NeuroGuide by Applied Neuroscience, Inc.

The most affordable and comprehensive EEG system available: Dynamic EEG Databases, LORETA, Discriminant Functions, Power, Coherence, Phase, JTFA, Burst Metrics, Phase Reset, Statistics, Instantaneous Coherence & Phase Reset, Phase Locking & Phase Shift Duration, Batch Processing, Bi-Spectra & Neurofeedback, 3D Imaging

Take a test drive – download a FREE NeuroGuide Demo at: www.appliedneuroscience.com

gqeg@appliedneuroscience.com  727-244-0240

Pre vs Post Treatment Statistics and Z Score EEG Biofeedback & LORETA Z Score Biofeedback
COMPREHENSIVE TRAINING can only come from a comprehensive faculty. Our faculty members are clinicians with active practices, authors of core textbooks and cutting edge studies, and neuroscientists with decades of practical experience and knowledge. We provide three levels of neurofeedback: classical amplitude training, database guided live Z-Score PZOK, and QEEG interpretation and LZT training workshops. Most workshops offer APA and BCIA CE hours.

**Coming:** Web-based workshops!
With thousands of systems in the market, it is clear that NeXus technology is making a big impact on the fields of Neuroscience, Psychophysiology, Biofeedback, and Neurofeedback. The new NeXus-10 Mark II by Mind Media, is the latest (r)evolutionary step in the NeXus family. Its design is based on the feedback of thousands of world-wide NeXus users over the past 8 years. In combination with the BioTrace+ Software, the Mark II is probably the most versatile, flexible and powerful feedback system ever built, yet also the easiest to use. Stens corporation is very proud to be the exclusive distributor of NeXus for the US and Canada. We will be happy to help you with all your questions regarding the NeXus-10 Mark II. You may be surprised at its price too! US/Canada: call 800-257-8367. Other: contact Mind Media.

www.stens-biofeedback.com
www.mindmedia.info
Contents

Letter from ISNR President Randall Lyle, PhD .............. 6
Letter from AAPB NFB Division President
Richard Soutar, PhD ..................................... 7
Letter from ISNR Editor Merlyn Hurd, PhD .............. 10
Letter from AAPB Editor Roger H. Riss, PsyD .......... 11
Letter from ISNR Executive Director
Cindy A. Yablonski, MBA ................................. 13
Letter from AAPB Executive Director David L. Stumph ... 15
Evidence for the Effectiveness of NeuroField in a
Three-Year-Old Boy with Insomnia
Jamie D. Moore, RN, BCN and Erica L. Kube, BS ........ 16

Hemoencephalography:
A Practical Approach to Neurofeedback Training
Christel Kannegiesser-Leitner and Ralph Warnke ........ 23

Epilepsy: New (Old) Treatment without Drugs
Erik Peper, PhD ........................................... 30

Neurofeedback and Biofeedback Training with Olympic
Athletes Penny Werthner, PhD, Sommer Christie, PhD (CAD),
Margaret Dupee, PhD (CAD) ................................ 32

Providing Biofeedback and Neurofeedback for Hypervigilant
and Hyperactive Clients Cynthia Kerson, PhD ............ 39

I’ve Learned the Neurofeedback Basics—
So Now What’s Next? Judy Crawford ......................... 43

Neurofeedback Around the World .......................... 44

Research Foundation Update ............................... 46

Online Supplement

The following material may be found in the NeuroConnections Supplement at http://isnr.org/neurofeedback-info/neuroconnections-newsletters.cfm.

References for: Neurofeedback and Biofeedback Training with Olympic Athletes Penny Werthner, PhD, Sommer Christie, PhD (CAD), Margaret Dupee, PhD (CAD)
Letter from ISNR President

If you’re like me, you probably go straight to the research articles and case studies in the Journal and bypass the editorial. Sometimes I do that because I wrote the editorial and I already know what it says. Other times it is because I am more interested in discovering things that will help my practice rather than engage in some debate or another. Today, I want to strongly encourage you to read the editorial in the Journal of Neurotherapy that accompanies this issue of NeuroConnections.

While the technology involved in NFB is central to what we are able to do, it is not the only element.

As you will see in the editorial, back in 2011 the ISNR Board of Directors engaged with several people to seek a way to press insurers into reconsidering their judgment that NFB is an experimental procedure and therefore not reimbursable. The path suggested was to use the Wellstone-Dominici Parity Act as a means to force insurance companies to provide their evidence for considering the process experimental and thereby denying coverage. According to the Act, if a denial is issued and an appeal filed, the insurer must provide the reason for denial since it is illegal for them to deny care for a procedure that has an equivalent level of evidence for procedures that are already covered. The thinking was that plenty of evidence exists for the effectiveness of NFB for several conditions, particularly ADHD.

The Board of Directors commissioned Ed Pigott to draft a template letter that ISNR members would have access to which could be customized by each provider and used to appeal claims when the insurance company denied the claim. The plan is to encourage members to actively file claims for their clients for NFB services, particularly for ADHD, and when the claim is denied to use the letter and appeal the decision. Upon a second denial the clinician would then report the denial to the Federal Insurance Regulatory Board and ultimately demand that the insurer provide an external review, paid for by the insurer. This is a provision offered by the Affordable Care Act. As you will see in the editorial and in the review of evidence white paper available on the ISNR website, neurofeedback has not only equivalent evidence of effectiveness, but in fact, superior effectiveness in the treatment of ADHD.

I also want you to read the editorial and the white paper because I think it will improve your practice. While the technology involved in NFB is central to what we are able to do, it is not the only element. There is also the influence of the clinician providing the service. Most of us are well aware that we are no longer able to conceive of the human organism as a Cartesian dualism, separating mind from body. Everything is influencing us as we engage in relationships, therapies, and treatments, etc. The attitude and confidence of the clinician is also influencing the outcome and is probably the difference between a very successful treatment and a so-so outcome. I want you to read these documents because they will significantly increase your confidence. The authors have done a great job of pulling together the available evidence for neurofeedback effectiveness and offered it in direct comparison to the effectiveness of the critics and traditional treatments.

I will be honest. I felt my chest puffing up a little and I held my head a little higher after reading the editorial. It reminded me in a most beneficial way of why I do what I do and how many people I have been able to help over the years, and how we still need to fight for the right to make our benefits available to an even greater number of people. Finally, I am proud to say this is your ISNR Board at work. Many, many hardworking people have been at this for a long time, trying to further our field. In particular I want to thank Richard E. Davis, Genie Davis, Henry Harbin, and Ed Pigott for their dogged dedication and effort to get this done. They have persevered when many others would have given up.

Best,

Randall Lyle, PhD

Randall Lyle, PhD

ISNR Mission Statement
To promote excellence in clinical practice, educational applications, and research in applied neuroscience in order to better understand and enhance brain function. Our objectives are:
• Improve lives through neurofeedback and other brain regulation modalities
• Encourage understanding of brain physiology and its impact on behavior
• Promote scientific research and peer-reviewed publications
• Provide information resources for the public and professionals
• Develop clinical and ethical guidelines for the practice of applied neuroscience

AAPB Neurofeedback Division Mission Statement
To improve human welfare through the pursuit of its goals. The specific goals are:
• The encouragement and improvement of scientific research and clinical applications of EEG technology and neurofeedback.
• The promotion of high standards of professional practice, peer review, ethics, and education in neurofeedback.
• The promotion of neurofeedback and the dissemination of information to the public about neurofeedback.
• The division is organized for the purpose of carrying on educational and scientific objectives and is not to be operated for profit.
At this year’s meeting of the neurofeedback division of AAPB a strong theme emerged which inspired a round of passionate dialogue that I have not seen in years. Members spoke of how weary and fed up they were of the constant infighting and bickering they encountered on the list serves and that has become the backdrop of so many meetings. Everyone realizes that some high emotion is expected and healthy in debates regarding cherished ideas about method and theory, but what often occurs seems to move far beyond that healthy boundary. It is this same intensity of exchanges that originally split AAPB and ISNR and still resounds on the list serves when the subject of reunification between the two arises.

This topic is especially pertinent because at this same meeting there was a strong sentiment to reunify the two organizations for many practical reasons, such as reduced member costs for going to two meetings that often have both neurofeedback and biofeedback presentations and workshops. Vendors have also expressed strong dissatisfaction with the high costs of attending both of these meetings and recently signed a petition regarding their concerns. The pros and cons of all of this are considerable and too many to review here, but they are being aired once again on the list serves in their usual passionate and often accusatory form.

This is a topic likely to haunt us for some time and does not appear to be moving toward resolution in the near future. Several fundamental factors seem to be at play and two of them are the old money and status issues that haunt all organizations. These are perennial and difficult for most organizations to deal with, but many of them find enough maturity among the membership to overcome these issues. We would hope that an organization with so many clinicians would be able to resolve conflict effectively on these traditional topics.

Another issue of importance that appears to contribute to the ongoing conflict is one of confusing sales claims with science. We should consider this carefully.
and be wary of it. In conferences where vendors with a high level of scientific training number so abundantly among participants it is easy to see how this can happen. These vendors often represent conflicting paradigms with regard to methodology because their equipment is often exclusive to their methodology (and consequently their theory) or highly informs it. This can lead to inflated claims based on so-called “facts.” The FDA understands “puffery” and allows a certain level of it. When these claims get infused into scientific dialogue they become a corrupting factor. This can be amplified by loyal users who become indoctrinated through exclusive product use. It was resoundingly acknowledged by the entire NFB membership at AAPB that there is no high quality research utilizing controlled groups designs that at present generates a high confidence level that one method or product is superior to another.

As a young, dynamic, and growing field with a need for diversity of thought and investigation we should not be prematurely limiting the exploration of theory and method as a consequence of bias driven by the aforementioned confounds. Perhaps we should keep in mind that psychology has over 2000 different therapeutic methods with affiliated research paradigms, and the APA is robust and strong in spite of it. Finger pointing and accusations of unethical behavior based on unvalidated differences of opinion is not the best science. One of the key architects of modern scientific thinking, Karl Popper, concluded that we can never be right in science, we can only probably not be wrong and that is always a tentative state. That is what separates us from religion and politics. We might do well to keep this in mind in our future dialogues, and perhaps the resulting improved dialogue will lead to more fruitful results.

Richard Soutar, PhD, BCN

One of the key architects of modern scientific thinking, Karl Popper, concluded that we can never be right in science, we can only probably not be wrong and that is always a tentative state.
QEEG / TOPOGRAPHIC BRAIN MAPS:
Generalized Anxiety Disorder Subtypes

High Beta Subtype: Anxiety, Insomnia, Alcohol / Drug Abuse

High Alpha Subtype: Anxiety, Depression, ADD

Low Alpha Subtype: Anxiety, Insomnia, Alcohol / Drug Abuse

Cingulate Dysfunction: Anxiety, Rumination, Obsessive Compulsive Disorder

High Mean Frequency Beta: Anxiety, Alcoholism, Insomnia

High Mean Frequency Alpha: Anxiety, Insomnia

Available Services

Full Package: #'s 1-7: minimum recommended for Neurotherapy
   Includes electronic copy. Priority mail is $20 extra.
   $225.00

Full Package: #'s 1-6: Without report (1-5 only)
   Includes electronic copy. Priority mail is $20 extra. If one database used the minimum is $75.00
   $195.00

01) NX Link - NYU/E. Roy John Normative Database (Eyes Closed)
   A) NX Link Discriminant Analyses: ADD, LD, Depression, Memory/Dementia, Substance Abuse, Head Injury, Schizophrenia/Thought Disorders
   $70.00

02) EureKa3! - NovaTech EEG LORETA Analysis System and Adult Normative Database - Eyes Closed
   $70.00

03) Neuroguide - R. Thatcher Normative Database
   A) Eyes Closed Linked Ears Z-scores // Eyes Closed LaPlacian Z-scores
   $70.00/each

04) Neurorep - W. Hudspeth QEEG Analysis System
   A) Eyes Closed - Weighted Average, Z-scores, Magnitude, % Power, LaPlacian, Average Spectrum, coherence, connectivity
   $70.00/each

05) Thatcher TBI Discriminant Analysis and Severity Index
   $70.00

06) Thatcher Learning Disabilities Discriminant Analysis and Severity Index
   $70.00

07) Clinical Correlations and Neurotherapy Recommendations by Bob Gurnee
   $70.00

08) Conventional Medical EEG - Read by Neurologist
   $125.00

09) EureKa3! – NovaTech EEG LORETA Analysis - Eyes Open-Non Database
   $70.00

10) Neurorep - W. Hudspeth QEEG Analysis System: Task
    Weighted Average, Z-scores, Magnitude, % Power, LaPlacian, Average Spectrum
    $70.00

11) Supervision and Training Hourly Rate
    $100.00

12) Extra set of Printed Maps sent priority mail
    $35.00

13) Electronic (sent via FTP or E-mail) and Paper Copies of Maps sent priority mail with package purchase
    (Standard package rates only include electronic or paper copies of maps, not both)
    $20.00

14) Overnight Shipping & Handling (Price varies with carrier, destination, & package weight)
    $Varies

Total value: $630

Robert L. Gurnee
MSW, BCIA/EEG, QEEG Diplomate, Director
Welcome to the summer edition of NeuroConnections!

This issue’s idea was to bring into one edition (or more) case studies and articles that profiled using biofeedback (peripheral) and neurofeedback in treating clients. The articles we have received have given us a rich background and specific techniques to use with our clients.

First is an article about a three-year-old with insomnia that Jamie Moore and Erica Kube successfully treated with Neurofield. This is a heartfelt study and well worth your time.

Christel Kannegiesser, Leitner and Ralph Warnke provide us with an exciting discussion of HEG and their work with clients. I find HEG one of the easiest, simplest instruments to use with really impressive results. Whether you use HEG yet or not, be sure to read their article.

Peper gives us some valuable advice on using breathing techniques with epilepsy clients. If you have never read Dr. Peper’s books or attended his workshops, this is a first taste of this wonderful clinician/researcher’s mind. Also, the article helps us to remember how important breathing techniques are with very fragile clients. I, myself, start all training with breathing techniques and continue with several minutes per session for a long time.

Penny Werthner, Sommer Christie, and Margaret Dupee discuss research on neurofeedback and sports performance, and describe how their work with Canadian Olympic athletes helps them to have a greater sense of control over their performance and cope better with the stress of competition.

Cynthia Ker- son provides us with a discussion of the various types of peripheral biofeedback techniques and gives us information on their use with a hyper-vigilant client.

Finally, John Davis, PhD, was able to round up information regarding the activities in Europe and Mexico. It is so wonderful to see how much is going on around the world. Hopefully, this column will remain as a staple in NeuroConnections.

Now have fun this summer and see you at ISNR!!!!

Merlyn Hurd, PhD, BCN Senior Fellow
Letter from AAPB Editor

In the fall of 2006, ISNR board leadership, under direction of Judith Lubar, convened over breakfast with AAPB Neurofeedback Division board leaders, headed by Tom Collura, to approve plans for a new joint venture. Their vision: a merger of newsletters. While practical benefits, such as shared financial risk, and reduced competition for advertiser support were noted, the consensus that morning formed around the compelling benefits to the field of a unifying voice for neurofeedback and a new level of cooperation between the two organizations. I no longer recall who suggested the name NeuroConnections; but all in attendance concurred that this title was an apt description of our shared aspirations.

Since its launch in January 2007, I have been privileged to serve as co-editor of NeuroConnections newsletter, representing the AAPB Neurofeedback Division, in collaboration with my gracious and talented ISNR counterpart, Merlyn Hurd, and the very welcome creative organizational talents of Barbara Trumbo, our new managing editor, who is already raising our production process to new levels of professionalism. It is my hope that the efforts of the NeuroConnections editorial team have in some small way given form to the vision and aspirations articulated at that 2006 breakfast meeting. Readers also mention that they have noted a “raising of the bar” regarding consistency and quality of content over recent years; in truth my co-editors get much of the credit for this trend. However, more so than the quality of content, I am particularly proud of NeuroConnections’ role as a bridge between our two organizations, which I hope will serve as a model for continued cooperation and collaboration within the field.

Merlyn, Barbara, and I are grateful to the ISNR and APBB Neurofeedback Division boards for their consistent interest in and unflagging support of NeuroConnections, yet we recognize that NeuroConnections has been, and continues to be largely a “labor of love” of a handful of dedicated volunteers, relying more on a collegial spirit of cooperation than on formal processes. As we enter our 6th year, and in recognition of the maturation of the NeuroConnections partnership, the NeuroConnections editorial team is once again entering into a dialog with board members to develop and articulate a common vision for our next stage of evolution and to sow the seeds for a more formalized structure to sustain us into the future. We look forward to this dialog, and to NeuroConnections’ continued contribution as a unifying voice for the neurofeedback community.

