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Greetings colleagues. This is now my third letter to you as president, which brings me to the awareness that my tenure is over halfway complete. While this year has been exhausting in many ways I am more than ever invigorated and excited for the future of the organization. I hope you’ll take a few minutes to continue through this letter as I have some very important updates, acknowledgments and news to share with the community. If you had the opportunity to read the statements that I hoped to achieve as during my board term, any of the previous presidential letters, or board of directors’ updates sent out by email you’d know that our organization is making progress on some very important and significant advances.

Before I can go any further explaining our future I have to acknowledge our immediate past. As you likely have become aware Cynthia Kerson, PhD, who has been our executive director since 2006, left this position at the beginning of May. I especially want to acknowledge the dedication and passion Cynthia has given to the organization. She has made significant efforts to many facets of the organization and she has truly helped us grow to where we are today. I wish her every success in her continued endeavors in our field. While her roles may be changing I’m pleased that her talents and skills will still be utilized to promote and contribute to the field of neurofeedback. She will continue to be very active in the neurofeedback community and notably remains the Executive Director for the ISNR Research Foundation and you’ll notice that she currently continues to be managing editor for this very newsletter. Thank you Cynthia and I look forward to the future.

Our membership continues to grow and through the efforts of the International Institutional membership category. By the time this issue makes it to your mailbox our membership could easily exceed 1000+ members for the first time in our organization’s history. Martijn Arns, our international member at large has led the board through significant considerations for making this program a reality. As I write this letter I am en route to Greece to fulfill and invited visit with our European colleagues and the Society for Applied Neurosciences (SAN) conference to discuss continued efforts to truly represent an international effort to promote neurofeedback. Upon invitation, I will also visit our Australian colleagues during the Applied Neuroscience Society of Australasia (ANSA) conference in August to continue to develop and strengthen the collaborations and support from ISNR. During this very exciting growth period it has caused the board to pause to make sure that we have adequately developed structures and systems that support ISNR’s governance.

Rather than immediately hire a replacement executive director, under the leadership of president-elect Richard Davis, the board has investigated and determined to receive services from an interim executive director program. The LaSalle University Non-Profit Center in the School of Business will provide a comprehensive evaluation of our organization’s needs as well as provide significant documentation including job description, duties and procedures for our next permanent executive director while also being our interim executive director. The interim executive director should begin in the middle of May and we are hopeful that we will have a search for the permanent position before the 2011-year ends.

Recently the standards committee members, representing a diverse cross-section of neurofeedback providers, authored a Standards of Practice paper that was produced through a very lengthy process of weighing the issues involved, after which it was unanimously approved by the standards committee and then unanimously approved by the ISNR Board of Directors. This document represents an official position of the organization, and consequently, it is an official statement of ISNR, but also, like any such organizational position paper, it will be periodically reviewed, updated, and modified following relevant input from the membership and approval by the Board. Especially at this early stage of release of the Standards paper, concerns and comments from ISNR members who have carefully read the document are requested and welcomed. You have no doubt likely seen considerable discussion among the members and even outside our membership regarding our standards committee’s recent publication. This discussion has been very collegial and has risen to an academic level that I am very proud of. It is through the professional discussion and debate that we carve out documents that are representative of who we currently are but also provide a vision of who we achieve to become. I urge you to find the full discussion and invitation for commentary instructions for members in the archives of our members list serve.

In other developments I am very excited to announce that our website and shopping cart are under development. Over the next 2-3 months the www.ISNR.org website will be having a complete overhaul. This was one of my primary objectives as president in order to be able to reach the public in a more user friendly and understandable manner as well as be a service to our membership. Our professional content will largely remain unchanged however the PR committee (chaired by Sarah Prinsloo) has the vision to additionally have a public and lay person portal to have more basic information describing our field, our members and the services that may be provided. This overhaul will bring our web design to a more current look and have increased ease in user interface and navigability.

I wanted to also take this time to introduce some very exciting developments for our

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**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.
in the tenor of our discourse toward one of greater mutual acceptance and tolerance of differences. This obligates me to model the behavior I hope to see, which involves some degree of sacrifice on my part. I must retreat from opportunities to engage in verbal confrontation, which I have traditionally relished, and I invite others to do the same. Ours is an intrinsically multi-disciplinary enterprise, and no one has the right to shout another perspective off the stage. No profession has squatters’ rights here. None has a perpetual lease, or title to intellectual property with respect to the core tenets of our discipline.

