mobilizing restoring forces within the brain that ultimately serve to strengthen regulatory networks through repetitive, push-pull, action-reaction couples. (This emphasis on healthy dynamics is currently reflected in peripheral biofeedback through the growing interest in heart rate variability training, where we “drive” the cardiac control loops with the breath as a forcing function.) It allows us to understand that the reinforcement of certain sub-bands of the EEG spectrum may yield a salutary clinical outcome without a residual change in static EEG parameters in that band, particularly if that parameter is not deviant at the outset.

The NLD-model allows us to understand that neurofeedback should be effective even in the absence of any EEG anomaly, and in this regard it presents a challenge to the more purist QEEG position. However, the NLD model presents a challenge to mechanisms-based training as well, in that it loosens the connection that has prevailed in our minds between specific protocols and the elicitation of state change (i.e., state of arousal, of vigilance, and of attentional focus). By the same token, it loosens the connection between specific protocols and particular symptom clusters. A generic approach to neuro-regulation, one that is largely agnostic not only with respect to steady-state EEG phenomenology but also with respect to the symptom profile, appears to be possible.

The NLD-based approach can be thought of as the “blind watchmaker,” referenced as it is solely to the moment-to-moment unfolding of EEG phenomenology across the entire frequency spectrum. Yet the specific protocols adopted for normalization depend also on mechanisms-based assumptions, and they require empirical validation. This approach, to the extent that it is valid, presents a significant conceptual challenge to our work in that it may result in both a simplification of neurofeedback for certain clinical populations and in a generalization of the method to non-clinical usage, eschewing the deficit focus. The largest impact the NLD-based models have on our approach is in the adoption of dynamic thresholding, as well as in a gradual movement toward a more comprehensive appraisal of the broad-band real-time EEG signal within the feedback loop to the client.

Summary

The most fruitful evolution of neurofeedback going forward would involve the maturation of all three of these basic approaches within their natural domains of application, while allowing a creative tension and cross-fertilization between them. The natural domain of QEEG-based approaches is the more severely impacted clinical population with neurological problems: traumatic brain injury and stroke; seizures; dementias; pervasive developmental delay; cerebral palsy; and the autism spectrum. The natural domain of NLD-based models is the non-clinical application of neurofeedback: optimum mental fitness, brain exercise, and meditation practice. The natural domain of targeted, mechanisms-based training is the traditional psychopathologies: the anxiety-depression spectrum, attentional disorders, personality disorders, Bipolar Disorder, trauma recovery, and addictions. Also within its compass are pain syndromes, autonomic dysregulations, sleep disorders, and specific learning disabilities. However, all three approaches can be effective in all of these domains. It is remarkable to observe that regardless of the particular approach, most of the work in neurofeedback appears to be accomplished with just a few key protocols.

For this more positive development of maturation by cross-fertilization to occur, we must surrender the expectation that any one of these approaches will preempt the others and drive them to extinction. In the utilization of the respective approaches, every therapist is subject to an intermittent reinforcement schedule, one that is known to be the most resistant to extinction. Mechanisms-based training appears to occupy the middle ground, drawing from both of the major alternatives (and informing them as well). It has in fact metamorphosed to the point where it bears little resemblance to its origins. With the proliferation of protocols has come a new ambiguity about underlying mechanisms. It may be better to refer to this training as symptom-driven. The best neurofeedback will be that which utilizes information from the steady-state EEG, fully exploits the information contained in the real-time EEG across the entire spectrum, and is exquisitely attentive to the physiological changes induced in the patient throughout the training process. It’s just not SMR-training anymore.

References


BOOK REVIEW

Review of Michael Thompson and Lynda Thompson (2002), Setting Up for Clinical Success with the Procomp+/Biograph

Published in Amsterdam: Biofeedback Foundation of Europe. ISBN: 0-88962-780-0. Reviewed by Joseph Barr, Ed.D.

The busy clinician seeking to master a new biofeedback system looks ahead to investing hours learning the system and frustrations with the eccentricities and quirks of that system. The greatest ally would be a levelheaded colleague with years of experience on the system who can point out the hidden strengths and pitfalls of the program.

Michael and Linda Thompson’s Setting Up for Clinical Success with Procomp+/Biograph provides just that, a 100 page practical guide to one of the field’s most popular EEG biofeedback/general biofeedback systems. They are the guides to mastering the Procomp+/Biograph.

The ProComp+ is the hardware platform utilized by not only the Biograph, but also the Othmer’s EEG Spectrum, Val Brown’s Neurocare System, and a software program very similar to the Biograph called Multitrace. The ProComp+ can manage up to eight channels concurrently, including combinations of EEG, EMG, GSR, Temp, BVP, EKG, and Respiration. The software used on the Thought Technologies System is the Biograph version 2.1.