Roger H. Riss, PsyD, BCN, BCB
Senior Fellow, QEEG-t

AAPB’s 44th Annual Scientific Meeting
Session Recordings Available for Purchase!

If you were unable to attend the 2013 AAPB Annual Meeting in Portland, Oregon on March 13-16, or if you were there and just could not attend all the sessions that interested you, we encourage you to purchase CD, DVD and/or full-meeting or individual session MP3 audio session downloads. Backcountry Recording is offering audio recordings of many of the meeting’s educational sessions. Information on available recordings and pricing may be obtained by contacting:

www.BackCountryRecording.com
(904) 460-2379
info@BackcountryRecording.com

Visit www.aapb.org for more information TODAY!
Jonathan E. Walker, M.D.

- Board Certified Neurologist
- Board Certified Electroencephalographer
- President of the Neurofeedback Division of AAPB
- President of the American Board of QEEG Technology
- Pioneer in the field of neurotherapy research and treatment, he has used neurofeedback in his medical practice for over 20 years

EEG / QEEG interpretations, analyses and reports with protocols using the modular activation / coherence approach to allow practitioners to achieve superior results

Dr. Walker personally reads each QEEG Service includes phone consultation with Dr. Walker

Neurotherapy Center of Dallas
12870 Hillcrest, Suite 201, Dallas, Texas 75230

Call us: 972-991-1153, Ext. 14
Email us: admin@neurotherapydallas.com
Visit our Web site: www.neurotherapydallas.com
Letter from ISNR Executive Director

Make Plans to Participate in ISNR’s 21st Annual Conference in Dallas

Where will you be September 18-22, 2013? If you are a clinician, educator, researcher, or mental health professional interested in techniques, applications, technologies, and solutions to applied neuroscience in order to better understand and enhance brain function, then you need to be at the ISNR 21st Annual Conference.

This year’s conference will feature the leading experts in the advancement and application of neurofeedback. The organizers, Leslie Sherlin and Dan Williams, have put together an outstanding conference program this year. A special thank you to the conference committee members for their continued dedicated service to ISNR’s conference work:

Leslie Sherlin, Co-Chair
Dan Williams, Co-Chair
John Carmichael (retired)
Peder Fagerholm
Noel Larson
Lexi Meinhold
Steven Rondeau
Hank Weeks
Noland White

Timely and compelling presentations will be offered in various formats including workshops, posters, and supplier exhibitions. And, back by popular demand, small group discussions where you can share your ideas and expertise with colleagues.

A renewed commitment to our suppliers will offer more emphasis on the exhibit hall where you can have face-to-face discussions with those providing the technology, products, services, and solutions for the issues you face in your practice or business. We will have concentrated, unopposed exhibit hours along with a special ribbon-cutting ceremony to kick off this year’s conference.

We welcome your company as an exhibitor and sponsor at the conference. If you would like more details on the menu of options for exhibitors and sponsors, please visit www.ISNR.org or feel free to contact Annette Suriani, CMP (Conference Direct) at Annette.suriani@conferencedirect.com or (703) 261-6562. We are pleased to welcome Annette to the ISNR Conference team this year as our Conference Director. Annette has 25+ years of association, conference, and tradeshow management experience. I am sure that you will enjoy interacting with her.

I am pleased to report that the organizers are again offering a conference program format to provide for longer and more in-depth presentations that will facilitate an atmosphere of understanding and integration of research and practice. Evenings will feature receptions and poster sessions along with opportunities for networking and socializing with colleagues and friends. The conference has an earlier end time on Sunday morning to facilitate travel. Plan to arrive Wednesday and depart late Sunday to take advantage of all that the conference offers.

The ISNR conference will be held at the InterContinental Dallas, centrally located in the heart of North Dallas, just 13 miles from downtown. Few Dallas luxury hotels offer outstanding hospitality, world-class dining, along with a location near a vibrant, bustling district featuring shops, restaurants, and bars within walking distance of your room. The hotel also features a spacious outdoor pool and easy access to the northern suburbs, Love Field and DFW International Airport.

In addition to the parallel oral presentations and workshops, here are a few highlights of the keynote speakers:

- Lorenzo Cohen, PhD, Professor and Director of the Integrative Medicine Program at The University of Texas MD Anderson Cancer Center
- M. Joy Dauncey, PhD, ScD, FSB, Fellow of Wolfson College, University of Cambridge, UK
- Martin Paulus, MD, University of California San Diego, Laboratory of Biological Dynamics and Theoretical Medicine
- Judson Brewer, MD, PhD, Medical Director, Yale Therapeutic Neuroscience Clinic, Assistant Professor, Department of Psychiatry at Yale University School of Medicine

Invited Speakers:

- William Cullinan, PhD, Dean of the College of Health Sciences and director of the Integrative Neuroscience Research Center at Marquette University.
- Paul Zarkowski, MD, Assistant Professor Dept. of Psychiatry and Behavioral Sciences at the University of Washington.

We welcome your submissions for the conference. Poster, oral paper, and workshop submissions are now open and close on May 3. Learn more about how to register for the conference, make a submission, and sign up to exhibit or the various sponsor opportunities at www.isnr.org.

I value your input, your ideas, and your suggestions. This is your organization and your involvement is essential. So please feel free to contact me to discuss any issues. My email is cyablonski@isnr.org.

With best wishes,
Cindy A. Yablonski, MBA
Experience Life...AGAIN™ With the New 7th Generation Alpha-Stim®

It Melts Away Anxiety, Lifts Depression And Helps You Sleep Longer And It Does All That Simultaneously And Safely
Where have you been all its life?

What is the Alpha-Stim® AID?
The Alpha-Stim® AID is a medical device used for the management of anxiety, insomnia and depression (AID). Alpha-Stim® AID provides a safe, effective and proven alternative to drugs. Use it during talk therapy, while working at your desk, or at home watching TV or meditating. After treatment, there are no physical limitations imposed so you can immediately resume your normal activities. The treatment is simple and easily administered at any time. People using the Alpha-Stim® AID usually report a pleasant, significantly relaxed feeling of well-being accompanied by an alert mind.

Try it Yourself.
You Will Be Amazed How Good You Can Feel.
Most People Experience a Significantly Better Mood, and Sleep Longer and Deeper.

✓ Simultaneously Treats Anxiety, Insomnia and Depression
✓ Proven Effective in Many Double-Blind Studies
✓ Most Research of Any Therapeutic Device
✓ Research Being Funded by DOD, VA, NIH, NCI
✓ Veterans Chose Alpha-Stim® 73% of the Time When Given a Choice of 5 Non Drug Therapies
✓ Results are Long Lasting and Cumulative

What Makes Alpha-Stim® Unique?
It’s the waveform. Alpha-Stim® generates a unique and proprietary waveform that no other device can replicate. The waveform in a therapeutic device is analogous to the precise chemical compound that differentiates one drug from another.

Alpha-Stim® waveform is distinctive in its proven safety and effectiveness. It uses such a low current that some people can’t even feel it. It is never turned up to where it is uncomfortable. After just one simple 20 to 60 minute treatment via ear clip electrodes your body can relax comfortably while your mind is more alert.

Patient Self Reports: Alpha-Stim® vs. Drugs

Anxiety
Wexar (N=2288) 64%
Alvars (N=838) 85%
Alpha-Stim® (N=1186) 90%
Alpha-Stim® (N=398) 85%

Insomnia
Lunesta (N=462) 36%
Sonata (N=62) 48%
Alpha-Stim® (N=96) 81%
Alpha-Stim® (N=143) 64%

Depression
Zone Off (N=2820) 79%
Well-Bad (N=1748) 87%
Alpha-Stim® (N=495) 78%
Alpha-Stim® (N=371) 83%

Percent of Patients Reporting Improvement

Scan to take the Alpha-Stim® AID for a test drive

Visit our website at Alpha-Stim.com

In the USA the FDA restricts this device to sale by, or on the order of a licensed practitioner. It is sold over-the-counter throughout the rest of the world. Side effects occur in less than 1% of people and are mild and self-limiting consisting mainly of headaches and skin irritation on the ear lobe electrode site.

© Copyright 2012 by EPI Inc. ALL RIGHTS RESERVED. Alpha-Stim® is registered in the U.S. Patent and Trademark Office and Worldwide Patents Pending.

Special Offer for NeuroConnections Readers

Want to try an Alpha-Stim®?
We have a FREE 60 day Practitioner Loan Program. We offer FREE webinars by an M.D. on the science and implementation of Alpha-Stim® for every new Alpha-Stim® practitioner.

Not a practitioner? First ask your physician or psychologist if Alpha-Stim® is right for you. We have a money back satisfaction guarantee. If Alpha-Stim® doesn’t work for you return it and all you will pay is a restocking fee. Call for details.

Call us at 800.FOR.PAIN (800.367.7246) and speak with an Alpha-Stim® support representative to receive your FREE Overview of Alpha-Stim® Technology brochure or email us at info@epi.com

2201 Garrett Morris Parkway
Mineral Wells, TX 76067 USA
800.FOR.PAIN in USA and Canada
(940) 328-0788 - info@epi.com
Letter from AAPB Executive Director

44th Annual Conference Offers Exciting New Vibe!

The AAPB Board of Directors, Program Planning Committee, and staff organizers would like to thank everyone who attended the 2013 AAPB Annual Scientific Meeting, Creating Synergy: Integrating Methods and Modalities. In addition, we wish to thank the scholars, researchers, practitioners, and thought leaders who presented their work at the meeting. It is our sincere hope you found this year’s meeting helpful, informative and fun!

If you missed this year’s AAPB Annual Scientific Conference in Portland Oregon on March 13-16, you missed an exciting new vibe! In this case, “new” is actually a double entendre.

The first sense of the word is that there was a new excitement surrounding the meeting this year. The conference attracted more than 60 students, many of whom provided podium or poster presentations. The quality of the presentations was outstanding. And the excitement of the overall conference attendance was evident in all aspects of the conference. The students were engaged at all levels within the organization and welcomed into the AAPB family like never before.

There was also a newness that was apparent in the overall youthful feeling present in the meeting. AAPB has suffered in the past from the results of an aging member population. The infusion of youth into the organization provides a new-found hope for the future of biofeedback and neurofeedback that has not been felt in recent times!

On behalf of AAPB, we extend our sincere gratitude to the Foundation for Education and Research in Biofeedback and Related Science (FERB) for their generous support in funding 40 of the students to attend and present at the meeting. Brain Science International (BSI) was also instrumental in funding the students’ participation in the FERB fundraising event at the conference. The event was successful in raising more than $12,000 to support future funding for student grants and scholarships.

With this infusion of youth into AAPB, we are already beginning to see results in membership growth. As we look to the future for AAPB, there is definitely a new vibe that is generating an excitement that we believe will have a positive impact, both on AAPB’s future and the overall future of biofeedback and neurofeedback.

Were you unable to attend AAPB’s 44th Annual Scientific Meeting in Portland? Perhaps you attended the Meeting but were unable to see all of the sessions that interested you. Thanks to the amazing team at Backcountry Recording, you can now order many of the sessions found at this year’s meeting. PLEASE NOTE: Only sessions where speakers gave consent to be recorded are available to order.

To order: Contact Backcountry Recording at (904) 460-2379.

We look forward to seeing you all next year in Savannah, Georgia, March 19-22, 2014 for AAPB’s 45th Annual Scientific Meeting! Details will be available soon!

David L. Stumph, IOM, CAE

ISNR Launches Toolkit for Clinicians

Two new resources for clinicians have been launched on the ISNR.org website.

First, an ISNR-sponsored ADHD study to support insurance reimbursement for neurofeedback, a peer-reviewed white paper. Commissioned by ISNR and authored by Ed Pigott, PhD, Lindsey De Baise, PhD, Eugenia B. Davis, PhD, and Richard Davis, MS, this study is:

- A thorough documentation of neurofeedback efficacy for ADHD.
- A comprehensive document that neurofeedback practitioners may access for insurance appeals and insurance parity requests on behalf of their clients/patients.
- An excellent marketing tool which clearly documents the evidence base for neurofeedback treatment of ADHD.
- A current reference list of neurofeedback studies for ADHD.
- A source for appropriate research design of learning-based treatments such as neurofeedback.

In addition, the clinician’s toolkit, which includes the white paper, as well as letter templates for neurofeedback clinicians and those they treat, to use in the insurance claims appeal process.

You will find the toolkit on the ISNR website at: [http://www.isnr.org/neurofeedback-info/toolkit.cfm](http://www.isnr.org/neurofeedback-info/toolkit.cfm).

Take advantage of this invaluable resource today!
Evidence for the Effectiveness of NeuroField in a Three-Year-Old Boy with Insomnia

Jamie D. Moore, RN, BCN and Erica L. Kube, BS

Abstract

The objective of this study is to investigate the effect of NeuroField real-time Z-score training and low-intensity pulsed electromagnetic field (pEMF) stimulation on a three-year-old child diagnosed with Stickler Syndrome, Pierre Robin Sequence, and insomnia. Based upon the child’s history, a NeuroField training plan was implemented to target the parents’ primary complaint of insomnia. The boy had a total of 27 NeuroField training sessions. A pre-training, follow-up-training, and post-training Quantitative Electroencephalography (qEEG) was analyzed. Parent report of sleep and behavior was also recorded. The results show significant differences between the pre-test, follow-up, and post-test qEEG data. Symptoms of insomnia, restless sleep, and behavior problems improved over the course of the study. The data analysis also concluded that qEEG patterns showed continued improvements beyond the cessation of training.

Case Report

The subject is a three-year-old male who had been diagnosed by medical professionals with Stickler Syndrome and Pierre Robin Sequence. Prior to birth, the young child was diagnosed with intrauterine growth restriction (IUGR). At birth, the child required multiple resuscitations and suffered respiratory arrest, resulting in anoxia. He was placed on extracorporeal membrane oxygenation (ECMO). After stabilization, the child suffered from severe sleep apnea and wore an apnea monitor for several months. During the next three years of life, the child had undergone anesthesia for six major corrective surgeries. At the age of three, the toddler’s parents brought their child in for neurotherapy consultation. In desperation, the young parents explained that their toddler does not sleep. Per parent report, the child would not take naps and took four hours or more to fall asleep. During sleep, the parents reported that the toddler is extremely restless. The child wakes in the mornings irritable and low in energy. The toddler presented as hyper-vigilant, hyperkinetic, and anxious. He also is small for his age group and has poor coordination and balance. The child has no history of seizure, and his MRI was within normal limits, though anoxia was noted. He regularly sees a pediatric physician and a nutritional therapist. He received most of his nutrition through a gastric tube.

Literature Review

Cellular injury occurs during an anoxic event. Deprivation of oxygen and metabolic substrates such as glucose causes a loss of energy and oxidative stress (Abramov, Scorziello, & Duchen, 2007). Anoxia is correlated with deficits in memory, learning, attention, visuoperceptual and visuoconstructional abilities, generalized intellectual impairment, behavioral problems, and difficulties in executive functions. (Allen, Tranel, Bruss, & Damasio, 2006; Caine & Watson, 2000; Garcia-Molina et al., 2006; Lim et al., 2004; Myers et al., 2008; Pierro et al., 2005). No specific pattern emerges as a result of an anoxic event. Impairment observed in anoxic cases depends on a magnitude of factors, such as the nature and duration of the anoxic event as well as the regions associated with neuronal degeneration (Bachevalier & Meuiner, 1996; Wilson, 1996; Wilson, Harpur, Watson, & Morrow, 2003). Abnormal EEG has been documented in several cases of anoxia, particularly, background slowing correlated with an encephalitic state (Thaler, Reger, Ringdahl, Mayfield, Goldstein, & Allen, 2012).

A growing body of recent research has suggested concerns that anesthetic agents may pose a risk in vulnerable brains of the very young (Zuccherelli, 2010). The current research is preliminary, but concern in the medical field has warranted the foundation of the Anesthesia Patient Safety Foundation to discuss long-term effects of surgery and anes-

1. Stickler syndrome is a group of hereditary conditions characterized by a distinctive facial appearance, eye abnormalities, hearing loss, and joint problems. These signs and symptoms vary widely among affected individuals.
2. Pierre Robin syndrome (or sequence) is a condition present at birth, in which the infant has a smaller-than-normal lower jaw, a tongue that falls back in the throat, and difficulty breathing.
neurotoxicity (Zuccherelli, 2010). Research on human brain development and anesthesia has suggested that children between birth and two to three years of age are at risk for developing anesthetic neurotoxicity (Sun, 2010). Anesthesia has also been studied for its effects on circadian rhythms. The research has shown that general anesthesia can alter circadian rhythms on the days following surgery (Dispersyn, Pain, Challet, Touitou, 2008).