Over the twenty-two years that I have been attending meetings, I have always been amazed at the degree to which the Balkanization of the biofeedback field sustained itself in the face of the obvious unitary quality of our regulatory regime. Those who practiced EMG training considered themselves so distinct from the whole that eventually they spun off into a separate organization from the AAPB. Those who continued to pursue alpha training eventually found themselves so unwelcome at the AAPB that they too spun off to form their own organization. Years later, the EEG biofeedback contingent also decamped to form the SSNR in 1993.

Unfortunately, the virus of compartmentalized thinking migrated with the daughter organizations into their new institutional settings. Right belief needed to be promoted, and heresies expunged. Certainty was claimed for propositions which did not deserve it. Fruitful discourse was aborted. And so here we are, with no end in sight for the basic rifts within the field. The answer, of course, lies in reaching across the breaches in support of our common objectives.

The underlying reality of our discipline is that our regulatory regime functions as an integrated whole. Autonomic regulation is not rigorously separable in the discussion; the division into central and peripheral regulation is not realistically sustainable. Hence the division into separate agendas for biofeedback and neurofeedback is going to be increasingly limiting. It is not that our prior understandings were false. It is rather a question of whether they remain useful. As the integrative nature of our regulatory hierarchy is coming to be understood, the latter perspective is simply going to be more fruitful. Our organizational arrangements should accommodate to this shift, if not at the formal organizational level, then at least at the conceptual level. We now need to reach across the boundaries we ourselves have established.

Some while ago I heard a program on TED which talked about the advantage of having lots of different ideas contend with one another. He drew the analogy to sexual reproduction, which brings different genetic resources into combination. Just as biological systems are most productive of change at the interface between different communities, so our intellectual growth is promoted by the engagement of divergent perspectives. Instead we tended to have the active resistance to any new initiatives. The result is that the field has fragmented into sub-disciplines divided by the instrumentation being utilized. This is a direct analogy to the fragmentation in the original biofeedback discipline according to the physiological variable being trained. To an extent, our pathology is shared by the field of neurophysiology as a whole. Said neuroscientist Christof Koch, “People are more likely to use each other’s toothbrush than they are to use each other’s protocols.”

When a new finding is brought to the attention of our community, the typical response is to ask whether the aspirational “claim” is already supported by the literature. But if we limited ourselves to living within the comfort zone of published science it would be like driving while looking in the rear view mirror. As Daniel Siegel has said, “If you had to have the science first, we would never get anywhere in science.” First comes the observation; then comes the discernment of a pattern of occurrences; and then we already have the obligation to share what we have observed with colleagues. Anecdote is not a pejorative. Sometimes even a single observation rises to significance. When I first heard from Dan Chartier of a 40-point improvement in IQ score, from 72 to 112, in one of his early clients, it was already sufficient to loosen the moorings on the belief that the IQ was essentially invariant. Something had been accomplished that had no trivial explanation.

In the sometimes lengthy progression from mere conjecture toward solid scientific status, our community should at least benignly tolerate, if not affirmatively value and support, the innovators. The constraints of peer review are often detrimental to the tender shoots of new initiatives. Peer review tends to censor or dismiss anything too far from the beaten path. This is a fact of life in mainstream science that will not change. But that is all the more reason for our community of professionals to provide a buffer to the harsher judgments of the world at large, a safe harbor for innovation within its orbit. While the world at large is bidding us to make harsher judgments, for example with respect to evidence-based criteria, within our own organization we should be moving in the opposite direction, toward softer judgments and greater openness to divergent perspectives.

Siegfried Othmer, PhD
There are two articles about LORETA, one on LORETA itself and the other on sLORETA. Both will increase your understanding of this very powerful analysis and training programming. Do take the time to read them and think about adding them to your practice. I can attest to the power of both.

The Brodmann issue is beautifully handled by the Thompsons: Michael, Linda and James and David Hagedorn, all (PhDs) in their Network Rational article as Part 1 of this issue. Also David Kaiser, PhD again gives us the definitive discussion of Brodmann and the implications in analysis and training. Again, hope you take the time to read both articles.

Finally Thought Technology in their series of articles is providing us with a look at athletic personal and ADHD. Very informative!

Have a wonderful summer!!