Michael Thompson is an MD and former residency-training director at the University of Western Ontario. Psychologist Linda Thompson co-wrote The ADD Book with William Sears and is the Director of the ADD Centre in Toronto. This very user-friendly guide has evolved out of the Thompsons’ staff training and international training seminars on the Biograph (sponsored by Thought Technology) that they have conducted over the last years.

“Setting Up” is replete with detailed pointers on exactly how to draw a great deal from the Biograph System. While the Biograph comes with an online help manual, the Thompsons pass along wisdom and observations garnered from hours constructing and polishing screens and protocols on this software system.

What began as Michael and Linda’s copious training handouts has evolved into a manual that not only introduces the Biograph software program but also introduces the Thompsons’ clinical model developed at their ADD Centres/Biofeedback Institute of Toronto. While purchasing this guide might be a stretch for the clinician who does not own the ProComp+/Biograph, it is rewarding to observe how the Thompsons’ clinical model is deployed utilizing the Biograph System.

The guide outlines the way the Thompson’s integrate both EEG and EMG, temp, EDR and RSA biofeedback in the treatment of ADD/ADHD and other disorders. It is refreshing to observe the way the authors integrate applications of EEG with the strengths of more traditional, general biofeedback. Their approach and this guide are grounded in evidenced-based practice. In the introduction they note that they have been mentored by Barry Sterman and the Lubars, hence there is an emphasis on more established protocols and not on approaches with mere promise.

While they do not call for a 19 lead full cap diagnostic QEEG on all ADD clients, they do recommend QEEG if there is “any concern about a primary medical condition such as a seizure disorder, head injury…” The authors fall between those who recommend a QEEG assessment on every client and those that suggest site-specific interventions are uncalled for and that general, non-linear, protocols will improve functioning. The Thompson’s model proposes careful, well-artifacted, single and/or two-channel assessment with regular reassessment to track progress.

Approximately one-quarter of “Setting Up” is addressed to assessment issues. The authors indicate that the goal of assessment is to “compare the power of different frequency bands to expected age norms and use the data to develop an EEG normalization training program”. While the Biograph software package displays colorful graphics of EEG, the Thompsons recommend the use of a profile histogram filled in by hand or a 2 Hz bin program that will process EEG raw data and export the data to a Microsoft Works Spread Sheet as a baseline. Although the process seems cumbersome the authors assure that “this method of graphing takes only about 3 to 5 minutes after you have done it a couple of times”.

In addressing the topic of filters they note that while IIR (Infinite Impulse Response) Butterworth provides the “sharpest definition and best statistics” it is currently available only for assessment screens. The
Thompsons recommend IIR Hamming for feedback screens and assure the reader that in new versions of the Biograph one will be able to use Butterworth in training screens. Screen preparation topics include; screen position and size, how to deploy a second monitor, setting thresholds, choosing “feedback” (a term in this system that refers only to auditory feedback), utilizing and linking to animation, Midi and Wave Audio Files, muscle artifact inhibits for EEG training, and many others.

The authors seek to cultivate: “…an optimal state of mental and physiological functioning. A relaxed alert state will broaden associative capabilities and perspective, decrease fatigue, allow calm reflection on alternative approaches to tasks and, when combined with high levels of alertness, improve reaction time and increase response accuracy.” (Thompson & Thompson, 2002, p. 53)

They recommend that every EEG display screen include breaths per minute, temperature, and EDR.

The authors note interesting options on the Biograph system. They describe how to make bar graphs change color (say from red to green) when a given threshold is met. Further, the program is sophisticated enough to set a specific color-code criterion (for example; SMR greater than 4.5, Theta less than 16, EMG 45-58hz less than 5, for the EEG Linegraph).

The index has twenty detailed color screens that the authors have developed and utilized in their Centre. These prove to be excellent templates for assessment and training.

Available, but not accompanying the book, is a CD-ROM of nearly every screen described in the book. Psychophysiological Stress Tests, RSA Feedback Screens, and numerous feedback screens are available to utilize and customize. While the Thompsons carefully coach the reader through the construction of all the screens it is attractive to the clinician to begin with the screens and customize them to one’s specifications.

The clinical guide is available through the Biofeedback Foundation of Europe, the publisher, at www.bfe.org, for $35.00 (US) and the CD is available for $100.00. The book is also available through Thought Technology at 800-361-3651. A videotape of the Thompson’s 2002 Biograph Workshop is available through Futurehealth at www.futurehealth.org.