Neurofeedback has long been studied for its effects on insomnia and other sleep disorders (Hammond, 2007; Hauri, 1981, Hauri, 1982). Cortoos et al. (2010) produced a study that demonstrated that SMR neurofeedback was superior to other forms of biofeedback in improving sleep behavior. Several studies have shown that patients with insomnia exhibit elevated levels of beta EEG activity (Merica, Blois & Gaillard, 1998; Perlis, Smith, Andrews, Orff & Giles, 2001).

Low frequency repetitive transcranial magnetic stimulation (rTMS) has been shown to decrease intracortical excitability and have inhibitory properties (Romeo, Anschel, Sparing, Gangitano, & Pascal-Leone, 2002). These findings suggest that magnetic stimulation has implications for therapeutic use. NeuroField is a type of neurofeedback device that incorporates the use of low intensity pEMF stimulation. The NeuroField pEMF ranges from 1–50 microtesla, which is 10,000,000 times weaker than the stimulation generated by rTMS (Dogris, 2011).

Only a few studies which utilized NeuroField have been published. Publications that are available have studied the effects of NeuroField on Parkinson’s disease, premenstrual dysphoric disorder, attention deficit disorder, anxiety, conduct disorder, and post-traumatic stress disorder (Dogris, 2011; Dogris, 2012). In addition to the available research, NeuroField has been rated by licensed practitioners to be clinically valuable. The effect of NeuroField pEMF appears to be very similar to the effects of rTMS and has been documented to have long-term effects (Dogris, 2011; Dogris, 2012). Based upon the clinical and statistical findings, further investigation of NeuroField and its implications are warranted. The current study investigates the effect of NeuroField real-time Z-score training and low-intensity pEMF stimulation in the case of a three-year-old child.

### Table 1: NeuroField training outline for three-year-old boy with insomnia.

<table>
<thead>
<tr>
<th>Week Number</th>
<th>Participant Received</th>
<th>NeuroField Protocol</th>
<th>Electrode Placement</th>
<th>Coil Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Pre-training qEEG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5 NeuroField RTZ</td>
<td>0.31–1Hz HD</td>
<td>C3, C4</td>
<td>C3, C4, P3, P4, F3, F4, C3, C4</td>
</tr>
<tr>
<td>2</td>
<td>2 NeuroField RTZ</td>
<td>0.31–1Hz HD</td>
<td>C3, C4</td>
<td>C3, C4, P3, P4, C3, C4, Cz</td>
</tr>
<tr>
<td>3</td>
<td>2 NeuroField RTZ</td>
<td>0.31–1Hz HD</td>
<td>C3, C4</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>No training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2 NeuroField RTZ</td>
<td>0.31–1Hz HD</td>
<td>C3, C4</td>
<td>F3, F4, P3, P4</td>
</tr>
<tr>
<td>6</td>
<td>1 NeuroField RTZ</td>
<td>0.31–1Hz HD</td>
<td>C3, C4</td>
<td>C3, C4, P3, P4</td>
</tr>
<tr>
<td>7</td>
<td>3 NeuroField RTZ</td>
<td>0.31–1Hz HD</td>
<td>C3, C4</td>
<td>C3, C4, Cz, Pz, Fz, C3, C4, Pz</td>
</tr>
<tr>
<td>8</td>
<td>3 NeuroField RTZ</td>
<td>0.31–1Hz HD</td>
<td>C3, C4</td>
<td>Fz, C3, C4, Pz</td>
</tr>
<tr>
<td>9</td>
<td>2 NeuroField RTZ</td>
<td>0.31–1Hz HD</td>
<td>C3, C4</td>
<td>Fz, C3, C4, Pz, C3, C4, Pz</td>
</tr>
<tr>
<td>10</td>
<td>Follow-up qEEG, 2 NeuroField RTZ</td>
<td>9–12Hz HD</td>
<td>P3, P4</td>
<td>P3, P4</td>
</tr>
<tr>
<td>11</td>
<td>2 NeuroField RTZ</td>
<td>9–12Hz HD</td>
<td>P3, P4</td>
<td>P3, P4</td>
</tr>
<tr>
<td>12</td>
<td>2 NeuroField RTZ</td>
<td>9–12Hz HD</td>
<td>P3, P4</td>
<td>Fz, P3, P4, Pz</td>
</tr>
<tr>
<td>13</td>
<td>1 NeuroField RTZ</td>
<td>9–12Hz HD</td>
<td>P3, P4</td>
<td>Fz, P3, P4, Pz</td>
</tr>
<tr>
<td>14–18</td>
<td>No training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Post-training qEEG</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
activity can relieve symptoms of insomnia and restless sleep. 3) Low-intensity pEMF stimulation has a lasting effect on EEG. The null hypothesis in this study is that: 1) NeuroField pEMF will not reduce high beta, 2) there will be no changes in the infant’s sleep patterns, and 3) 30-day follow up will show no changes in the EEG or the infant’s sleep patterns.

**Instrumentation and Methods**

**Quantitative EEG**

Three qEEGs were acquired on three separate dates. A pre-training qEEG was recorded prior to the start of NeuroField sessions. A follow-up qEEG was recorded after receiving twenty low-intensity pEMF training sessions using the NeuroField X2000 and NeuroField Plus system. A third post-training qEEG was recorded six weeks after the last NeuroField pEMF training session. Each 19-channel qEEG was recorded using an Electro-Cap (Electro-Cap International, Inc). EEG acquisition was collected using a BrainMaster Discovery 24E amplifier. All qEEG recordings were acquired in the eyes open condition, because of the age of the participant. All reference and cap electrodes were confirmed to have 5–10K Ohms resistance values using a Checktrode®, model 1089NP impedance monitor. Impedance was measured to ensure the integrity of the data. QEEG data was analyzed using the NeuroGuide referenced normative database. Data was analyzed in both linked ear and Laplacian montages.

**NeuroField**

This study utilized the NeuroField X2000 with NeuroField Plus and 200 wound coil system. This system is a four-channel frequency generator that is capable of generating low intensity pEMF from 0.31 to 300,000 Hz. The X2000 model has the ability to measure a participant’s physiological response to each low-intensity pEMF stimulation through two channels of EEG or heart rate variability.

The NeuroField system connects to a cable which is attached to four 200 wound coils. The 200 wound coils adhere to the NeuroField cap, which is worn on the cranium. The coils are then placed on the cap to target specific training areas determined by qEEG and presenting symptoms. Each of the four 200 wound coils creates an EMF intensity of 1–50 microtesla (or 1–500 milligauss).

**Study Procedure**

NeuroField sessions began shortly after the analysis of the baseline qEEG. Each session utilized NeuroField low-intensity pEMF. During this study, low-intensity pEMF was generated at 5V DC for 5,000–10,000 milliseconds. NeuroField real-time Z-score thresholding (RTZ) was used throughout the course of training.

---

**NeuroField RTZ is a feedback system which can be used to instantaneously measure the effect of each NeuroField pulse on brain activity.**

---

**NEUROFIELD**

The Energetic Wave of the Future

- **X3000 pEMF Stimulation**
- **Real Time Z-Score Thresholding & HRV**
- **Q20 - EEG D/C Amplifier**

WWW.NEUROFIELD.COM  (760) 872-4200  CONTACT@NEUROFIELD.ORG  NICHOLASDOGRIS@VERIZON.NET
1 to 19 Channel NeuroGuide Neurofeedback
Seamless Integration of QEEG and EEG Biofeedback

Available for Users of
Deymed
BrainMaster Discovery
Neuropuls
Nexus
Mitsar
Neuron Spectrum
ABM
Mindo
Avatar EEG
gTech

Including:
Real-Time Z Score
Symptom Check List
Discriminant Functions
Power
Coherence
Phase
JTFA
Burst Metrics
Phase Reset
Statistics
Instantaneous Coherence & Phase Reset
Phase Lock and Phase Shift Duration
3-D LORETA Z Score Biofeedback.

Take a test drive – download a
FREE NeuroGuide Demo at:
www.appliedneuroscience.com

Contact US at:
qeeg@appliedneuroscience.com
727-244-0240
NeuroField RTZ is a feedback system which can be used to instantaneously measure the effect of each NeuroField pulse on brain activity. NeuroField RTZ measures and analyzes 4–32 seconds of EEG activity after each low-intensity EMF pulse. The EEG activity is then instantaneously analyzed using the NeuroGuide Z-score database. NeuroField RTZ repeats frequencies which meet the set training parameters which are guided by the results of the qEEG and presenting symptoms. The RTZ function can be set to threshold on a single or multiple frequency bands.

For the purpose of this study, the RTZ function was set to repeat frequencies which reduced high beta activity within ±1 standard deviation. NeuroField pEMF with RTZ thresholding was given for 40–60 minutes each session. The three-year-old participant had a total of 27 NeuroField RTZ training sessions. Table 1 illustrates the course of NeuroField training sessions, qEEG recordings and analysis, NeuroField protocol, electrode placement, and coil placement used throughout the duration of training. All training sessions and qEEGs occurred in the eyes open condition.

**Results**

The results of the pre-training, 20-session follow-up training, and six weeks’ post-training qEEG were analyzed; summary Z-score analyses are presented in Figures 1, 2, and 3. Statistical Analysis was completed using the NeuroGuide normative database and NeuroGuide statistical software. Three one-way analysis of variance (ANOVA) comparisons were run on the qEEG data; pre-test vs. post-test, pre-test vs. follow-up and post-test vs. follow-up. All conditions showed significant changes in all EEG frequency ranges (p < 0.0001). The high beta range showed significant reductions in absolute power, hyper-coherence and phase in all conditions (p < 0.0001). (A comprehensive summary of results generated by the NeuroGuide statistical program is available upon request from the authors).

Parent report of average sleep latency and duration per night were recorded weekly. The results of this data indicated that the toddler required less time to fall asleep (Figure 4) and begun sleeping through the night (Figure 5). The parents reported that nighttime restlessness decreased. The child began taking rou-

---

**Figure 1**: Summary Z-score Analysis of Pre-NeuroField training qEEG.

**Figure 2**: Summary Z-score Analysis of Follow-up qEEG, recorded after 20 NeuroField RTZ sessions.
tine naps by week three. Throughout the training, the parents also reported that the child had more energy, increased focus, and less anxiety.

Discussion
The purpose of this study was to examine the effect of the NeuroField RTZ pEMF procedure on an infant with Stickler Syndrome, Pierre Robin Sequence, and insomnia. The results of this study support the hypothesis that pEMF training is able to reduce high beta and normalize sleep patterns. Furthermore, the data shows that high beta reductions continued after training was discontinued from follow-up to post-test qEEG. This observation supports the notion that the brain is able to continue regulating itself after the pEMF correction was implemented.

This case clearly demonstrates neuroplasticity and adaptability of the brain. As the brain became more regulated, and excess high beta activity became more normalized, other EEG activity also became more normalized. Delta training was not individually targeted in this case. The normalization of delta was a surprising clinical finding. Excess delta may have been present in the brain due to a multitude of reasons, including: sleep deprivation, history of anoxia, or as a compensatory mechanism for the excess high beta. Whatever the root cause may have been, the NeuroField training plan significantly changed all EEG frequency ranges.

It appears that NeuroField pEMF training has clinical value which warrants more research and study. Future research should focus on large subject samples with control groups and placebo/sham/blind conditions. It would also be helpful to study each of the individual training programs that are available with the Neu-
roField software.

This case study offers support for the idea that early intervention is very important. Neurotherapy does work for very young children. Sleep loss can impair performance, cognition, and have other health and behavioral implications. A child’s sleep patterns may also affect other members of the family. Unfortunately, clinicians, researchers, and even parents often ignore sleep disorders in children. This case study demonstrates that when you change a brain, you change a life. And when you change a child’s life, you change a brain, you change a life.

A note from the parents: “Before receiving training at Integrated Neurotherapy, our son typically fell asleep four hours after being put to bed for the night, despite going without a nap during the day. He would wake up in the middle of the night and have trouble falling back to sleep by himself. Since being seen at Integrated Neurotherapy, our son now falls asleep routinely within 30 minutes. Moreover, he sleeps longer and rarely wakes in the middle of the night. The improvements in our son’s sleeping habits have allowed our whole family to sleep and function better! Our son’s prior insomnia had affected our family’s health, work efficiency, and social life. We are thankful for the resolution of our son’s insomnia, as it has restored our lives to a more normal and positive routine.

About the Authors

Jamie Moore, RN, BCN, has been a Registered Nurse for over 33 years. He graduated from Saint Joseph’s School of Nursing in 1979, and has continued to study the brain and Autism Spectrum Disorder ever since. Jamie has studied under Leslie Sherlin, and completed training by John Anderson, a pioneer in the field of neurofeedback. He completed his internship/mentoring under Nicholas Dogris, inventor of the NeuroField system. Jamie plans to continue his education in neurotherapy and nursing, and to carry on practicing from his heart.

Erica Kube, BS, is a graduate from the program of neuroscience and biology at the University of Nebraska, Omaha, where she received recognition for her achievement and outstanding performance. She has authored award-winning work and practices neurotherapy full-time. Erica has completed extensive training with experts in the field of neurotherapy including John Anderson and Nicholas Dogris. She is currently finishing a Master’s of Science in Clinical Counseling. This advanced training and passion for learning the latest approaches have increased the efficiency and effectiveness of neurotherapy, from which her clients achieve maximum health and quality of life.

Disclaimer: The authors of this study have no affiliation with any of the brands or businesses mentioned in this paper. The participant and parents were not compensated for their participation in this study.

References


Neurofeedback is a fast-progressing treatment method. The scope of pathologies and non-pathologies being treated with neurofeedback is likewise growing steadily. One of the biggest challenges in neurofeedback, particularly when treating children (i.e. with ADD/ADHD), is that EEG-based neurofeedback is easily affected by artifacts; in addition, at a rate of one session per week, typical neurofeedback therapies for ADD/ADHD take about a year to complete.

This article describes a different approach to neurofeedback treatment. It is based on the concept of nIR-based hemoencephalography (HEG) therapy as proposed by Toomin and others. While there also is pIR-based HEG as well, this publication focuses on nIR-based HEG. The key target groups here are ADD/ADHD children, dyslexic children, and children with other forms of learning disorders. The authors are in the process of assessing the potential of a time-compressed HEG training of several sessions per day over a period of one or two weeks each (over a maximum of two to three weeks total). The aim is to provide children and youth with limited concentration and endurance a treatment they can more easily cope with and perceive as successful in a fast and convincing way.

The treatment in this case is embedded in the clinical practice of a child and youth psychiatrist. The participants of the HEG training have undergone a sequence of other measures prior to HEG treatment which is briefly described in the following for better reference and understanding:

The “psychomotor holistic therapy” (PMHT)1 is a form of dedicated therapy where diagnosis and development of the individual therapy plan take place in the clinical practice, while the actual training for the most part is done at home.

This article describes a different approach to neurofeedback treatment. It is based on the concept of nIR-based hemoencephalography (HEG) therapy as proposed by Toomin and others. While there also is pIR-based HEG as well, this publication focuses on nIR-based HEG. The key target groups here are ADD/ADHD children, dyslexic children, and children with other forms of learning disorders. The authors are in the process of assessing the potential of a time-compressed HEG training of several sessions per day over a period of one or two weeks each (over a maximum of two to three weeks total). The aim is to provide children and youth with limited concentration and endurance a treatment they can more easily cope with and perceive as successful in a fast and convincing way.