Merlyn Hurd, PhD, BCN Fellow
Continued from page 4

conference in September that will take place in Carefree, Arizona (just outside Phoenix). The conference committee and Ann Marie Horvat have been working diligently to bring exciting speakers, innovative developments and a schedule that maximizes the opportunities for learning and networking. Our membership has increasingly expressed interest in integrative approaches to neurofeedback. In response to this I was excited to call specifically for talks and workshops that are focused on neurofeedback in combination with other “peripheral” measures. We had a great response and you’ll find a number of such talks in this year’s program. To highlight this effort one of our invited speakers will be our colleague, Dr. Richard Gevirtz, who will speaking on recent research in heart rate variability and EEG along with providing a workshop on the topic. Other notable speakers include keynotes, Paola Arlotta, PhD from Harvard, Scott Makeig, PhD from the University of California San Diego and Robert Pascual-Marqui, PhD from the Key Institute. I am very excited about the variety of topics and the quality of all our highlighted speakers. You can find a full list of keynote and invited speakers on our website www.ISNR.org. Still on the topic of the conference is a different schedule format. Many individuals reported wishing they had more time with our plenary speakers. By your request speakers will have more time in slots of either 30 or 60 minutes. Also there will be no evening sessions with the exception of our traditional receptions with poster sessions and banquet dinner allowing attendees to maximize their time networking or taking advantage of the beautiful desert and resort amenities.

I’ll respect your time and conclude by expressing my continued appreciation to the board of directors, staff, committee chairs and members and members who continue to promote and advance our field through collaboration, collegial debate and professional actions. ISNR truly is a membership organization and it is through your dedication and passion that we will continue to grow and have a positive impact. Be well I hope to see you in September!

Leslie Sherlin, PhD
Background:
Back in 1995 at one of the early meetings of the newly formed Society for the Study of Neuronal Regulation, Lynda and Michael Thompson presented a paper entitled, “Exceptional Results with Exceptional Children.” The cases presented were children with severe behavioral disorders who had not responded to traditional treatments such as medications, behavior modification, and extensive psychotherapy. With parental consent they tried a new, purely experimental approach for which there was little research support and no way of explaining why neurofeedback (NFB) might work, except to cite outcomes of increased attention span in children with Attention Deficit Disorder who were treated using neurofeedback.

Despite our limited knowledge and equipment that recorded only single channel EEG and basic biofeedback (Autogenics A620 and Focused Technologies F1000), these difficult cases made remarkable improvements regarding both behavior and medication reduction. A dramatic example was a 13-year-old boy with Autism who initially just screeched and flailed his arms when seated in front of the computer. By the time he finished 85 sessions he had been demitted from the MID class (for children with mental retardation) and had moved on to high school where he was enrolled in regular classes except for mathematics, in which he took an advanced class. Additionally, he was being invited to parties by his peers. Eight years later, when we called to invite him back for follow-up, his father declined, explaining that his son was doing well in college and did not want anyone to know that anything had ever been wrong with him.

What were the procedures that produced these results? We had done single channel assessments and training, placing the active electrode over Cz, referenced to the left ear in most cases, or in some cases (especially when EMG artifact was a problem, as with the autistic lad), we used a sequential placement: FCz and PCz. Both referential (old term: monopolar) and sequential (old term: bipolar) training were successfully used with very difficult cases in the early years, following the lead of Joel and Judith Lubar who used those placements for ADD (Lubar, 1991).

With today’s perspective and the knowledge gleaned from sixteen additional years in the field, how do we account for our early success? This paper will allude to how our practices developed over these years. It will emphasize, with its discussion of networks, an overview of what we hypothesize to be a reasonable answer to the question of why our original, admittedly rather simple approach, was successful. The explanation is based on a theoretical framework that derives both from others’ research and our own evidence based practice. QEEG data (either single channel or 19-channel) continues to provide the basis for planning all interventions. The 19-channel data, when available, is combined with LORETA analysis for source localization and then we apply knowledge of Brodmann areas, functional networks, and the client’s symptoms. Our observation is that symptoms and functional neural networks are mutual among many of the disorders we are working with in general practice.