The authors have put together a thorough, user-friendly guide to a widely used biofeedback system. Consider profiting from their attention to detail.

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**BRIEF REPORT**


**Steve Baskin, PhD, Stanford, CT**

AAPB member Dr. Robert Freedman had his research on hot flashes reviewed in the *New York Times Science Times* on 9/3/02. Dr. Freedman has been studying hot flashes for about 20 years at Wayne State University, where he is a professor of psychiatry and obstetrics and gynecology. Dr. Freedman and his colleagues have compared menopausal women who have flashes with those who do not. These women swallow radiotelemetry pills that measure core body temperature and are also hooked up to psychophysiological measures such as skin temperature, skin conductance and respiratory exchange ratio. In some studies drugs are used to precipitate or terminate flashes and some women spend time in the sleep laboratory. Dr. Freedman has reported that women without hot flashes have a “neutral zone” of about 0.7 degrees F, and their core temperature can rise or fall in that zone without making them shiver or sweat. Women who suffer from flashes have an almost nonexistent zone where a tiny rise in core temperature will cause a hot flash, and a tiny drop elicits shivering. Dr. Freedman theorizes that shrinking and expanding neutral zones are related to norepinephrine levels in the brain. The Times article had a photo of a smiling Bob Freedman in his laboratory.
The “Mozart Effect” is the positive effect of listening to Mozart’s music on a variety of performance tasks, as documented by a growing number of research reports in the past seven years. Research has shown that exposure to Mozart’s music improved performance on spatial IQ tasks by 8-9 points (Rauscher, Shaw, & Ky, 1995), and created long term improvements in children’s spatio-temporal reasoning (Rauscher et al., 1997). Listening to Mozart has also been shown to impact on a number of neurophysiological measures, including increasing EEG coherence, increasing inter-hemispheric coherence, changes in amplitude of alpha rhythms, and changes in EEG power in the right temporal area (Hughes, 2001).

John Hughes, MD, PhD, of the University of Illinois Medical Center, delivered a keynote address at the September 2002 meeting of the Society for Neuronal Regulation, introducing the Mozart Effect, and reporting on research applying this effect to epilepsy. Hughes studied 29 patients with repetitive focal epileptiform discharges or bursts of generalized spike-and-wave complexes in waking or comatose states. He monitored these individuals with 18 channel EEG instruments, using a standard 10-20 placement. The EEG’s were recorded before, during and after Mozart music, and during and after control music. The Mozart piece was the Sonata for Two Pianos in D Major (K. 448), the same piece used in most of the previous research on the Mozart Effect. The control musical selections consisted of “Old Time Pop Tunes” or the contemporary composer Phillip Glass’s “Music with Changing Parts.”

Hughes’ results showed that epileptiform activity dramatically decreased during the Mozart music, with reduction in rate or frequency of focal discharges and in amplitude of these discharges. During the pause between movements the epileptiform activity returned for some subjects, and decreased when the next movement began. The control music selections did not produce any measurable reduction in epileptiform activity.

A second study monitored an eight year old girl with focal EEG discharges in the right posterior temporal area. Mozart music was played ten minutes each hour during her wakeful periods, including during her school day. The number of clinical seizures decreased from 9 to 7 to 1 over three periods of wakefulness. Further details on both investigations are available in Hughes (2001).

Hughes (2001, 2002) also subjected the Mozart music, similar music from other classical composers, the pop music, and the contemporary composition from Phillip Glass, to mathematical analysis to identify periodicities which might be involved in entraining brain activity, and producing the documented enhancements of neurocognitive function. He showed highly organized long-term periodicities in the classical music, which presumably resonate with the “superorganized cerebral cortex.” He also identified repetitive melodic lines in Mozart and other classical composers. Both of these elements were dramatically absent in the pop and contemporary musical pieces. Hughes examines the relationship between the musical periodicities and repetitive melodic lines and the periodicity of the human brain. It appears to be the longer term periodicities, averaging around 30 seconds or greater, which are beneficial to the brain. Contemporary music either lacked any measurable periodicity or showed much shorter patterns. The shorter term periodicities have not been associated with beneficial or enhancing effects.

References


Joseph Barr, Ed.D., is a psychologist in private practice at Biofeedback North (www.bfnorth.com) in Deerfield, Illinois. He is past-president of the Biofeedback Society of Illinois and was Chief of Psychology at Lutheran General Hospital in Chicago's Northern Suburbs. Joseph is on the adjunct faculty at Northwestern University and has taught at the University of Illinois Medical School and his alma mater, Indiana University. He has a long-standing professional interest in psychophysiological disorders and peak performance. He has consulted to the US Olympic Team, other athletes, business professionals, musicians, and students. Joseph is a BCIA Fellow.