The treatment in this case is embedded in the clinical practice of a child and youth psychiatrist. The participants of the HEG training have undergone a sequence of other measures prior to HEG treatment which is briefly described in the following for better reference and understanding:

The “psychomotor holistic therapy” (PMHT)1 is a form of dedicated therapy where diagnosis and development of the individual therapy plan take place in the clinical practice, while the actual training for the most part is done at home.2 The HEG treatment described in this article is the one key exception to this routine procedure. PMHT integrates and combines several therapy methods depending on the individual client’s needs. This includes PADOVAN therapy, the Warnke Method for Central Auditory Processing (CAP),3 and others. HEG was added as a key therapy well over a year ago, with astonishing success. Patients with ADD/ADHD, with or without additional developmental disorders, particularly struggle with focusing and are easily distracted by stimuli from their respective environment. Therefore, the clients described in this article originally received an extensive training program based on PMHT and elements of the Warnke Method4 dedicated to improve both auditory and visual brain processing skills. This is added to by Padovan’s concept of neurofunctional reorganization5, which is likewise designed to facilitate interhemispheric coordination as a key requirement for improved concentrative skills. Improvements in the cumulated training sequences typically are accompanied with advances in endurance, speed, and concentration in day-to-day routines. Still, there are patients who, despite training success, still do not meet the real-life demands towards those parameters. These are the patients additionally treated with HEG. Neurofeedback using HEG trains the subject to increase blood flow to a targeted area of the brain.6

While HEG and EEG-based neurofeedback settings typically propose train-
ing on a once-a-week basis, the settings in the ongoing case studies are different. As clients generally travel long distance to receive their treatment, a 30- to 40-sesion HEG therapy on a once-a-week basis seemed essentially impossible.

For those clients, a new concept of compact HEG training was developed and carried out. Instead of spreading training sessions throughout 30–40 weeks, it was consolidated into two weeks, with three different training sessions per day. While the overall evaluation of this new form of compressed HEG treatment is still an ongoing process, the following case studies show the potential of this new approach.

**Case 1: Philipp**

When starting his PMHT treatment, Philipp had just started 5th grade, facing severe problems related to both ADD and dyslexia. He showed no signs of hyperactivity or excessive impulsivity. His original test scores, particularly his coordination and basic low-level skills in both visual and auditory processing tasks, were correspondingly poor. After six months of PMHT treatment it became clear that while Philipp had no problem understanding the school curriculum, his endurance was poor and his working speed was too slow, requiring his extreme effort to accomplish given school tasks. His willingness to continue working at this effort level deteriorated, while his advances in perception remained stable. Attention and spelling skills got better, but still needed further improvement. In order to accomplish this, Philipp started with concentrated HEG neurofeedback in July 2012, going through a first week of intensified HEG training sessions.

In the beginning, Philipp showed obvious problems concentrating when conducting HEG neurofeedback. His blood flow in the prefrontal cortex scarcely improved or remained stable. He was unable to control the change in blood flow and even dropped in his RED/IR ratio. This changed in a matter of days. With his endurance increasing, his level of concentration also improved, and his overall training scores got better.

In order to compare and evaluate progress more effectively, the Seconds-Points Ratio (SPR) was introduced. The SPR indicates the level of concentration over the extent of a training unit. Dividing seconds by the number of points scored produces a number that is to be compared to the optimal score of 10. With a standard setting of one point for every 10 seconds of stable/increasing HEG ratio. For example, over three minutes, a maximum score of 18 points can be reached. Hence, the value 10 is equivalent to the best-possible score a client can accomplish with a continuously stable/growing
HEG ratio. The higher the SPR value, the poorer the overall level of concentration. The SPR offers no insight on the level of endurance shown by the client. With a low SPR value, the growing overall session duration indicates a growing level of endurance in the client, as obviously it is more challenging to maintain a low SPR over an extended period of time.

Even on the second day of training, Philipp’s SPR started to drop in value significantly, once even reaching the optimal score of 10. However, at this time, Philipp was able to focus for merely a few very minutes. With ongoing training, the session duration extended with an increasingly stable low SPR score. In the process, Philipp became able to switch between focus and defocus in a controlled and defined manner. In the beginning, he needed to conduct specific concentration tasks (i.e. mental arithmetic) in order to refocus after a phase of relaxation. He learned in an impressive way to toggle between focus and defocus upon command. From this point on, the remaining training days were aimed towards further improvement of Philipp’s endurance level and the ability to switch from relaxation mode to concentration and back.

As a side effect of the HEG condensed training, it was possible to show to Philipp that he tended to get nervous when facing sudden tasks despite the fact that intellectually he could successfully complete such exercises. Since Philipp had been suffering from a severe case of exam nerves, he practiced maintaining his level of concentration when being challenged by surprise tasks and to better cope with sudden fear levels. Over the next months, Philipp shall try his best to transfer his new focusing and coping skills into everyday life. Since both his motor skills and low-level functions (auditory and visual processing skills) have been trained successfully and exceed his target scores, the corresponding training has been reduced to a weekly maintenance exercise.

In the overall analysis, Philipp’s endurance, as well as his level of confidence, has strongly improved, adding to an overall positive personal development. He voluntarily works for school (i.e. actively learning vocabulary or practicing for exams, which before was unheard of) as he has become far more ambitious, thanks to his training success. In October 2012, his second week of condensed intensive HEG training took place. After a brief struggle in his first session, Philipp could soon continue with his level of success in training as before in July. When challenging him with reading tasks, it became obvious in both his skill level and the HEG performance, how much his level of concentration during reading tasks had improved. For reference, the same setting was repeated with Philipp now playing his accordion, a task he had always mastered without struggling with concentration. With an increasingly high point score, he continued to extend the duration of his training sessions. Several times, he reached the maximum scores of 10.2, 10.3, and 10.6, with a total training time per session of 15–17 minutes and an impressively stable HEG ratio.

The Duration Second Point Ratio (DSPR) combines the SPR with the change in session duration. The session duration was scaled between 2 and 20 minutes; the longer the session the lower the score. The SPR provides an objective measure of Philipp’s progress; at first only in rather brief training sessions, then with a growing duration (of more than 17
minutes) showing his increasing level of endurance. Die low-level pre/post analysis of Philipp’s low-level functions was not possible since he had already undergone a specific training of those skills using the Brain-Boy® training system, which otherwise had been a solid additional reference for improvement in fundamental brain processing skills. Subjective measures are Philipp’s growing level of self confidence, his ambition, his willingness to make an effort, and in the following interval, his noticeably improving school grades, both in preferred and non-preferred subjects.

Philipp’s third and final HEG training week is scheduled for May 2013.

Case 2: Frederic
Frederic (13 years old) has been struggling with a combination of ADD and a severe case of dyslexia. Arithmetic is no problem for him, yet math word-tasks turn out to be severe challenges, as are reading and writing in general. Frederic improved in both areas thanks to his original PMHT training (see above). His growing academic achievements made him more ambitious, so with his spelling skills getting better, his lack of concentration due to ADD remained a severe problem for further academic progress.

Frederic’s initial HEG training session lasted merely 2 minutes and 20 seconds; in session 16, Frederic managed to keep his attention and the corresponding HEG ratio up for a full 14 minutes without disruption. His SPR strongly improved likewise, as he reached the optimal score of 10 repeatedly, twice scoring the top score of 100 points. His endurance grew significantly as he was able to maintain his focus for longer periods of time.

There was an additional advancement to be seen in Frederic throughout
this first week of training. While it took him some time in the first couple of days to establish the required level of focus, on day five he managed to do so swiftly, even early in the morning. According to his parents, Frederic was all but a morning person, so the poor early morning results in the first days were not surprising. It still remains to be seen to what extent Frederic can transfer the training effects to his daily routines. Particularly noteworthy and impressive, was his ability to toggle between focus and defocus after training unit 12 on command (Figure 8).

This new ability will certainly be beneficial to Frederic to concentrate in school. Frederic reported in the first weeks after his initial HEG training that he found it much easier to focus during exams in school. His grade point average (GPA) improved and so did his low-level functions. Reviewing Frederic’s SPR shows a similarly successful development in the course of training (Figure 7). The ability to maintain his level of focus grew in time. Figure 8 shows how Frederic’s SPR closes in on 10 while his session durations kept increasing. His overall objective DSPR score steadily improved, as can be seen in Figure 9.

Case 3: Johanna

The third case is Johanna. Born in 2000, she was diagnosed with ADD, CAPD, a disorder of speech development, and dyslexia, with an average IQ to work with. A Medikinet medication treatment was aborted as it caused Johanna to fall into depressive moods.

Johanna started her PMHT in 2011. Her initial therapy protocol included sensory-motor skill training as well as low-level training to improve her central auditory processing skills. When starting the training, some of her low-level skills had already been close to the expected training target scores. Johanna improved her reading skills and her spelling. Likewise, her self-confidence and her attention got better. Thanks to this improvement, prior to her first HEG training it was decided to move her from the special needs school to a regular high school, repeating the grade level.

To help Johanna in coping with the increased demands in school, particularly in regard to focus and perseverance, she underwent an HEG training in summer/autumn 2012 with several trainings per week and two to three intensive training days per week during vacation.

During summer vacation Johanna struggled severely with HEG; her daily routine in the summer lacked orderliness at large. She completed a total of 18 training units, usually with three trainings per morning on two to three days per week. Even at the 3% auto-threshold level, she could not establish a decent level of attention. There was limited progress in her training, still failing to focus at the expected 1% auto-threshold level. After summer vacation her daily routine returned to being structured and regulated. Upon her next visit she appeared much more balanced, despite the fact that she had changed schools. She no longer seemed overburdened and was able to integrate in her new class. Johanna had a good start in her new school. Her ability to focus was noticeable.
Easy to use with more channels.

Powerful research capabilities.

Totally customizable for every patient.

HIPPA compliant data comparisons among patient populations.

For more information, we invite you to visit our website at

WWW.OCHSLABS.COM
Despite the fact that Johanna had paused her low-level training with the Brain-Boy®, a test of those functions on September 27, 2012, after summer vacation, showed strong improvements with most scores within or near the target values. There was little room for additional HEG training. In the next sessions Johanna swiftly reached an SPR of around 10. This apparently is a positive aftereffect, as Johanna likewise has managed to apply the trained patterns of focus/defocus. Nevertheless, it is suggested for her to continue with another round of condensed intense HEG training in order to help her stabilize and maintain her skills in the long run and to succeed in school. Johanna’s overall SPR development shows the improvement she underwent (Figure 10). Starting at a score of 55, she managed to bring down the SPR to close to 10. Her session duration also grew from three to up to eight minutes, showing a solid increase. The overall combined progress score is expressed by her DSPR score (Figure 12).

Summary
In all three cases a condensed intensive HEG training with up to 15 sessions per week, of 20–30 minutes each, appears to be a promising alternative to the long-term once-a-week training. All three cases benefitted from the condensed training, both measurable in their SPR and growing session lengths. All three youth and their parents reported significant positive effects in everyday life, particularly noticeable in respect to concentration, ambition, self-confidence, and academic achievements. Typically, an improvement of 1 to 1.5 GPA points was reported.

It has yet to be seen what the long-term effects of the training will be. Further analysis with a greater number of participants is planned to validate the promising effects in these first case studies. So far, condensed intensive HEG training has shown to be a solid training option to help with ADD/ADHD and related issues.

About the Authors
Christel Kannegiesser-Leitner, PhD, is an experienced child psychiatrist from Southern Germany. She has written several books on ADD/ADHD, learning disorders and associated subjects. The Psycho-Motor Holistic Therapy (PMHG) was developed by her, helping many hundreds of children with learning problems to severe physical and/or mental disorders in Central Europe. Kannegiesser-Leitner has been invited speaker on dozens of presentations and has created a network of medical doctors and trainers in Germany working with PMHG. Contact: kannegiesser-leitner@web.de, website: www.foerdervereinspsyga.de.

Ralph Warnke is the president of MediteCH, an innovative German medical device manufacturer. Warnke has been teaching biofeedback and neurofeedback courses for well over a decade. He has led and participated in national and international research projects targeting improved learning, concentration, and brain processing skills (the European-funded research project F.L.I.C. [Foreign language Learning with the Instinct of a Child]). His latest research was dedicated to the treatment of functional analphates, showing significant plastic neuronal changes in the brain regarding language tasks shown in fMRI. Contact: ralph.warnke@meditech.de, website: http://meditech.de/index.php?id=10&L=2.

References
Nothing is so hard as watching a child having a seizure.
—Elizabeth A. Thiele, MD, PhD, Professor of neurology at Harvard Medical School

Until recently, when people asked me, “What would I suggest as a non-toxic/non-invasive biofeedback approach for the treatment of epilepsy?” I automatically replied, “A combination of neurofeedback, behavioral analysis treatment, respiration training, a low glycemic diet, and stress management—and if these did not work, medications.” I have now changed my mind!

Epilepsy is diagnosed if the person has two or more seizures. About one to two percent of the population is diagnosed with epilepsy and it is the most common neurological illness in children (Saunders, 2003; Thiele, 2012). Medication is usually the initial treatment intervention; however, in about one-third of the people, the seizures will still occur despite the medications. In some cases, people—often without the support of their neurologist/healthcare provider—will explore other treatment strategies such as diet, respiration training, neurofeedback, behavioral control, or traditional Chinese medicine.

It is ironic that one of the tools to diagnose epilepsy is recording the electroencephalography (EEG) of the person after fasting while breathing quickly (hyperventilating). For some, the combination of low blood sugar and hyperventilation will evoke epileptic waveforms in their EEG and can trigger seizures. (For a discussion of how this process also contributes to anxiety see Peper et al, 2009) More importantly, hyperventilation, when paired with low sugar levels, tends to increase slow wave EEG which would promote seizure activity as shown in Figure 1 (Peper et al, 2009).

If hyperventilation and fluctuating blood sugar levels are contributing factors in triggering seizures, why not teach breath and diet control as the first non-toxic clinical intervention before medications are prescribed. This breathing ap-

Figure 1: EEG mean frequency change at different blood-sugar levels in response to hyperventilation (redrawn from Engel, Ferris, & Logan, 1947).
Dietary therapy is the most effective known treatment strategy for epilepsy.

Approach has shown very promising clinical success in the treatment of epilepsy and anxiety (Fried et al, 1984; Fried, 1987; Peper et al, 2009).

Self-management should be the first clinical intervention, not the last. Similarly, neurofeedback—brain wave biofeedback—is another proven approach to reduce seizures. This approach was developed by Professor Maurice B. Sterman at UCLA, and was based upon animal studies. He demonstrated in 1968 that cats who were trained to increase sensory motor rhythm (SMR) in their EEG could postpone seizure onset when exposed to a neurotoxin that induced seizures (Sterman, 2000). He then demonstrated that human beings with epilepsy could equally learn to control their EEG patterns and inhibit seizures (Sterman & Egner, 2006). This approach, just as the breathing approach, is non-toxic and reduces seizures.

Underlying both of these approaches is the concept of behavioral analysis to identify and interrupt the chained behavior that leads to a seizure. Namely, a stimulus (internal or external) triggers a cascading chain of neurological processes that eventually results in a seizure. Thus, if the person learns to identify and interrupt/diavert this cascading chain, the seizure does not occur. From this perspective, respiration training and neurofeedback could be interpreted to interrupt this cascading process. Behavioral analyses include all behaviors (movement, facial expressions, emotions, etc.) which can be identified and then interrupted. As professors Joanne Dahl and Tobias Lundgren (2005) from Uppsala University in Sweden state, “The behavior technology of seizure control provides a low-cost, drug free treatment alternative for individuals already suffering from seizures and the stigmatization of epilepsy.”

Until recently, I would automatically suggest that people explore these self-control strategies as the first intervention in treatment of epilepsy and only medication for the last resort. Now, I have changed my mind. I suggest the ketogenic diet as the first step for the treatment of epilepsy, in conjunction with the self-regulation strategies—medication should only be used if the previous strategies were unsuccessful.

As Elizabeth A. Thiele, MD, PhD, professor of neurology at Harvard Medical School, points out, dietary therapy is the most effective known treatment strategy for epilepsy (Thiele, 2012). A ketogenic diet has a 90% clinical success rate in children—even in patients with refractory seizures. This diet stabilizes blood sugar levels and is very low on simple carbohydrates, high in fat, some protein, and lots of vegetables (a ratio of 4 grams of fat to 1 gram of carbohydrates and protein). In adults, the success rates drop to about 50%. The lower success rate may be the result of the challenges in implementing these self-regulatory diet approaches. Even though, a ketogenic diet is the most effective therapy, it is less likely to be prescribed than medications—there are no financial incentives; there are, however, many financial incentives for prescribing pharmaceuticals.

These lifestyle changes are very challenging to implement. They need to be taught and socially supported. Just telling people what to do does not often work. It is similar to learning to play a musical instrument. The person needs step-by-step coaching and social support, which is an intensive educational approach. To learn more about the research underlying the ketogenic diet as the first level of intervention for epilepsy, watch Professor Thiele’s video presentation from the 2012 Ancentral Health Symposium, Dietary Therapy: Role in Epilepsy and Beyond (Thiele, 2012).