Networks: A Compelling Rationale for Combining Neurofeedback, Biofeedback and Strategies

Michael Thompson, MD, Lynda Thompson, PhD
James Thompson, PhD & David Hagedorn, PhD

Central Midline Structures (CMS): An Anatomical and Functional Unit (Northoff, 2006)
In broad general terms the CMS cortical areas includes the following:
• MOFC = medial orbital prefrontal cortex (BA 11, 12);
• VMPFC = ventromedial prefrontal cortex (BA 10, 11);
• PACC = pre- and subgenual anterior cingulate cortex (BA 24, 25, 32);
• SACC = supragenual anterior cingulate cortex (BA 24, 32);
• DMPFC = dorso medial prefrontal cortex (BA 9);
• MPC = medial parietal cortex (BA 7, 31);
• PCC = posterior cingulate cortex (BA 23, 31);
• RSC = retroplenial cortex (BA 26, 29, 30).

We suggest that in thinking about the CMS and its importance in networks that one consider including other structures that directly connect to these areas. These might reasonably include the hippocampus, the entorhinal/uncus area, and the insula.

Figure 1
Central Midline Structures (CMS)

Drawing from Neurofeedback Book (AAPB.org) & ADD Centre Brodmann Areas Booklet (ISNR.org)
Artwork by Amanda Reeves & Bojana Knezevic
Mechanisms that May Underlie Treatment Changes:

Given the overlap in symptoms across many disorders and, by extension, overlap in the neural networks involved, it is logical to postulate that many of the disorders successfully treated using neurofeedback (NFB) may have underlying mechanisms in common. For the most part, there appears to be dysfunction to different degrees, in only a few basic networks. Many of the disorders, for example, have in common difficulties in attention (executive network) and/ or anxiety (affect network). A few disorders include difficulties in monitoring of self and self in relation to others (default network). The autistic spectrum disorders (ASDs) have major difficulties in at least these three major networks. The majority of our patients, regardless of diagnosis, appear to have difficulties related to these networks with just a different “balance” of involvement of the three networks across clients and diagnostic categories. These three networks can all be influenced by neurofeedback at the sites over the central midline structures (CMS) (See Figure #1). They are also altered by means of biofeedback and, in particular, by Heart Rate Variability (HRV) training, which will influence the same CMS through afferents to the brain stem (medulla) and from these nuclei to the basal ganglia and the cortex (Thompson & Thompson, 2009).

Central training near Cz (Jasper, H., 1958) with referential placement (ear reference) should have an effect on the affect network (the emotional brain) as shown in Figure #2.

The loops that involve connections from cortex to basal ganglia to thalamus and back to cortex may affect many functionally related areas of the cortex. It may also be reasonable to hypothesize that there are more changes in the brain (both amplitude and phase) in relevant networks if we use sequential training. Sequential placement, in addition to the advantage of common mode rejection lessening the effects on the EEG due to certain artifacts, may produce improvements related to amplitude changes at either (or both) site(s) and, in addition, may encourage phase and coherence changes. (When the two sites are in phase for a particular bandwidth, amplitudes will decrease - as is seen with an artifact that is common to both sites. Whereas if they become less in phase, amplitude will increase.) If the distance between two sites is lengthy, they may largely be connected through a loop that is cortex-to-basal ganglia-to-thalamus-back-to-cortex, rather than simply cortical-cortical. This, in turn, suggests that our NFB training likely affects functional networks and not just direct connections between two sites.

On the other hand, if only a single site is clearly outside your data base norms, then amplitude training for a specific frequency range at that site may be more logically done with a referential montage. With amplitude training and referential placement you have a clearer idea of what has changed at a particular site. (M. Barry Serman [personal communication] often used sequential placements in his earliest research but switched to referential placement after a grant reviewer insisted on more specificity about what was being changed during operant conditioning of brainwaves.)

Combining NFB with BFB to Influence Central Midline Structures

With these early clients we were applying Lubar’s principles that worked for ADD and we thus chose the central location(s) for a number of reasons: CZ reflects activity of both the frontal cortex and the sensorimotor strip; relative to other sites, because of its distance from the ear(s) that are used as a reference, it has higher amplitudes (due to less common mode rejection); because of its distance from the jaw, shoulder and neck muscles there is less EMG artifact; because of distance from the eyes there is less eye movement artifact. The frequencies trained were based on single channel QEEG data measured at CZ. Typically we were decreasing bandwidths in the theta range, increasing low beta (either sensorimotor rhythm [SMR] in the 12 [or 13] – 15 Hz range along the motor strip or beta in the 15 – 18 Hz range) and had an inhibit on frequencies above 20 Hz. Those beta frequencies above 20 were assumed, with the equipment available at that time, to reflect muscle (EMG) artifact. Now we realize 20-36 Hz may reflect excess high frequency beta, including spindle beta. In some patients this high amplitude, high frequency beta may correlate with dysfunction. However, this beta may also correlate with high IQ and multi-tasking, so care must be taken in making any interpretation (Thompson & Thompson, 2005). More recently we have observed that, in patients where the differences from the data base z-scores appear to correlate with dysfunction (such as anxiety or ruminating) rather than high functioning, LORETA often shows the source of this dysfunction to be in the cingulate cortex (Thompson & Thompson, 2010).