Victor Canda was born in Chile. He studied classical guitar in Chile and Germany, and has performed as a soloist and in chamber music ensembles, performing renaissance, baroque and contemporary music. In 1993 he enrolled in the Psychology Department at the University of Konstanz and graduated as a clinical psychologist in February 2000. His current work focuses on clinical neuroscience, brain plasticity and motor disorders, specially focal hand dystonia. He currently teaches at the University of Konstanz on topics related to the sensorimotor system and is an associate researcher of the Institute of Physiology and Arts Medicine in Terrassa, Spain.

Thomas Elbert is a Professor of Clinical Psychology, Behavioral Neuroscience, and Biomagnetism at the Universitat Konstanz in Germany. He is on the Editorial Boards for several journals, including Psychophysiology, IEEE Transactions on Biomedical Engineering, and the Journal of Psychophysiology. He conducts research in several areas including: the clinical implications of neuroplasticity, functional cortical organisation, brain imaging; and the behavioral treatment of neuropsychiatric disorders.

John H. Gruzelier, MA, PhD, is Professor of Psychology and Head of the Department of Cognitive Neuroscience & Behavior, Faculty of Medicine, Imperial College of Science, Technology and Medicine, University of London. His interests in cognitive neuroscience include psychopathology, psychophysiological measurement, brain functional liberalization, and hypnosis. He has taught and published on stress intervention procedures including mental control through neurofeedback and the enhancement of immunity through self hypnosis. He has been co-editor of the International Journal of Psychophysiology since its inception in 1984, is a member of the Editorial Boards of the International Journal of Clinical and Experimental Hypnosis and the Journal of Neurotherapy and is editor of Contemporary Hypnosis. He is currently on the board of the Center for the Study of Music Performance, Royal College of Music and the Board of Governors of the International Organization of Psychophysiology, and has served as president of the British Psychophysiology Society.

Donald Moss, PhD, is a partner in Western Michigan Behavioral Health in Grand Rapids and Grand Haven, Michigan. He directs their Chronic Pain Services. He is Editor of Biofeedback and Consulting Editor for the Journal of Neurotherapy. He is adjunct graduate faculty of the Saybrook Graduate School and Research Center in San Francisco. His primary interests are the application of clinical psychophysiological knowledge and interventions to the anxiety disorders, and to the functional problems of primary care medicine. He is senior author of a new edited volume Handbook of Mind/Body Medicine for Primary Care (Sage).

Randy Neblett, MA, LPC, is a Licensed Professional Counselor with a master's degree in psychology from Southern Methodist University. He has provided counseling and biofeedback services in the Dallas area for 12 years, specializing in physical rehabilitation. Though his experience has included spinal cord, head injury, stroke, and chronic pulmonary rehabilitation, his primary interest is in chronic pain. He currently manages a biofeedback department at PRIDE - Productive Rehabilitation Institute of Dallas for Ergonomics, a multidisciplinary chronic pain management program for chronically disabled workers. He recently accepted an adjunct faculty position at the University of Texas Southwestern Medical School.

Siegfried Othmer, PhD, is a physicist who has been involved with neurofeedback along with his wife Susan Othmer since EEG training benefited their epileptic son Brian in 1985. After developing a neurofeedback instrument optimized for the higher-frequency ("SMR-beta") training, the Othmers started EEG Spectrum in 1988 to offer EEG biofeedback services. Since 1990, the Othmers have trained some 2,500 neurofeedback professionals in their methods. They also established a worldwide neurofeedback practitioner network that is now in some thirty countries.

Rene E. Pichler, BA, is currently a clinical psychology doctoral student at the Illinois Institute of Technology in Chicago, Illinois. Her research has focused primarily on the development of children. She currently teaches undergraduate psychology courses and works as a research assistant for a local hospital. Other research interests include sport and health psychology. Rene received her undergraduate psychology bachelor's degree from Elmhurst College in Elmhurst, Illinois.

Harald Rau is chief psychologist at the Psychiatric Hospital Gilead, Bethel, Germany and Professor and associated member of the Faculty of Psychology and Sports Sciences of the University of Bielefeld, Germany. His research interests include cardiovascular psychophysiology, behavioral medicine, functional brain imaging in traumatized borderline patients, and biofeedback.