About the Author

Erik Peper, PhD, is an international authority on biofeedback and self-regulation. He is Professor of Holistic Health Studies/Department of Health Education at San Francisco State University. He is President of the Biofeedback Foundation of Europe and past President of the Association for Applied Psychophysiology and Biofeedback. An author of many scientific articles and books, most recently, Biofeedback Mastery and Fighting Cancer: A Nontoxic Approach to Treatment. He received numerous awards such as the 2004 California Governor’s Safety Award for his work on healthy computing and the 2013 Distinguished Scientist Award from AAPB. He lectures and teaches all over the world and has a practice at BiofeedbackHealth in Berkeley, California (www.biofeedbackhealth.org). His research interests focus upon strategies to optimize healing, illness prevention, holistic health, optimizing health at the work site, and respiratory psychophysiology. He publishes a blog, the peper perspective | ideas on illness, health and well-being (www.peperperspective.com) from which this article was adapted. You may contact him at: epeper@sfsu.edu.

Note: This article was adapted from the March 10, 2013 post of the peper perspective: http://peperperspective.com/2013/03/10/epilepsy-new-old-treatment-without-drugs/.

References


Continued on page 45
Neurofeedback and Biofeedback Training with Olympic Athletes

Penny Werthner, PhD
Sommer Christie, PhD (CAD)
Margaret Dupee, PhD (CAD)

The field of sport psychology has established many psychological skills that athletes must develop to help them perform well—skills such as focus, visualization, setting of effective goals, developing plans for both training and competition, management of negative distractions, management of emotions, and relaxation. While all these skills play a role in preparation for sport competition, there is no doubt that learning two skills—the ability to focus effectively on the correct cues at the right time, and the ability to manage one’s level of arousal—is crucial to ensure optimal sport performance. Competitive sport at all levels occurs within a stressful environment, and an athlete’s ability to control her or his response to stressful stimuli, and to focus, is essential to performance at the highest levels (Gould, Dieffenbach, & Moffett, 2002; Jones, Hanton, & Connaughton, 2007; Robazza, Pelizzari, Bertollo, & Hanin, 2008; Taylor, Gould, & Rolo, 2008).

This article will discuss some of the historical and more recent research on neurofeedback in sport and then describe more specifically how we have used neurofeedback, along with biofeedback, with Canadian Olympic athletes.

EEG and Sport Performance

There is a body of research that has examined EEG training and its effect on sport performance. The early electroencephalographic (EEG) research sought to explore how the expert athlete’s brain functioned during performance, particularly in sports such as shooting, archery, and golf. One of the first published EEG studies involving athletes demonstrated that superior marksmen performed better (i.e., more accurate shots) when they exhibited less high-frequency EEG (Bird, 1987). Pullum (1977) observed increased alpha power in marksmen during the aiming period versus at rest, suggesting that mental relaxation was associated with superior performance specifically for shooting sports. Hatfield and colleagues (1982, 1984, 1987) conducted a series of studies with expert marksmen and their findings lent support to the neural efficiency hypothesis (Vernon, 1993) in expert athletes.

Neural efficiency is measured by event-related desynchronization/synchronization (ERD/ERS: Pfurtscheller & Lopes da Silva, 1999) of EEG alpha rhythms at 8–12 Hz. The neural efficiency hypothesis suggests that brighter individuals have more efficient cortical function (i.e., weak fronto-parietal activation, low-amplitude alpha ERD) during cognitive tasks as compared to individuals who perform poorly on intelligence quotient (IQ) tests (Grabner, Fink, Stipacek, Neuper, & Neubauer, 2004; Neubauer & Fink, 2003; Ruff, Knauff, Fangmeier, & Spreer, 2003). The neural efficiency hypothesis is consistent with extant theoretical frameworks in motor control. For example, Fitts and Posner’s (1967) motor acquisition theory suggests that learners go through three successive phases when acquiring motor skills: (1) cognitive analysis (development of a mental image of the skill), (2) association (physical practice of the skill and the association of cognitive representations with behavior), and (3) automaticity (performance of the skill with little conscious effort). According to motor acquisition theory, expert performers do not need to think (cognitive analysis and association) about the execution of well-learned motor skills because the skills have become automatic. Experts can therefore carry out actions with little conscious effort. The concept of “psychomotor efficiency,” as described by Hatfield and Hillman (2001) has been used to describe this quality of cognitive-motor processing in athletes.

In 1982, Hatfield, Landers, Ray, and Daniels found that expert marksmen exhibited higher left temporal (T3) alpha power, indicative of cortical idling (Pfurtscheller, 1992), reduced self-talk, and avoidance of excessive verbal-analytic processing. These authors also found less right temporal (T4) alpha power indicating a primary emphasis on visuo-spatial processing during aiming, just prior to shooting. “The EEG evidence supports a regional relaxation effect in expert performers such that they refine brain activity processes to exclude nonessential processes” (Hatfield & Kerick, 2007, p. 90). Hatfield, Landers, and Ray (1984) also found that expert marksmen showed heightened alpha power and a steady decrease in left temporal (T3) activation from the early to the later phase of the aiming period. This finding demonstrates that elite marksmen are “less and less reliant on verbal-analytical processes as-
associated with the left temporal region as they successfully approached the trigger pull” (Hatfield & Kerick, 2007, p. 91).

Other studies have examined the differences between expert and non-expert performers and in general, the findings also support the psychomotor efficiency theory. Collectively, studies with marksmen demonstrated that experts have reduced cortical activation compared to less-skilled individuals (e.g., Deeny, Haufler, Saffer, & Hatfield, 2009; Deeny, Hillman, Janelle, & Hatfield, 2003; Del Percio et al., 2009a, 2009c, 2011; Haufler, Spalding, Santa Maria, & Hatfield, 2000; Janelle et al., 2000). Evidence of psychomotor efficiency has also been found in elite kendo and gymnastic athletes (Kita, Mori, & Nara, 2001), elite karate and fencing athletes (Babiloni et al., 2008; Crews & Landers, 1993), archers (Landers et al., 1994; Salazar et al., 1990), and golfers (Babiloni et al., 2008; Crews & Landers, 1993). One group of studies exploring best and worst shots/putts in high level performers found increased alpha power (alpha ERD) over epochs leading to best shots and a progressive reduction in power prior to worst shots for experts (e.g., Babiloni et al., 2008; Crews & Landers, 1993; Loze, Collins, & Holmes, 2001). In contrast, another group of studies have observed higher alpha and beta power during worst shots (Kerick et al., 2004; Landers et al., 1994; Salazar et al., 1990) and prior to aborted shots (Hillman et al., 2000). These results suggest that optimal performance is associated with greater event-related alpha power (ERAP) up to an optimal level, and that excessive relaxation (excessive ERAP) is associated with a decline in performance.

It is important to clarify however, that only closed-skill, self-paced sport athletes (marksman, archery, and golf) have been measured during actual physical performance. To date, EEG equipment is such that minimal movement will affect the EEG signal and cause artifact to the raw signal. The research on psychomotor efficiency in sports requiring movement (kendo, gymnastics, karate, and fencing) were all conducted in a lab. For example, Babiloni et al. (2009, 2010b) measured the EEG patterns of athletes by having subjects sit in an armchair in front of a computer screen and observe short videos and judge the technical/athletic level of the exercise seen. Other studies measured cortical activation during simple voluntary movements (i.e., wrist extension) and upright standing (Del Percio et al., 2007, 2009b, 2010; Kita et al., 2001). It is for this reason that there is a current lack of understanding of the optimal performance state during performance for sports other than marksman, archery, and golf. Of note, EEG remains the most ecologically valid over all other techniques (e.g., functional magnetic resonance imaging or positron emissions tomography) for use in unconstrained real-world settings (Hatfield & Kerick, 2007).

Based on the research identifying optimal performance states, “the underlying rationale of using neurofeedback training to enhance performance is one based on associations” (Vernon, 2005, p. 348). Training is based largely on the associations made between optimal performance states and the associated patterns of cortical activity (Vernon, 2005). Thus, findings from research on expert performers’ cortical activity has led researchers to examine if training these specific EEG patterns (i.e., reduction in left-temporal activity prior to skill execution) will enhance performance. Landers and colleagues (1991) conducted one of the only controlled EEG training studies with pre-elite archers. They hypothesized that correct feedback (rewarding low frequency activity in the left hemisphere) would improve archery performance over incorrect feedback (low frequency activity in the right hemisphere rewarded) and a no feedback control group. Pre- to posttest comparisons revealed that the correct feedback group improved performance, the control group remained the same, and

Figure 1: This screen (Biograph Infiniti, Thought Technology Ltd.) is used to help athletes train problem solving and a narrow focus. Thresholds are set to reward beta115–18Hz, and inhibit beta2 24–36Hz.
• Neurofeedback Certification
• qEEG Certification
• Webinars with CEs

**BCIA Neurotherapy Certificate Program***^*

**Dates and Places:**
- July 10-12, 2013: BSI Headquarters, Pleasanton, CA (near SF)  
  (In person or via web attendance)
- September 17-19, 2013: ISNR, Dallas, TX
- October 30 - November 1: Biofeedback Society of California,  
  Los Angeles, CA

$995 Individual / $895/ea 2 or more from the same facility / $550 Students

**Professional QEEG Certificate Program***

**Dates and Places:**
- July 12-14, 2013: BSI Headquarters, Pleasanton, CA (near SF)  
  (In person or via web attendance)
- September 17-19, 2013: ISNR, Dallas, TX
- October 30 - November 1: Biofeedback Society of California,  
  Los Angeles, CA

$995 Individual / $895/ea 2 or more from the same facility / $550 Students

**Clinical and Assessment Application of Low-Resolution Brain Electromagnetic Tomography (LORETA)***

**August 9-10, 2013:** BSI Headquarters, Pleasanton, CA (near SF)  
(In person or via web attendance)

$995 Individual / $895/ea 2 or more from the same facility / $550 Students

**Clinical Practice – Hands on Training**
**By Appointment**
$7,500.00 per week

**BCIA and QEEG Mentoring**
Mentoring for certification can be done remotely; one-on-one  
or in groups.
$150/hr / $130/hr purchase of 10 hours BCIA mentoring
$250 QEEG mentoring and case conferencing

**Look for Summer 2013 webinars in July and August**
All live webinar recordings are available for viewing after the  
presentation. 1.5 CEs for as low as $95 on relevant topics such  
as QEEG interpretation, LORETA, AVE, fundamental neuroscience  
and much more. Find them at www.brainsinternational.com >  
Courses > Recorded Webinars.
$75 live attendance & 15-day review period
$50 30-day viewing pass of recordings

* Accredited by the QEEG Certification Board for QEEGT or QEEGD certification
^ Accredited BCIA 36-hour didactic for BCN certification. On-line portions must be  
completed prior to attending.

Additional courses are available online.
For more information and to register, visit:  
www.brainsinternational.com/courses

Jay Gunkelman  
QEEG Diplomate
Barry Sterman  
PhD, QEEGD, BCN
Cynthia Kerson  
PhD, QEEGD, BCN, BCB
Joel Lubar  
PhD, QEEG

BSI Brain Science  
INTERNATIONAL

EEG/qEEG/ERP Analysis and Education
866-888-8820 or 925-416-1400
the incorrect feedback group declined
in performance. This study “provided
strong evidence for the causal influence
of regional cortical relaxation on sport
performance” (Hatfield & Kerick, 2007,
p. 98). One could argue that although this
study provided evidence of a causal rela-
tionship, the conclusions should be lim-
ited to shooting performance and not all
sport performance.

More recently, in another controlled
EEG training study, Arns and colleagues
(2008) were able to increase the percent-
age of successful golf putts by 25% on
average, using EEG feedback based on
personalized event-locked EEG pro-
files. In order to obtain each participant’s
personalized profile for training, event-
locked amplitude spectra averages were
-calculated over a one-second pre-putt
interval for successful and unsuccessful
putts. From this data, personalized
training profiles were created. Arns and
colleagues noted that the EEG profiles
linked to successful performance varied
between participants. Some participants
showed increased pre-frontal alpha, con-
sistent with the literature on psychomotor
efficiency in shooting sports, and some
demonstrated increased SMR or low-beta
prior to successful performance. This re-
search would indicate that not only alpha
training would be necessary for optimal
performance training in sport.

Research in a number of diverse
fields has also identified other EEG fre-
quency ranges (e.g., SMR and beta1) for
improved attention in both clinical and
healthy populations (e.g., Arns, de Ridder,
Strehl, Breteler, & Coenen, 2009; Gruzel-
lier, Egner, & Vernon, 2006; Monastra,
Monastra, & George, 2002). EEG and
spectral power analyses are considered
valid psychophysiological indications of
attention (Gale & Edwards, 1983). Spe-
cifically, SMR has been found to corre-
late with a state of mental alertness and
focus, and a physical state of stillness and
reduced muscle tension (i.e., inhibition of
motor output) (Thompson & Thompson,
2003). Beta1 or low beta activity has been
found to be associated with states of high
alertness, concentration, and focused at-
tention (e.g., Gomez, Vazquez, Vaquero,
Lopez-Mendoza, & Cardoso, 1998; Vazquez
Marrufó, Vaquero, Cardoso, &
Gomez, 2001). Validation work on EEG
training protocols utilizing SMR, beta1
and alpha-theta protocols for dance and
music performance has been completed
(Gruzelier et al., 2006), yet little well-
controlled research has been conducted
in sport. Recent uncontrolled studies in
a variety of sports have implemented dif-
f erent neurofeedback training protocols
combined with biofeedback training to en-
-hance performance in athletes (e.g., Bea-
uchamp, Harvey, & Beauchamp, 2012;
Blumenstein & Orbach, 2011; Dupee &
Werthner, 2011; Harvey, Beauchamp,
Saab, & Beauchamp, 2011).

Figure 2: This screen (Biograph Infiniti, Thought Technology Ltd.) helps an athlete learn to shift states
between anxiety and rumination (24–36Hz) (the boat fades and the screen goes black) to a more calm and
focused state (beta1 15–18 Hz) (the boat re-appears). This is powerful learning for athletes and should be
implemented only later on in the training (training session #6 or 7, although will depend on the athlete).
It allows an athlete to ‘feel’ and recognize when they are becoming anxious, and how much energy that
takes, and enables the athlete to develop the ability to “let go of” those thoughts, and return to a calmer
and more focused state (beta1 15–18Hz).

Neurofeedback and Biofeedback
Training as Essential
Complimentary Tools

Biofeedback is an essential complement
to neurofeedback in any training pro-
gram for optimal performance in sport.
As Green, Green and Walters’ (1970)
noted many years ago, “every physiolog-
ical change is accompanied by a parallel
change in one’s mental-emotional state,
and conversely, every mental-emotional
change—conscious or unconscious—is
accompanied by a physiological change”
(p. 3). In competitive sport, when an
athlete becomes over-aroused or highly
anxious, his or her ability to cope with
the performance demands becomes di-
-minished. With the sympathetic nervous
system turned up, and the stress response
highly activated, the body responds phys-
-iologically in a variety of ways—there is
often an increased heart rate, respiration
rate, electrodermal activity (EDA), and
muscle tension, and decreased peripheral
body temperature (e.g., Bundy, Lane,
Murray, & Fisher, 2002; Filaire, Alix,
Ferrand, & Verger, 2009; Janelle, 2002).
Research in sport has clearly demonstrat-
ed that excess arousal can affect motor

Figure 2: This screen (Biograph Infiniti, Thought Technology Ltd.) helps an athlete learn to shift states
between anxiety and rumination (24–36Hz) (the boat fades and the screen goes black) to a more calm and
focused state (beta1 15–18 Hz) (the boat re-appears). This is powerful learning for athletes and should be
implemented only later on in the training (training session #6 or 7, although will depend on the athlete).
It allows an athlete to ‘feel’ and recognize when they are becoming anxious, and how much energy that
takes, and enables the athlete to develop the ability to “let go of” those thoughts, and return to a calmer
and more focused state (beta1 15–18Hz).
performance (i.e., reduce reaction time, affect rhythm and timing), cause mental errors due to narrowed focus, and reduce performance (e.g., Bird & Horn, 1990; Davis, Sime, & Robertson, 2007; Janelle, Singer, & Williams, 1999). Just as the quality of performance as a function of activation level follows an inverted U-curve and requires an individualized approach to finding what works, so does brain stability (Othmer & Othmer, 2011). It is for this reason that both biofeedback and neurofeedback training are essential for developing the ability to self-regulate. The goal for athletes looking to enhance performance through psychophysiological training is to learn to maintain a flexible mind and body, in that they “are able to withstand stress, recover from stress, and return to a baseline characterized by a relaxed mind in tune with a relaxed body” (Thompson & Thompson, 2007, p. 251).