In nearly all cases we used some biofeedback, initially just finger temperature and electrodermal response (EDR). We also taught diaphragmatic breathing and encouraged dropping the shoulders as a simple relaxation technique to decrease anxiety as well as EMG artifact. We always worked 1:1 with quiet encouragement, modeling, and teaching the children learning strategies (emphasizing active reading, listening, and organization skills) during part of each neurofeedback session when the EEG indicated they were calm and focused (Thompson & Thompson, 1998).

To determine which biofeedback modalities to train, we now use a stress assessment that demonstrates changes during stressors (STROOP color test and mental math) and recovery after stress for peripheral skin temperature, electrodermal response, muscle tension, heart rate, and breathing frequency. Heart rate variability training (HRV) is now taught in virtually all training sessions with adolescents and adults (Thompson & Thompson, 2007).

Much of the NFB training done at our Centre, both now and in the early days, begins at a central location. Increasingly in the neuroscience literature central midline structures are being investigated due to their involvement in the default network.

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Networks
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Cortex-Basal Ganglia-Thalamus-Cortex Circuit

One key to understanding why NFB applied over an appropriate site along the CMS, such as FZ, FCZ, CZ or PZ, may have such a profound effect on different, but functionally related, areas of the brain is to recognize the key importance of the cortex-basal ganglia-thalamus-cortex circuit that affects functionally-related areas. In simplest terms both the putamen and the globus pallidus are inhibitory. When cortical activity stimulates a specific area of the caudate or putamen (components of the striatum within the corpus striatum) then those nuclei will inhibit a functionally related, specific area of the globus pallidus. Lateral inhibition of other areas of the ‘striatum’ will stop other functional areas of, for example, the putamen from inhibiting the globus pallidus. The firing rate of the globus pallidus is very high and is constantly inhibiting the thalamus. Thus the one area of the putamen (or caudate) that is activated will inhibit and stop the rapid inhibitory firing of a specific area of the globus pallidus. In this manner only one specific functional area of the thalamus is released from the inhibition of the globus pallidus allowing functionally related areas of the cortex to be activated. It can be thought of as opening a ‘gate’ to the cortex, which can intensify a specific selected program of action. Thus the one site where there is no inhibition allows activation of that one area’s thalamo-cortical connections to a ‘set’ of functionally related, even though distant, areas of the cortex. Less important pathways continue to be inhibited by other nuclei in the globus pallidus.

An example of the above is that activation of the motor cortex, such as when a hyperactive child is moving his or her feet under the school desk, will stimulate the putamen, which in turn inhibits an area of the globus pallidus, which will then no longer inhibit the functionally related area of the thalamus. In this manner the ventro-lateral nucleus within the thalamus stops producing the oscillations (oscillations with the reticular nucleus of the thalamus) that would produce theta in the cortex and the student stays awake and alert.

Every Brodmann Area (BA) site has functions that overlap with the functions of many other sites (Thompson, Thompson & Wu, 2007). In no way is this CMS training overview meant to decrease the importance of training over other cortical areas if such training is indicated by the 19-channel QEEG findings. It does, however, help us understand why beginning with NFB training over the CMS has truly profound positive effects in many different disorders. We have often been surprised, for example, that, after training at FCz and simultaneously doing, relaxation training, HRV training and incorporating metacognitive strategies with clients with Asperger’s Syndrome, further training at other sites such as T6 (which often shows deviations from database norms in people with Autistic Spectrum Disorders) is not necessary. This is because symptoms related to the functions of that area, such as difficulty reading non-verbal cues, had resolved through the initial CMS training.