Robert Schleser, PhD, is Professor of Psychology at the Illinois Institute of Technology, Chicago, Illinois. His interests in psychology include childhood psychopathology and sport psychology. His interests in childhood psychopathology include the effects differential cognitive development on the response of same age
children to various instructional and educational practices. He is a consultant for the Chicago Public School District, doing program evaluation of multiage teaching practices in 58 schools. His research with children includes engaged teaching and directed discovery teaching, especially between the ages of 5 and 7 years of age, focusing on investigating cognitive developmental factors and the minority achievement gap. He is also a sport psychologist, doing individual training with elite athletes, including hockey players, basketball and other athletes. He is an expert media consultant and has been interviewed by many national news organizations and periodicals.

Sandra K. Sondell, PhD, completed a PhD in clinical psychology from the Illinois Institute of Technology, Institute of Psychology, in May 2002. She completed a Bachelor of Arts degree from Emory University in 1998. She is currently doing her internship in clinical child psychology at the Hennepin County Medical Center in Minneapolis. Her research throughout graduate school focused on child development and gender differences. Other interests include behavior disorders and neuropsychology.

David Sternbach, earned his B.M. and M.M. at Indiana University; and an M.S.W. at New York University. Mr. Sternbach is a former horn player with Casals Festival Orchestra, Mostly Mozart Festival Orchestra, and the Aspen Festival Orchestra. He is a former member of West Berlin Opera Orchestra, Danish Opera Orchestra, and the Boston Pops. Mr. Sternbach is a former music faculty member at the University of West Virginia and currently is Professor of brass studies, and the Founding Director of Center for Arts and Wellness at George Mason University. He is in private practice in Performance Psychology and conducts special research in Overuse Injury Prevention and Performance Anxiety.

Sebastian “Seb” Striefel, PhD, became a Professor Emeritus in the Department of Psychology at Utah State University in September 2000. For twenty six years he taught graduate level courses in ethics and professional conduct, clinical applications of biofeedback, clinical applications of relaxation training and behavior therapy. He was also the Director of the Division of Services at the Center for Persons with Disabilities at Utah State University. In that role he managed a variety of programs, including an outpatient clinic, a biofeedback lab and an early intervention program. He is a past president of the Association for Applied Psychophysiology and Biofeedback (AAPB), current president of the Neurofeedback Division of AAPB, Secretary/Treasurer of the International Section of AAPB and regularly writes an ongoing ethics column and conducts workshops on ethics, standards, and professional conduct.

Edward Taub, PhD, received his doctoral degree from New York University in 1970. He is a behavioral neuroscientist who developed a new family of techniques, termed Constraint-Induced movement therapy or CI therapy, that has been shown to be effective in improving the rehabilitation of movement after stroke and other neurological injuries in humans. At this point CI therapy is being used in many countries worldwide. An extension of this technique has been used as a successful treatment for focal hand dystonia in musicians. Dr. Taub is the recipient of four recent awards for his research, is a past president of the Biofeedback Society of America as a result of his early work in thermal biofeedback, and has been on the Board of Directors of four scientific societies.

Marcie Zinn, PhD, NCTM is a clinical psychologist who specializes in Performing Arts Psychopathology and cognitive-developmental issues in the arts, as well as an active statistical consultant. She is a certified professional concert artist and is certified by the Music Teachers’ National Association in Piano Performance. Her research interests are in neurocognitive-developmental issues in the arts for children and adults. Her other skills involve computer consulting in hardware and software and is active in developing hardware and software solutions for internet-based music study. They also include graphic arts work (he designed the cover of this issue) and Website development and design. He is currently in private practice in Pleasanton, California, and in Geneva, Illinois with his wife, Marcie, managing lab schools for children in the arts and developing new, psychophysically-based teaching methods for children in the arts. Recent publications include Music Performance Anxiety and the High Risk Model of Threat Perception in Medical Problems of Performing Artists and Psychophysiology for Performing Artists in the third edition of Biofeedback: A Practitioner’s Guide.

Mark Zinn, MM, PC, NCTM is a professional concert artist and is certified by the Music Teachers’ National Association in Piano Performance. His research interests are in neurocognitive-developmental issues in the arts for children and adults. His other skills involve computer consulting in hardware and software and is active in developing hardware and software solutions for internet-based music study. They also include graphic arts work (he designed the cover of this issue) and Website development and design. He is currently in private practice in Pleasanton, California, and in Geneva, Illinois with his wife, Marcie, managing lab schools for children in the arts and developing new, psychophysically-based teaching methods for children in the arts. Recent publications include Music Performance Anxiety and the High Risk Model of Threat Perception in Medical Problems of Performing Artists and Psychophysiology for Performing Artists in the third edition of Biofeedback: A Practitioner’s Guide.
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