**Neurofeedback and Biofeedback Training with Olympic Athletes**

The purpose of neurofeedback and biofeedback training for athletes is to help them learn to identify and self-regulate the activation of both their autonomic (ANS) and central (CNS) nervous systems. The physiological and neurological feedback enhances an athlete’s awareness of what is going on inside his or her body and mind, facilitates the ability to focus, and facilitates recovery (e.g., Bar-Eli, 2002; Edmonds & Tenenbaum, 2011; Schwartz & Schwartz, 2003; Strack, Linden, & Wilson, 2011). When this ability to self-regulate arousal and to focus effectively is well developed, it has been shown to help athletes reduce anxiety, enhance focus, and ultimately enhance performance (e.g., Bar-Eli, Dreshman, Blumenstein, & Weinstein, 2002; Dupee, & Werhner, 2011; Edmonds, Tenenbaum, Mann, Johnson, & Kamata, 2008; Galloway, 2011; Gruzelier et al., 2006; Harvey et al., 2011; Hatfield, Landers, & Ray, 1987; Peper & Schmid, 1983; Zaichkowsky, 1983).

Accordingly, Thompson and Thompson (2003) describe the optimal performance state as the ability “to achieve a relaxed, yet alert, calm, openly aware state with efficient problem solving capacity and a minimum of anxiety and ruminations” (p. 273). Furthermore, athletes with a greater sense of self-regulation over their psychophysiology have a greater sense of control over their performance, and cope better with the stress of competition (Hatfield & Hillman, 2001).

**Optimal Performance Training**

Our work with high-performance athletes has always begun by conducting a baseline psychophysiological stress assessment (BFE Optimal Performance Suite, created by Dr. Vietta Wilson, 2006) and an 18-site EEG assessment using The Learning Curve (Van Deusen, 2006). The two assessments allow us to see how each athlete reacts to various stressors and whether or not they are able to recover and return to baseline when there is no stressor. The analysis of the two assessments helps identify and inform the creation of an individualized training protocol. In general, analysis of the assessment data has, to date, revealed that the majority of athletes demonstrated a good ability to focus (although not for longer than 15–20 seconds) and a less well-developed ability to put their body and mind in recovery.

We have designed our neurofeedback and biofeedback training interventions for athletes with the purpose of optimizing four key abilities. In each training session, we work on an ability to briefly and quickly recover, quieting both the autonomic nervous system (ANS) and central nervous system (CNS) for 1–3 minutes. We then work on the athlete’s ability to create a calm, narrow focus. As the training progresses, we also work on a deeper recovery state that involves quieting the ANS and CNS for 6–20 minutes. After approximately 9–10 training sessions (for most athletes), we begin to work on the ability to shift states between narrow focus and brief recovery (Thompson & Thompson, 2003).

More specifically, the training sessions are designed based on three main objectives. The first objective is enabling the athlete to develop the ability to quiet

![Figure 3: Using this screen (Biograph Infiniti, Thought Technology Ltd.), athletes also learn to shift states. Athletes learn to increase alpha so that the top ball moves to the right. Athletes then work on increasing beta1 (15–18 Hz) by moving the bottom ball to the right, and then letting focus go (decreasing beta1), letting their mind wander, by moving the ball back to the left.](image-url)
the autonomic nervous system. We use biofeedback to work on developing self-awareness and self-regulation of muscle tension, respiration rate, heart rate, skin conductance activity, and peripheral body temperature. The second objective is enabling the athlete to learn to effectively manage the central nervous system. Neurofeedback is used to train brief mental recovery (8–10Hz) with electrode at Pz; high alpha (11–13Hz), where the athlete learns to be relaxed and yet alert and externally aware, electrode at Pz; and a narrow focus (15–18Hz), with electrode at Cz, where the athlete learns to attend to specific cues, and finally, working on the questions of the athlete to ensure each athlete is reflecting and learning how to apply these skills in his or her own training and competition environment—questions such as, “How did that feel?” “What could you do differently?” “How might you use this in training or in competition?” In fact, an essential component of our effectiveness with athletes is that sport psychology consultation is conducted in conjunction with the neurofeedback and biofeedback training. While all training sessions are currently conducted in our lab, it is essential to help athletes make the link between what they are doing in the lab with how they will apply these skills in training and competition environments.

In conclusion, research in the field of sport performance enhancement with neurofeedback and biofeedback training provides “an unbiased, objective index of psychological processes” (Hatfield & Hillman, 2001, p. 367) and is an extremely valuable tool to complement an existing psychological skills training program. Essential to the effective training of elite athletes is an idiosyncratic approach to training that includes an understanding of the competitive environment. For example, athletes will be nervous and may, at points in time, exhibit a busy brain (beta2, 24–36Hz), and that is normal given the intense circumstances of an Olympic Games or World Championships. A productive way to train athletes—knowing that they will be stressed—is to help them understand that this training will ensure they develop the ability to switch states (i.e., rumination to focused attention) at will. Another crucial piece to training athletes is the importance of using both neurofeedback and biofeedback as complimentary tools for training. Indeed, in sport, without being able to self-manage physiologically, we would strongly argue that neurofeedback would not be particularly effective. Finally, a truly effective intervention with Olympic athletes should ensure the neurofeedback and biofeedback work is reinforced on a regular basis in the actual sport setting.

**About the Authors**

Penny Werthner, PhD, is the Dean, Faculty of Kinesiology, University of Calgary, a former Olympic athlete, and a sport psychology consultant working with many Olympic athletes and coaches, for the summer and winter Olympic Games.

Sommer Christie is a PhD student at the University of Calgary, and a former national team rugby player.

Margaret Dupee is a PhD student at the University of Ottawa.
**Training Programs from the Leader in Biofeedback**

### 2013 CERTIFICATE PROGRAMS

#### 5-Day Professional Biofeedback

<table>
<thead>
<tr>
<th>Location</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, GA</td>
<td>Feb 9 – 13</td>
</tr>
<tr>
<td>Portland, OR</td>
<td>Mar 11 – 13</td>
</tr>
<tr>
<td>Mill Valley, CA</td>
<td>Apr 13 – 17</td>
</tr>
<tr>
<td>Elizabeth, NJ</td>
<td>May 11 – 15</td>
</tr>
<tr>
<td>Anaheim, CA</td>
<td>June 15 – 19</td>
</tr>
<tr>
<td>Chicago, IL</td>
<td>July 20 – 24</td>
</tr>
<tr>
<td>Hartford, CT</td>
<td>Aug 12 – 14</td>
</tr>
<tr>
<td>Oakland, CA</td>
<td>Aug 24 – 26</td>
</tr>
<tr>
<td>Dallas, TX</td>
<td>Sep 12 – 14</td>
</tr>
<tr>
<td>Anaheim, CA</td>
<td>Oct 19 – 23</td>
</tr>
<tr>
<td>Ft. Lauderdale, FL</td>
<td>Nov 16 – 20</td>
</tr>
<tr>
<td>Mill Valley, CA</td>
<td>Dec 7 – 11</td>
</tr>
</tbody>
</table>

#### 4-Day EEG Neurofeedback

<table>
<thead>
<tr>
<th>Location</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, GA</td>
<td>Feb 14 – 17</td>
</tr>
<tr>
<td>Portland, OR</td>
<td>Mar 7 – 10</td>
</tr>
<tr>
<td>Mill Valley, CA</td>
<td>Apr 18 – 21</td>
</tr>
<tr>
<td>Elizabeth, NJ</td>
<td>May 16 – 19</td>
</tr>
<tr>
<td>Anaheim, CA</td>
<td>June 22 – 25</td>
</tr>
<tr>
<td>Chicago, IL</td>
<td>July 25 – 28</td>
</tr>
<tr>
<td>Dallas, TX</td>
<td>Sep 15 – 18</td>
</tr>
<tr>
<td>Anaheim, CA</td>
<td>Oct 24 – 27</td>
</tr>
<tr>
<td>Ft. Lauderdale, FL</td>
<td>Nov 21 – 25</td>
</tr>
<tr>
<td>Mill Valley, CA</td>
<td>Dec 12 – 15</td>
</tr>
</tbody>
</table>

Check out our QEEG dates on our website.

Call us at **800-257-8367** or register online at [www.stens-biofeedback.com](http://www.stens-biofeedback.com)

---

*NeXus wireless Bluetooth® technology with BioTrace is available exclusively from Stens-Biofeedback*

---

**Stens Corporation**

**The leading supplier of biofeedback equipment and training for 36 years**

CEs for APA, CNA, BBS. Stens Corp is approved by the APA to offer CE for psychologists and maintains responsibility for the program. Infiniti is a registered trademark of Thought Technology, Ltd. Bluetooth is a trademark owned by Bluetooth SIG Inc., USA.
What do you do when a highly anxious client comes to you to do neurofeedback (NFB) and you know that alpha/theta, frontal symmetry and/or SMR training would be ideal, but you can’t get him or her to stay settled long enough for an eyes closed qEEG recording? The client who is hyperkinetic or hypervigilant will become frustrated. Compare these experiences to that of the avid meditator and you’ll likely find a very different resting or baseline EEG record. Additionally, the inability to settle for the assessment is clinically relevant and should be treated with the same weight as any other subjective or objective observation.

The resting state has been one of controversy. It is the condition of relaxation, peacefulness, and motionlessness and, in EEG is associated with the normal alpha rhythm and the reset function of the default mode network (DMN). FMRI studies show that resting brain activity differs intersubject and that the resting task, which is usually eyes open looking at crosshairs while one’s head is in a cage in the noisy, claustrophobic scanner does not dependently represent rest.

We look to the eyes closed resting state for comparison to normative EEG data. However, when one has anxious or hyperkinetic tendencies, the task of sitting still with eyes closed can feel like combat. One who is hypervigilant needs to know what’s going on around him and having eyes closed threatens that sense of safety. This is especially true when in a new environment. One who is hyperkinetic usually cannot remain motionless or keep his eyes still for any length of time.

And, once you’ve completed your assessment, you are then tasked with asking an ADHD child to sit still and attend for 30 minutes or to ask a highly aroused and hypervigilant trauma survivor to “trust” the dimly lit room, you, and your treatment. Starting NFB right away may well be contraindicated.

Hyper-arousal and vigilance present neurologically as well as physiologically. Observation of one invariably couples with the other. The neural networks activated in hyper-arousal include most of the subcortical, limbic areas; those areas most indicated in emotional regulation and valence. These networks are directly regulated when attending to the peripheral modalities as well. As John Nash stated in 2009 (p. 9), “When you feed back skin temperature, HRV, SCL or other ‘autonomic’… variables, you are feeding back information about the state of the various large scale systems of the brain.”

I defer to the Thompson and Thompson article (in the next issue of Applied Psychophysiology & Biofeedback) for physiologic discussion and remind the reader about the Porges model of Polyvagal Theory, which states that the sympathetic nervous system (SNS) in the body—more specifically in the heart, is directly interrelated to the hypothalamus pituitary adrenal axis (HPA) in the central and autonomic systems. Dysregulation of the sympathetic state, or flight/flight, dysregulates HPA action, leading to symptoms of stress including anxiety and ADHD.

The Phenotype model (Gunkelman, 2006) provides three possible EEG presentations in anxiety and four presentations in ADHD.

In Anxiety:
- **Fast alpha**: this is generally the high alpha range (9–11.5 Hz) and is found parietally (in the posterior area of the brain).
- **Low voltage fast EEG**: this is found in the frontal and central areas of the brain and occurs in the 20–35 Hz range.
- **Beta spindling**: Beta spindles are intermittent occurrences, usually lasting less than a second, in which the overall wave oscillates with more speed and higher amplitude than the baseline beta behavior.

In ADHD:
- **Diffuse slow activity (with or without slow alpha)**: This is an increase in delta and theta with or without posterior alpha.
- **Frontal lobe disturbances**: frontally dominant excess theta or alpha frequency activity.
- **Faster alpha variants (not low voltage)**: often includes greater EMG activity, alpha peak frequency greater that 12 Hz over posterior regions.
- **Spindling excessive beta**: rhythmic beta with a spindle morphology, often with an anterior prominence.

All of these EEG patterns co-occur with highly vigilant psychophysiological issues. Reducing or eliminating this state of physiologic hyper-arousal is necessary. However, this high level of arousal may deter the NFB treatment unless self-regulation is mastered or at least practiced regularly. It is the combined active, tangible nature of peripheral training and the subjective, passive nature of neurofeedback that more easily leads to success.

Treating the over-arousal with heart rate variability (HRV), electromyographic (EMG) and/or electrodermal skin con-
Observations of galvanic skin conductance levels (SCL) training (as well as other behavioral interventions such as CBT, exercise or meditation) is indicated. Depending on the motivation and goals set by the client, this could take anywhere from 1 to 10 sessions before doing NFB or even before doing the qEEG and related pre-assessments.

Here is a general reasoning for each of these three modalities:

**Heart Rate Variability**

HRV has deservedly gotten a lot of attention of late. Heart rate variability is the measure of the difference between heartbeats. A higher variability represents a shift in heart rate between inhale and exhale and the coherence between breath and heart. Thus, the higher the variability, the calmer overall state. Capnometry is often used to help the client learn his optimal breathing mechanism by being sure the exhale provides for enough gas exchange.

Opposed to the inhale, the exhale mechanism is the tougher one to learn. Without exhaling enough, we do not inhale enough. Additionally, breathing diaphragmatically and deeply suggests calmness and parasympathetic balance. Discovering the client’s optimal breath rate and mechanism is required. This is done by sampling different rates and looking for the highest variability when coupled with the inhale and exhale and also when the electrical output, as observed on the spectral display, is predominantly in the low frequency range (.04-15 Hz). I start with six breaths per minute and go as low as four or as high as eight. Sometimes, I have to increase to eight and then slowly train to breathe more slowly. At-home training can be done with the HeartMath EMwave or one of the available iPhone breathing apps, set up to the right breath pattern.

The better iPhone (or iPad, etc) apps can be programed to train specific inhale and exhale lengths, another essential aspect of the training. The exhale should be slightly longer than the inhale, coupling ‘letting go’ with each one.

When I work with clients in this modality, I start with a hand each on the belly and chest so the client can feel where his breath is flowing. I ask where he felt it. Often the sensation is not accurate. I then hold up a mirror and they can watch the process often providing more accurate awareness. I explain that breathing “into the belly,” is not really what we’re doing, but that expanding and contracting the belly allows for the diaphragm to rise and fall; falling to make way for the inhale and pushing the diaphragm up to help regulate the exhale. The mechanistic, rhythmic and steady velocity of the abdominal muscles is what is practiced and intensely observed. Once the optimal mechanism at the optimal breath rate is achieved, the practice of diaphragmatic

![Reduced EMG while SMR was at its highest during this 35 minute session. SMR (12–15 Hz) is shown in relative power. EMG is measured in microvolts.](image-url)
breathing becomes more intuitive and less labored. Then it can be practiced as a tool for staying focused and present without much conscious awareness during the NFB sessions.

As executive director for the ISNR Research Foundation, I am coordinating a project with Jay Gunkelman, Fred Gusman, and Kent Dresche for returning veterans from Iraq and Afghanistan (http://isnr-researchfoundation.org/uploads/Yountville_Proposal.pdf), that applies heart rate variability prior to neurofeedback training and the requirement of self-training once weekly during the EEG training. This model is a modern version of the very successful Peniston-Kulkowsky model, in which the HRV replaces the peripheral temperature training Peniston used.

The Thought Technology Infinity, Mind Media NeXus, HeartMath EM Wave, Better Physiology Capnometer, and StressEraser systems, as well as the many device apps that are appearing on the market to provide at-home training, provide the necessary modalities for this training. They can be used either individually or in tandem with the NFB.

**Electromyograph**

Muscle activation often occurs as a reaction to stress. Clenching and bruxing as in temporal mandibular joint syndromes (TMJ) on the frontalis muscles, tightening and stiffening on the sternocleidomastoid (SCM) muscle group in the neck and in the trapezius on the shoulders are the three more common stress-induced EMG issues that effect NFB training. Other issues, such as lower back pain, or repetitive strain syndromes are usually injury-related and don’t directly affect EEG recordings and so are not discussed here.