There are always exceptions. We do not, for example, begin our training over the CMS if the main problem is a reading disorder or a seizure disorder. With dyslexia, if that is the primary complaint and not a comorbidity with a bigger problem such as ADHD, we usually follow the QEEG, which typically shows inactivity over Wernicke’s area near the angular gyrus in the dominant hemisphere. With seizure disorders we may alternate SMR enhancement at C3 and C4 while decreasing slow wave activity (2 – 5 Hz) near the focus of the epileptiform activity. We may also train slow wave activity at the homologous site in the opposite hemisphere (Hammond, Hunt, Harper, O’Brien, & Dogris, 2011).

Traumatic brain injury (TBI) is another exception since head injury types, such as motor vehicle accidents, IED (improvised explosive device) blast exposure, and sport related deceleration injury can differ. IED comprises several types of injury – the pressure wave that passes through tissue damages neurons in different ways. One way is the axon will shear off or twist and break. This renders the pathway that utilized those axons somewhat hindered. Another type of injury is caused by a secondary neurochemical cascade (increased extracellular potassium, calcium influx and decreased magnesium) and associated inflammation which also damages neurons. The EEG and measurements of event related potentials (ERPs) help locate the different locations and degree of dysfunction, such as hypo- or hyper-sensitivity of the region. TBI patients, often functionally hindered by 1-½ times slower processing speed, appear to benefit from multiple and overlapping brain function assessment methods that include analysis of event related potentials (ERPs). The multi-factorial approach offers a more dynamic window into the interconnected brain systems. Advancing hardware and software applications, such as those used by Evolve Neuroscience (Hagedorn & Thompson, 2011) permit one to identify areas hindered by diffuse axonal injury resulting in delayed motor output and also to measure the extent this output is hindered by additional network dysfunction. The sites trained using NFB are therefore specific to the assessment findings.

Nevertheless, beginning training over the CMS is a reasonable starting point with the majority of our patients due to the network properties of the structures that underlie the CMS mid-line sites. Note that the goal with our client population is typically to improve self-regulation of attention and emotion and to optimize performance in the following disorders: ADHD, seizure disorders, ASD, movement disorders, age related mild cognitive impairment, and TBI. We do not often deal with addictions or personality disorders.

Figure 3
Cortical-thalamic loops involving motor activity.

Drawings by Amanda Reeves from The Neurofeedback Book

Cortex—Basal Ganglia—Thalamus—Cortex
Motor information goes from the somato-sensory cortex (SSC), premotor cortex (PMC), and supplementary motor area (SMA) to the putamen and then to internal globus pallidus and to the substantia nigra and pars reticularis. From these basal ganglia centers it is routed to the ventro-lateral and ventro-anterior nuclei of the thalamus. These nuclei send axons to functionally related areas of the cortex (Afer Kropotov, 2009).

Basal Ganglia
The corpus striatum lies adjacent to the lateral wall of the diencephalon (thalamus) and comprises the lentiform nucleus, caudate, amygdala, claustrum and nucleus accumbens. The lentiform comprises the putamen laterally, globus pallidus medially, and at its base the innominata substance inferiorly (containing the anterior perforated area). (Note that some neuroanatomy texts label caudate + putamen as the “striatum” and this is a different term than “corpus striatum.”)
A Few Important Networks (Affect and Distress, Executive, Default, Salience, and Placebo networks) and Why We Combine NFB with BFB

Our working definition of a network, for purposes of doing NFB & BFB, is a “net” of interconnected, functionally related, groups of neurons. We refer the reader to talks by Dirk De Ridder, such as his ISNR presentations in 2009 and 2010, for neuroanatomical details (De Ridder, 2009; De Ridder, 2010). We give here only a very basic overview. This is a rapidly evolving area and much will become more clearly delineated in the next few years.

In terms of applicability to work using NFB + BFB, the ventral anterior portion of the anterior cingulate cortex (ACC) is a key structure in the affect network. The ACC connects with the medial and orbital prefrontal cortex and the entire limbic system. In addition, it receives input from the brain stem that, important to our work, includes vagal afferents from the heart to the nucleus solitarius in the medulla, which connects to the locus coeruleus (noradrenaline production) (Porges, 2007) and then to the limbic system including the ACC. The ACC has direct links to the hypothalamic-pituitary-adrenal (HPA) axis. The reader can immediately see the role of these connections in the human stress response and hence the importance of treatment that combines HRV training with NFB to control stress (Thompson & Thompson, 2007). A distress network, as described in Dirk De Ridder’s work concerning tinnitus, is similar to that for pain and involves the following areas: orbital frontal cortex, anterior cingulate, amygdala, hypothalamus, posterior insula, primary motor cortex, and frontal pole (De Ridder, 2009; Kulkarni, 2005).