We are all aware of the nuisance frontalis, SCM, and trapezius tensions present in the EEG. Interpreting an EEG record with muscle artifact can essentially eliminate whole sections of channels. We have only the choice to inhibit all reward as EMG climbs, losing opportunity to provide feedback when the brain meets the specified criteria. Training to relax muscle groups is relatively simple and presents the client with something to focus on.

While the popular training of SMR (sensory motor rhythm) is useful when working on hyperkinetic clients, it is more often effective to couple it with EMG training. See Figure 1 that shows direct decrease of trapezius activity when the relative power of SMR is the highest during a 30-minute session. This session was trained with eyes open at C4; however, only after three sessions of EMG training.

Pre-training of EMG levels is indicated so the NFB can be uninterrupted by the muscle artifact. Also, muscle training is an active process. After careful baseline measures are taken, the client practices tensing and relaxing with the goal of reducing the EMG levels to about one-half of their baseline reading. Normal re-
laxed EMG levels shouldn’t exceed 5 µV in the areas we’re discussing (frontalis, SCM and trapezius). Posture and symmetry changes will also affect levels, and thus should be examined. Small shifts in these can dramatically change the levels. Once the client can reduce their EMG levels to about half, autogenic training and progressive relaxation help the client to further recognize the difference between tension and relaxation and the skills taught during these first few sessions can be used to maintain a relaxed and open presence while doing NFB.

The Thought Technology Infinity and Mind Media NeXus are capable of combined EEG and EMG training. However, other separate devices can be used simultaneously. If you hook up the EMG sensors along with EEG, you can effectively include a tone that remains on when the muscle levels exceed threshold, reminding the client to relax. This will not interfere with the EEG training and keeps the client focused and present. Setting the threshold of the EMG so the client gets gentle reminders, rather than no feedback at all, teaches the client to assimilate brain and body interaction.

**Skin Conductive Level**

SCL is the measure of skin conductance. In his book *Why Zebras Don’t Get Ulcers*, author Robert Sapolsky postulated that the palmar eccrine gland system exists as a temporary solution to escaping danger. When a threat (real or perceived) occurs, the eccrine glands in the palms of our hands and feet become activated, causing clamminess which then creates better traction for running (were we bare-footed) and holding weapons or grabbing vines for escape. However, in modern times, other than as the best biofeedback indication of over-arousal, clammy hands and feet don’t provide much else. Over- or chronic-activation of the sympathetic state is excellently indicated by the clammy hand phenomenon.

Often, anxious persons have a calm veneer, yet the presence of clammy hands will provide objective measure to their internal subjective experience. Today’s stressors are, for the most part, not life threatening and chronic, yet in this population, the system is activated as if they were.

SCL is measured in micromhos. One trains to reduce the level of SCL and make the hands drier. Often clients who have clammy hands don’t notice their level until introduced to it during biofeedback training sessions. It’s an excellent self-regulation technique because it’s portable and is always with the client—they simply check the level of clamminess on the palms of their hands. Once they become aware, they will use this as an earlier indicator of physiological arousal, and begin self-regulation sooner, by breathing, counting, quieting, thus aborting a panic attack, a burst of anger, or the debilitating experience of anxiety and over-arousal.

One or two sessions of electrodermal training (another term for SCL) may be indicated prior to NFB. However, to train SCL, relaxation breathing or HRV is required. This is because it is the HRV technique coupled with intention and visualization that affects the SCL. A healthy return to baseline levels after a stressor would be indicated by a decrease in SCL measures. Thus, baseline measures should be taken at the beginning of treatment and at the start of each session throughout the NFB training.

While doing NFB, the SCL can be monitored to provide insight to the response of the NFB training. If the is client is becoming more activated, this may indicate that the training is not be the right one. However, it could also mean it is. We respond to unfamiliar events as threatening, leading to temporary sympathetic arousal—clammy hands. If, within a few sessions, the SCLs are still high, it might be best to alter the NFB protocol, which can be small or large—a change of sites, thresholds or frequency ranges. If it does not sustain, the newly acquired state is adapted to and the activation level drops to baseline. Once the unfamiliar state is adapted to, the sympathetic arousal drops. See Figure 2 for an example of this phenomenon.

Another SCL observation is relaxation-induced anxiety (RAI). For many, relaxation is not a familiar state, and if brought to a deep state of relaxation, while HRV, EMG, and other measures look excellent, the SCL may not. Like with NFB, give this time and it, too, will likely improve.

SCL can be measured with the Thought Technology Infinity or the Mind Media NeXus. Additionally, a new personal app called eSense can be used in the clinic, as well as on the client’s device between sessions, for practice outside the NFB sessions.

The maintenance of the parasympathetic state will best help the client to remain open to the NFB conditioning. The tangible peripheral self-regulation provides a bridge to the intangible NFB. The breathing practicum will also keep the client focused and present during the NFB training.

**About the Author**

Cynthia Kerson, PhD, QEEGT, BCN, BCB is the Director Education for Brain Science International, Clinical Director of Marin Biofeedback in San Rafael, California and the Executive Director of the ISNR Research Foundation and the secretary of the QEEG Certification Board. She is BCIA certified in biofeedback, neurofeedback and holds certification as a technologist in QEEG and is a BCIA mentor. Dr. Kerson received her PhD in Clinical Psychophysiology at the University of Natural Medicine. You may reach Cynthia at: cynthiakerson@gmail.com

**References:**


I’ve Learned the Neurofeedback Basics—So Now What’s Next?

Judy Crawford

If we could summarize the major focus of BCIA’s mission and distill it into one word, that one word would be education. BCIA sets the educational and training standards for entry-level competency. BCIA has adopted a Blueprint of Knowledge that identifies the fundamental science, history, and theory required to complete the didactic education component of the certification process. BCIA educates the public by providing information that is based on the current science in the field and by providing the names of clinicians who can meet our competency standards.

Experienced neurofeedback professionals recognize that the completion of a basic didactic course is only the beginning of their educational journey. BCIA certificants are committed to life-long learning and eagerly seek continuing education opportunities. Certificants can expand their knowledge base and skill set so that they can add more options and reach out to different populations as appropriate to their scope of practice.

What is the continuing education requirement?

Certificants who carry the BCN are required to document 55 hours of accredited continuing education that includes 3 hours of ethics or professional standards. Senior Fellows are rewarded for their many years of additional training and are only required to complete 30 hours of accredited CE that also must include the 3 hours of ethics or professional standards. For a course to be appropriate, it must be:

- Accredited
- Blueprint relevant

What types of accreditation does BCIA accept?

Accreditation means that an outside entity has reviewed the speaker’s expertise specific to the topic, the listed educational goals, and the material to be presented to ensure that prescribed standards are met. BCIA accepts coursework offered by:

1. A regionally-accredited academic institution.
2. A national professional organization.
3. BCIA itself.

The term “regionally accredited academic institution” applies to a college or university that has been approved by one of the bodies as outlined by the US Department of Education. These recognized bodies are: The Middle States Commission on Higher Education; The New England Association of Schools and Colleges, Commission on Institutions of Higher Education; The North Central Association of Colleges and Schools; The Higher Learning Commission; The Northwest Commission on Colleges and Universities; The Western Association of Schools and Colleges, Accrediting Commission for Senior Colleges and Universities; and The Southern Association of Colleges and Schools, Commission on Colleges. These commissions provide the credibility for all schools that states regulate as a training path toward state license.

BCIA adopted this standard in 1981. Some forms of alternative medicine decided originally to form their own accrediting bodies and in essence manage their own affairs. However in recent years, many have decided that to support acceptance of their modality by traditional health care, adopting the US Department of Education standards was key.

Certificants may take a course from a regionally accredited academic institution and, should the topic be relevant to the blueprint, this course can be counted toward recertification. BCIA counts classroom hours, so a course taken for 3 hours a week across a 15-hour period would be worth 45 hours toward recertification. Only the content that is blueprint relevant may be counted and, in some cases, a 45-hour course would be claimed for recertification at a lower amount.

Many professional organizations are increasingly offering blueprint-related topics at their annual meetings or scientific programs. Stay abreast of their conferences and other learning opportunities. If you don’t see neurofeedback represented on the program, maybe you can suggest it!

Who evaluates CE topics for blueprint relevance?

You are the best person to judge the material for blueprint relevance. If you haven’t read the blueprint recently, now is the time! Go to www.bcia.org > Become Board Certified > Neurofeedback > Common Documents, where you will find the blueprint that will guide you as you select appropriate continuing education courses.

BCIA can only add modalities and applications to its Blueprints when efficacy has been scientifically established. LaVaque and colleagues’ (2002) “Template for developing guidelines for the evaluation of the clinical efficacy of psychophysiological evaluations” provides an invaluable framework for evaluating biofeedback and neurofeedback interven-
What are the best resources for courses?

Any didactic training program may be taken in full or in part for continuing education. Maybe what would best suit your needs would be a return to the fundamentals. Additionally, these same training programs may offer advanced topics. Check to see what they have to offer.

ISNR obviously is an excellent choice as their entire annual meeting program is a good fit for the blueprint and they attract speakers at the top of the field. Starting in September 2013, ISNR will offer both APA and continuing medical education (CME) credit for conference workshops. You can gain hours to maintain your professional license and your certification at the same time.

AAPB also offers a scientific program at their annual conference. Their regional or state societies offer blueprint-related programs and are accredited under AAPB’s APA umbrella. AAPB will be offering webinars later this year. Stay tuned for topics that fit your schedule and continuing education needs.

Does BCIA offer anything?

Yes we do—and in fact, we are very proud of our affordable, accessible online programs. We started out by selecting articles. There is no charge for the article but you pay $15 for a short online quiz. Completing the quiz earns you 1 hour of CE credit for recertification. That has worked well but we felt there had to be more opportunities.

BCIA launched their Clinical Update Series of webinars in January of 2012 and has since offered a wide variety of topics that include Neurofeedback, HRV, and Ethics. If you missed any, we have most of them recorded! We are adding topics and speakers to our 2013 schedule so watch your email for more information. If you haven’t received announcements from us, maybe we don’t have a current email address for you. Please contact us at info@bcia.org and we’ll put you on our list.

Remember, there are other ways to learn. BCIA awards continuing education hours for a range of professional activities including book authorship (40 hours), course instruction at an accredited institution (45 hours for a 3-credit course), dissertation (40 hours), journal article (10 hours), master’s thesis (20 hours), and presentation (3 hours for a 1-hour talk). BCIA counts enrollment in clinical workshops offered at AAPB chapter, state, and regional biofeedback meetings. You may earn 5 hours of continuing education for a minimum of 15 hours of mentoring. Finally, you may earn up to 20 hours per recertification period by studying references from your Blueprint’s recommended reading list and submitting a total of 40 multiple-choice questions.

BCIA is committed to promoting the best accredited continuing education opportunities the field has to offer so that its certificants will be “more than qualified—BCIA certified!”

Neurofeedback Around the World

During the last few months Dr. John Davis gathered information regarding activities of clinicians and researchers to help all of us become more informed. Following are updates for Europe and Mexico.

Europe Update:
March 2013 from Dr. Rien Breteler

- In the UK, B. Steffert published a paper on neurofeedback and ADHD. The Society for Applied Neuroscience is the main membership group to which neurofeedback practitioners belong. There is no specific regulation for neurofeedback practice in the UK. Neurofeedback is not covered by insurance, with rare exceptions. The medical profession has shown little interest in neurofeedback.
- In Poland, W. Kulinski et al. have published a paper related to CNS rehabilitation. There is a multi-level system of professional training in neurofeedback, followed by supervision. The Society of Biofeedback is the main membership group. Free neurofeedback is available in the schools, but neurofeedback is not covered by insurance.
- The Czech Republic and Slovakia have professional training courses for neurofeedback. Slovakia has created a special profession for neurofeedback therapists, and insurance covers neurofeedback if it has a special indication.
- In Turkey, T. Surmeli continues to publish studies of neurofeedback, most recently with schizophrenic subjects. The only professional training courses are provided by Dr. Surmeli. At this time, there are not regulatory standards, nor a registry for neurofeedback providers. The only Turkish group that has active members is a psychiatric association. The Turkish Ministry of Health approved neurofeedback as a treatment in 2010, but the Turkish Psychiatric Association has lobbied against neurofeedback, and the use of qEEG or EEG in psychiatry. The Turkish Medical Association recommended that neurofeedback never be used, regardless of the Ministry of Health’s approval. General practitioner physicians are not well educated regarding neurofeedback.

Dyadic research seems to be needed to establish any relationship between EEG and imagery, as well as the effects of imagery on the brain during physical activity.
• In the Netherlands, several groups actively publish research on neurofeedback (e.g., M. Arns, R. Breteler). There are also several offices that provide professional training in neurofeedback, some of which is for BCIA certification. Qualification to provide neurofeedback is recognized by the Dutch psychological association, the Professional Association for Integrated Neurofeedback Training, and the Biofeedback Foundation of Europe. There is also a Dutch Association for Neurofeedback. The Dutch health system does not reimburse for neurofeedback, but some insurance for complementary health care does.

Mexico update:
March 2013 from Carlos A. Novo-Olivas MD, MSc.

• The Mexican Society of Bio and Neurofeedback (www.smbn.org.mx) will be 3 years old in April. There are currently more than 70 active members.

• In December of 2010, the first book in Spanish on qEEG and EEG-biofeedback was published, with more than 300 copies sold in the first year. The preparation of the second edition is planned to start at the end of 2013.

• The first meeting of the SMBN was held in May 2012, with more than 90 attendees, five of them from Central and South America (Ecuador, Colombia and Honduras).

• In October 2012, the Association of Applied Integrative Neuroscience (ANIA, www.ania.org.mx) turned five years old. It was the first association to organize an inter-national meeting on qEEG and EEG biofeedback in Latin America in April 2008, with almost 80 attendees. It was an honored to have Roy John as a speaker.

• At the end of January of 2013, the first workshop (40hrs) organized by the SMBN was held in the University of Guanajuato, at Leon.

• The second meeting of the SMBN is planned for April-May of 2014.

• The SMBN is planning to create programs for different levels of expertise on EEG biofeedback, from technician to a postgraduate degree (Masters), with official recognition from the educational system.

• There is a new project to form a Latin American Federation in the next couple of years.

Rien Breteler, PhD, BCN, has been working in mental health care since 1984. Trained as a clinical psychologist, he was involved in addiction research and fear of flying before he discovered neurofeedback in 2003. He has published about neurofeedback, ADHD and dyslexia, and still is involved in research on neurofeedback procedures.

Rien is associate professor at the Radboud University Nijmegen (www.ru.nl) and Director of EEG Resource Institute (www.eegbiofeedback.nl). Currently, he is president of the Registration Board of the section Neurofeedback of the NIP, the Dutch Psychologists’ Association. Rien is married, has three children, has a passion for his Citroen CX, a French car, built up to 1991, and just restored his 1897 house in Nijmegen.

Dr. Carlos Novo-Olivas received his MD through the University of Monterrey, a postgraduate in Clinical Neuroscience through the Institute of Neurosciences and Applied Psychology, and a Master’s degree in teaching from the University of Navarra, Spain. In addition, he earned his QEEG-T from the Quantitative Electroencephalography Certification Board. He is the founder and president of the Society for Integral and Applied Neuroscience, founder and CEO of NeuroScopic Integral NeuroDiagnostics, medical director of NovoBrain, LLC, founder and current president of the Mexican Society for Bio and Neurofeedback, and invited professor of the Psychiatric Association of North of Mexico. Carlos is also an ISNR Research Foundation information officer, organizer of four international events in the field of applied neuroscience, and speaker in more than 10 national (Mexico) and international meetings. He also authored and edited of the first book in Spanish about qEEG and Neurofeedback, published by the University if Guanajuato (December 2009).
Research Foundation Update

ISNR Research Foundation 2013 Mini Grants for $2,000 Each
Applications at www.isnr-researchfoundation.org
Current grant program deadline June 1, 2013

Thank you to our recurring contributors= $280.83

- BRAINTRAIN—Gamma Contributor
- ARLETA JAMES—Alpha Contributor
- LORI SIMMS—Alpha Contributor
- LINDA WHEADON—Theta Contributor
- KATHY ABBOTT—Theta Contributor

Participate in the Foundation’s recurring contribution program. It’s simple and a great way to contribute.

Thank you to our recurring contributors= $280.83
Merlyn Hurd
Richard Soutar
Gerald Gluck
Jon Frederick
Bob Gurnee (SNI)
Deborah Stokes
Nick Dogris
Samuel Turcotte
(Zukor Interactive)
Joseph Barr
Daniel Kuhn
David Pavlick

Purchase our books at www.bmedpress.com

- ADD Centre Brodmann Booklet
  Thank you to the authors: Michael Thompson, James Thompson and Wu Wenging

- Multi-Component Treatment for PTSD
  Thank you to the author: John Carmichael

- The Art of Artifacting
  Thank you to the authors: Cory Hammond and Jay Gunkelman

- Doing Neurofeedback: An Introduction
  Thank you to the authors: Richard Soutar and Robert Longo

- The Other Side of the Desk: A story about a chronic pain specialist who became a chronic pain patient & his advice for chronic pain sufferers
  Thank you to the author: Dr. Stuart Donaldson.

Got an idea for a book? Let us know!
Simplify your practice - Focus on your clients

With each new version, BioGraph’s designers focus a lot of effort on making the platform easier to use. BioGraph 6.0's reorganised user interface is more intuitive and groups features functionally so you always find what you need when you need it. The new Tools menu offers more capabilities than ever before.

‡ Click a Quick-Start item for our exclusive one-click session launch.
‡ Customise your experience with regional settings and user preferences.
‡ Resize screens on the fly to fit any monitor's resolution.
‡ Interact easily with the new interface to do more with fewer mouse clicks.

ONE PLATFORM. INFINITE POSSIBILITIES...

THE BEST OF BIOGRAPH INFINITI IS BUILT IN

The most affordable and comprehensive EEG system available: Dynamic EEG Databases, LORETA, Discriminant Functions, Power, Coherence, Phase, JTA, Burst Metrics, Phase Reset, Statistical Analysis Coherence & Phase Reset, Phase Locking & Phase Shift Duration, Match Processing, Bi-Spectra & Neurofeedback, 3D imaging

BioGraph's audio feedback functions were rebuilt using a powerful video game sound engine, which gives it full control over sound responses and virtually eliminates feedback lag. With the addition of many new reviewing tools, unseen in other biofeedback systems, BioGraph Infiniti continues to be the most powerful multimedia bio/neurofeedback system on the market.

‡ Explore dynamic EEG entrainment with the new dynamic binaural beat pacer
‡ Improve reporting with revamped artifact rejection.
‡ Exchange data better with new export/import capabilities.
‡ Use real-time trending and segment analysis.

Enhanced Z-score Biofeedback

Z-score biofeedback provides a strong research-based approach to training and offers a wealth of information from a simple, concise set of metrics.

‡ Easily access popular assessment choices, to start and get the most out of z-score biofeedback.
‡ View all z-scores and metrics in a single, simple graphical interface.
‡ Distinguish all relevant information in one comprehensive, colour-coded display.
‡ Take advantage of fully automated functionality, including automatic artifact rejection.

There has never been a better time to get on the Infiniti platform. The evolution of BioGraph Infiniti software has culminated in version 6.0, which will change the way you do biofeedback and neurofeedback forever. With a wide variety of usability features, a new look and feel, a powerful new sound engine, and the most comprehensive set of computations on the market, you can offer your clients training capabilities that are unavailable anywhere else. Add to that practical user manuals, context dependent online help, year round workshops and weekly online training, and the transition to the most powerful biofeedback and neurofeedback software in the world is made easy. What are you waiting for? Start using Infiniti now!

What are you waiting for? Start using Infiniti now!

Visit www.aapb.org for more information TODAY!
Simplify your practice - Focus on your clients.

With each new version, BioGraph’s designers focus a lot of effort on making the platform easier to use. BioGraph 6.0’s reorganised user interface is more intuitive and groups features functionally so you always find what you need when you need it. The new Tools menu offers more capabilities than ever before.

- Click a Quick-Start item for our exclusive one-click session launch.
- Customise your experience with regional settings and user preferences.
- Resize screens on the fly to fit any monitor’s resolution.
- Interact easily with the new interface to do more with fewer mouse clicks.

ONE PLATFORM. INFINITE POSSIBILITIES...

There has never been a better time to get on the Infiniti platform. The evolution of BioGraph Infiniti software has culminated in version 6.0, which will change the way you do biofeedback and neurofeedback forever. With a wide variety of usability features, a new look and feel, a powerful new sound engine, and the most comprehensive set of computations on the market, you can offer your clients training capabilities that are unavailable anywhere else.

- Add to that graphical user manuals, context dependent online help, year round workshops and weekly online training, and the transition to the most powerful biofeedback and neurofeedback software in the world is made easy. What are you waiting for? Start using Infiniti now!

BioGraph’s audio feedback functions were rebuilt using a powerful video game sound engine, which gives it full control over sound responses and virtually eliminates feedback lag. With the addition of many new reviewing tools, unseen in other biofeedback systems, BioGraph Infiniti continues to be the most powerful multimedia bio/neurofeedback system on the market.

- Explore dynamic EEG entrainment with the new dynamic binaural beat pacer
- Improve reporting with revamped artifact rejection.
- Exchange data better with new export/import capabilities.
- Use real-time trending and segment analysis.

**Powerful capabilities**

BioGraph’s audio feedback functions were rebuilt using a powerful video game sound engine, which gives it full control over sound responses and virtually eliminates feedback lag. With the addition of many new reviewing tools, unseen in other biofeedback systems, BioGraph Infiniti continues to be the most powerful multimedia bio/neurofeedback system on the market.

- Explore dynamic EEG entrainment with the new dynamic binaural beat pacer
- Improving reporting with revamped artifact rejection.
- Exchange data better with new export/import capabilities.
- Use real-time trending and segment analysis.

**Exciting biofeedback tools**

With this new release, we’ve greatly expanded your bio/neurofeedback horizons.

- A slew of new computation algorithms offer your clients exclusive training capabilities.
- Blood pressure monitoring adds automated blood pressure recording and feedback.
- Slow cortical potential neurofeedback opens new avenues of clinical and research possibilities.
- Automatic channel configuration wizard for developers radically accelerates data channel setup.

**Enhanced Z-score biofeedback**

Z-score biofeedback provides a strong research-based approach to training and offers a wealth of information from a simple, concise set of metrics.

- Easily access popular assessment choices, to start and get the most out of z-score biofeedback.
- View all z-scores and metrics in a single, simple graphical interface.
- Distinguish all relevant information in one comprehensive, colour-coded display.
- Take advantage of fully automated functionality, including automated artifact rejection.

**ONE PLATFORM. INFINITE POSSIBILITIES...**

**THE BEST OF BIOGRAPH INFINITI IS BUILT IN**

**The Time is Now**

**NeuroGuide by Applied Neuroscience, Inc.**

The most affordable and comprehensive EEG system available: Dynamic EEG Databases, LORETA, Discriminant Functions, Power, Coherence, Phase, JTA, Burst Metrics, Phase Reset, Statistics, Independent Component Analysis, Phase Reset, Phase Locking & Phase Shift Duration, Batch Processing, Bz-Spectra & Neurofeedback, 3D imaging.

**BESA**

Biosemi
BrainMaster
Carlsson
Cortex
Diepholz
Lafayette
Maxim
Mitra
NeuroGuide NeuroFax
NeuroScan
NuAmps
ProComp
KINTER
& Many More

Pre-Post Treatment Statistics
and 2 Z-Score EEG Biofeedback
& LORETA 2 Z-Score Biofeedback

**Exciting biofeedback tools**

With this new release, we’ve greatly expanded your bio/neurofeedback horizons.

- A slew of new computation algorithms offer your clients exclusive training capabilities.
- Blood pressure monitoring adds automated blood pressure recording and feedback.
- Slow cortical potential neurofeedback opens new avenues of clinical and research possibilities.
- Automatic channel configuration wizard for developers radically accelerates data channel setup.

**Enhanced Z-score biofeedback**

Z-score biofeedback provides a strong research-based approach to training and offers a wealth of information from a simple, concise set of metrics.

- Easily access popular assessment choices, to start and get the most out of z-score biofeedback.
- View all z-scores and metrics in a single, simple graphical interface.
- Distinguish all relevant information in one comprehensive, colour-coded display.
- Take advantage of fully automated functionality, including automated artifact rejection.

**ONE PLATFORM. INFINITE POSSIBILITIES...**

**THE BEST OF BIOGRAPH INFINITI IS BUILT IN**

**The Time is Now**

**NeuroGuide by Applied Neuroscience, Inc.**

The most affordable and comprehensive EEG system available: Dynamic EEG Databases, LORETA, Discriminant Functions, Power, Coherence, Phase, JTA, Burst Metrics, Phase Reset, Statistics, Independent Component Analysis, Phase Reset, Phase Locking & Phase Shift Duration, Batch Processing, Bz-Spectra & Neurofeedback, 3D imaging.

**BESA**

Biosemi
BrainMaster
Carlsson
Cortex
Diepholz
Lafayette
Maxim
Mitra
NeuroGuide NeuroFax
NeuroScan
NuAmps
ProComp
KINTER
& Many More

Pre-Post Treatment Statistics
and 2 Z-Score EEG Biofeedback
& LORETA 2 Z-Score Biofeedback

**Exciting biofeedback tools**

With this new release, we’ve greatly expanded your bio/neurofeedback horizons.

- A slew of new computation algorithms offer your clients exclusive training capabilities.
- Blood pressure monitoring adds automated blood pressure recording and feedback.
- Slow cortical potential neurofeedback opens new avenues of clinical and research possibilities.
- Automatic channel configuration wizard for developers radically accelerates data channel setup.

**Enhanced Z-score biofeedback**

Z-score biofeedback provides a strong research-based approach to training and offers a wealth of information from a simple, concise set of metrics.

- Easily access popular assessment choices, to start and get the most out of z-score biofeedback.
- View all z-scores and metrics in a single, simple graphical interface.
- Distinguish all relevant information in one comprehensive, colour-coded display.
- Take advantage of fully automated functionality, including automated artifact rejection.

**ONE PLATFORM. INFINITE POSSIBILITIES...**

**THE BEST OF BIOGRAPH INFINITI IS BUILT IN**

**The Time is Now**

**NeuroGuide by Applied Neuroscience, Inc.**

The most affordable and comprehensive EEG system available: Dynamic EEG Databases, LORETA, Discriminant Functions, Power, Coherence, Phase, JTA, Burst Metrics, Phase Reset, Statistics, Independent Component Analysis, Phase Reset, Phase Locking & Phase Shift Duration, Batch Processing, Bz-Spectra & Neurofeedback, 3D imaging.

**BESA**

Biosemi
BrainMaster
Carlsson
Cortex
Diepholz
Lafayette
Maxim
Mitra
NeuroGuide NeuroFax
NeuroScan
NuAmps
ProComp
KINTER
& Many More

Pre-Post Treatment Statistics
and 2 Z-Score EEG Biofeedback
& LORETA 2 Z-Score Biofeedback

**Exciting biofeedback tools**

With this new release, we’ve greatly expanded your bio/neurofeedback horizons.

- A slew of new computation algorithms offer your clients exclusive training capabilities.
- Blood pressure monitoring adds automated blood pressure recording and feedback.
- Slow cortical potential neurofeedback opens new avenues of clinical and research possibilities.
- Automatic channel configuration wizard for developers radically accelerates data channel setup.

**Enhanced Z-score biofeedback**

Z-score biofeedback provides a strong research-based approach to training and offers a wealth of information from a simple, concise set of metrics.

- Easily access popular assessment choices, to start and get the most out of z-score biofeedback.
- View all z-scores and metrics in a single, simple graphical interface.
- Distinguish all relevant information in one comprehensive, colour-coded display.
- Take advantage of fully automated functionality, including automated artifact rejection.

**ONE PLATFORM. INFINITE POSSIBILITIES...**

**THE BEST OF BIOGRAPH INFINITI IS BUILT IN**

**The Time is Now**

**NeuroGuide by Applied Neuroscience, Inc.**

The most affordable and comprehensive EEG system available: Dynamic EEG Databases, LORETA, Discriminant Functions, Power, Coherence, Phase, JTA, Burst Metrics, Phase Reset, Statistics, Independent Component Analysis, Phase Reset, Phase Locking & Phase Shift Duration, Batch Processing, Bz-Spectra & Neurofeedback, 3D imaging.

**BESA**

Biosemi
BrainMaster
Carlsson
Cortex
Diepholz
Lafayette
Maxim
Mitra
NeuroGuide NeuroFax
NeuroScan
NuAmps
ProComp
KINTER
& Many More

Pre-Post Treatment Statistics
and 2 Z-Score EEG Biofeedback
& LORETA 2 Z-Score Biofeedback

**Exciting biofeedback tools**

With this new release, we’ve greatly expanded your bio/neurofeedback horizons.

- A slew of new computation algorithms offer your clients exclusive training capabilities.
- Blood pressure monitoring adds automated blood pressure recording and feedback.
- Slow cortical potential neurofeedback opens new avenues of clinical and research possibilities.
- Automatic channel configuration wizard for developers radically accelerates data channel setup.

**Enhanced Z-score biofeedback**

Z-score biofeedback provides a strong research-based approach to training and offers a wealth of information from a simple, concise set of metrics.

- Easily access popular assessment choices, to start and get the most out of z-score biofeedback.
- View all z-scores and metrics in a single, simple graphical interface.
- Distinguish all relevant information in one comprehensive, colour-coded display.
- Take advantage of fully automated functionality, including automated artifact rejection.
WHY CHOOSE BIOGRAPH INFINITI?
A CLINICAL SYSTEM YOU CAN RELY ON

Prioritizing data validity and reliability
Good BioGraph key strength—prioritizing the safety of your subjects.

Prioritizing data validity and reliability
One of BioGraph’s key design principles has always been to put your safety first. The system is crash proof and ensures optimal signal quality, integrating electrode impedance and artifact rejection are essential to clinical work. If you cannot rely on quality sensor data, you cannot ensure valid statistical analyses or demonstrate positive clinical outcomes.

Streamlining for ease of use
Version after version, in response to your feedback, we’ve made our system easier to use in order to help you work more efficiently. Version 5.0 introduced Quick Start functionality, which packs all the complexity of recording sessions into a simple desktop icon. Version 6.0’s many enhancements radically expand your clinical choices.

Engaging yet contingent multimedia feedback
As a multimedia biofeedback and neurofeedback platform, BioGraph’s audio and visual capabilities are exceptional. From the ability to manipulate MIDI audio files to the BioFun games, we have constantly maintained that engaging and engaging feedback is important; but accurate, informative and contingent biofeedback is essential.

Enhancing reporting capabilities
As a clinical software platform, BioGraph Infiniti analyzes your data accurately and generates easy to understand reports that make your client’s clinical progress evident. Release after release, we have created many specialized application suites to provide you with training and reporting screens for standard and user-definable protocols. The CardioPro Infiniti HRV Analysis module goes even further in providing high-end reporting capabilities.

BioGraph Infiniti’s HRV tools are on the most reliable and validated measurement models. Highly accurate sensors and low noise cables ensure quality signals, so you can focus on your work. Conforming to the latest FDA medical device policies and regulatory registrations across the world, including the recently released IEEE Recommendations for Neurofeedback Systems, the Infiniti platform meets the highest standards in the field and beyond.
WHY CHOOSE BIOGRAPH INFINITI?
A CLINICAL SYSTEM YOU CAN RELY ON

Prioritizing data validity and reliability
One of BioGraph's key design principles has always been to put your data safety first. The system is crash-proof and ensures optimal signal quality, integrated electrode impedance and artifact rejection are essential to clinical work. If you cannot rely on quality sensor data, you cannot ensure valid statistical analyses or demonstrate positive clinical outcomes.

Streamlining for ease of use
Version after version, in response to your feedback, we've made our system easier to use in order to help you work more efficiently. Version 5.0 introduced Quick Start functionality, which puts all of the complexity of running sessions into a simple desktop icon. Version 6.0's many enhancements radically expands your clinical choices.

Engaging yet contingent multimedia feedback
As a multimedia biofeedback and neurofeedback platform, BioGraph's audio and visual capabilities are exceptional. From the ability to manipulate MIDI audio files to the BioFun games, we have constantly maintained that enjoyable and engaging feedback is important, but accurate, informative and contingent biofeedback is essential.

Enhancing reporting capabilities
As a clinical software platform, BioGraph Infiniti analyzes your data accurately and generates easy-to-understand reports that make your clients’ clinical progress evident. Release after release, we have created many specialized application suites to provide you with training and reporting screens for standard and user-definable protocols. The CardioPro Infiniti HRV Analysis module goes even further in providing high-end reporting capabilities.