The distress network is possibly a component of the affect network. It highlights the interconnection between the central and autonomic nervous systems. Patients who have brain injury due to blast or motor vehicle accidents can also demonstrate symptoms of acute anxiety disorders and even more chronic conditions like PTSD (Post Traumatic Stress Disorder). In such cases, the electrocardiograph data, namely the R-R interval variability, is a frequently observed marker of both the brain injury and the stress disorder. The stress disorder symptoms in IED injuries and other mechanisms of TBI may correlate with hyper-activation of amygdala-hippocampus for IED injuries and perhaps more cingulate gyrus involvement in motor vehicle accidents. However, in both types of injury, it is probable that a distress network will be activated. Additionally, in these injuries, the patients also have other sympathetic nervous system hyper-activation symptoms (e.g., insomnia, temporomandibular joint disorder (TMD), muscle tension, and so on).

In head injury patients the addition of concurrent treatment with both NFB and heart rate variability BFB is indicated and arguably essential. Thus, regardless of the site of injury, it is still important that one consider the effects of that injury on all the major functional networks, for example: attention, executive, affect and salience networks, and combine NFB + BFB + strategies that will effect positive changes in these networks in order to help the patient recover.

We have many good examples that emphasize the importance of attending to dysfunction in all relevant networks in patients with TBI but one stands out. Before his automobile accident he had been a brilliant student. After the accident he had lost all ability to do his graduate studies. His memory was severely affected. He was unable to read and recall a simple page of information. He was understandably anxious and somewhat depressed. All hospital related rehabilitation therapies over more than a year period had little effect. After 8 months of NFB + BFB + Strategies that involved artificial intelligence and, two years later, graduated with his PhD in computer science...

The same ACC structure, but the more dorsal aspect, is a central structure in the executive network and it connects with all functionally related structures including the dorsolateral prefrontal cortex. Executive functioning is the overall capacity to manage perception, attention, selection, decision making, inhibition, memory, planning, problem solving, logical thinking (deductive / inductive), sequencing; and to monitor, evaluate, and self-correct outputs; and to respond verbally / non-verbally, motorically and/or socially for the purpose of the attainment of defined goals. The frontal lobes are crucial for all executive functions (Knezevi, Thompson & Thompson 2010; Kouijer, Jan, de Moor, Berry, Gerrits, Congedoet al., 2009). Good examples of improved executive functioning can be found in our own case series publications on 111 ADHD (Thompson & Thompson, 1998) and on 150 Asperger’s and 9 ASD (Thompson, Thompson, & Reid, 2010). The average IQ gain in these two case series were 12 and 9 points respectively. Significant academic and other changes were also recorded in these publications.

A good example of a complex network is one that is involved in depression (Figure #4) as described by De Ridder (2009). Logically, it does involve many of the same structures as were listed above for the distress network. He notes that in depression the vegetative / autonomic affect network symptoms involve a ventral compartment (e.g., sleep disturbance, loss of appetite and libido), which includes the hypothalamic-pituitary-adrenal axis, hippocampus, insula (BA 13), subgenual (SG) cingulate (BA 25), and the brainstem. The executive components

Continued on page 12
of the affect network in depression are found in the dorsal compartment, which modulates attentional and sensory-cognitive symptoms (e.g., apathy, attentional and executive deficits). This includes the dorsolateral prefrontal cortex (BA 9 & 46), the dorsolateral anterior cingulate (area 24b), posterior cingulate (BA 31), the inferior parietal lobe (BA 40), and the striatum. The dorsal prefrontal components, including the ACC, are also involved in the cognitive control of emotion including reappraisal, evaluation, and explicit reasoning concerning emotional stimuli. Information concerning cognition and emotion from the two compartments (dorsal & ventral) is integrated by the rostral anterior cingulate (BA 24), medial frontal cortex (BA 9 & 10), orbital frontal cortex (BA 11), and frontopolar areas. In addition, recall that selection of activation of particular pathways must involve the cortex—basal ganglia—thalamus to cortex connections, as was previously shown in a brief overview in Figure #1.

Another important network is called the default network. It comprises a number of central midline structures including the ventral-medial prefrontal cortex, anterior cingulate cortex, lateral parietal cortex for spatial self-reference, cuneus and precuneus and the posterior cingulate. These areas are concerned with understanding and constant monitoring of self and self in relation to others (Supekar et al, 2010). It is therefore involved in self-referential processing and understanding others’ intentions. These functions are important in our work with autistic spectrum disorders (ASD). The default network becomes active when the brain is not engaged in specific cognitive or motor tasks.

Another network subsumes an additional important function not fully covered by the previously mentioned networks. This is the salience network (Seeley, 2007). Its function is to determine the salience (relevance) of information. This salience network includes the dorsal and anterior cingulate gyrus (BA 24 & 25), insula, middle superior frontal area, and the para-central area (BA 4, 5, 6) the sub-callosal gyrus, entorhinal area (BA 28), uncus (BA 34), parahippocampal gyrus (BA 35), and fusiform gyrus (BA 36). The right dorsal anterior cingulate (dACC) and the right insula act as a switch between the frontoparietal executive network and the default network when determining salience. However, for each network there are always other networks that subsume similar functions but in a different context. One example might be a salience network, which we postulate could be related to evoked potentials. For example, P3a and P3b (positive approx. 300 ms responses to auditory or visual stimuli) involve a circuit pathway between frontal and temporal/parietal brain areas. They reflect rapid neural inhibition of ongoing activity to facilitate transmission of stimulus/task information from frontal (P3a) to temporal-parietal (P3b) locations. It is possible that P3a stems from the initial inhibitory activation elicited by focal attention to a distracting stimulus and P3b indexes subsequent inhibition related to memory (Polich, 2007). This is the process of determining salience of the stimulus in a GO – NoGO task, such as the continuous performance tests used to evaluate ADHD symptoms. Another example of a different salience network is a salience map (or network) to rank items in the visual field for locus of attention (Bisley & Godberg, 2006). The lateral intra-parietal area (LIP) connects to the frontal eye field (FEF) (as does the upper auditory cortex), superior colliculus, pulvinar nucleus, and inferior temporal area (BA...
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improvement. This activity will involve hippocampus to orbital frontal cortex (OFC) connections. De Ridder gives an example of placebo network action during a sham treatment versus real repetitive transcranial magnetic stimulation (rTMS) treatment over a central area that should influence the ACC in depression and addiction. The improvements associated with the placebo network in depression seem to involve different cortical connections but a common final destination as compared with improvements that result from rTMS. The rTMS has been shown to decrease 22-23 Hz beta activity with its source in the anterior cingulate (ACC). The ACC is connected to the OFC. On the other hand, De Ridder demonstrated that the sham rTMS does not work through the ACC but rather, it involves the parietal cortex to the OFC and the placebo network described above (De Ridder, 2010). Thus the placebo response with sham rTMS shows the parietal to OFC link and not the ACC to OFC pathway (Figure # 6).

The placebo effect for other disorders may involve additional areas. For pain relief, for example, the placebo effect also incorporates the nucleus accumbens and, to some degree, the ACC, insula, and dorsolateral prefrontal cortex, which are involved in the salience, executive, and affect networks. De Ridder shows the diagram below from Bene-detti (2005) to show areas involved in placebo effect for pain.

Discussion: When reviewing the pivotal position of the anterior cingulate gyrus in many networks the reader can see why we postulate that our original success with such a simple placement as Cz, which lies over the ACC and thus over a key area in the central midline structures, was so effective. Plus combining this with biofeedback increased the efficacy because of the indirect links via the brainstem to the ACC. A number of networks can be affected by both neuronal firing patterns from different areas within the ACC and by vagal input to the nucleus solitarius. Vagal tone can be improved with diaphragmatic breathing at about 6 breaths per minute. (Now we can be more precise by doing HRV training.) These networks involve feedback loops to the brainstem with connecting links to the limbic cortex. Knowing this helps us understand the effectiveness of our combined NFB and BFB work.

The Cz site may not feed directly into the placebo network outlined by De Ridder but our 1:1 trainer/trainee work and the family’s positive expectations may be assumed to indirectly trigger this network. We find it helpful to clinically think of placebo as “re-

Continued on page 16
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membered wellness.” Herbert Benson coined this term, which explains the involvement of memory through the hippocampus to orbital-frontal cortex connection.

Given this general understanding of networks, it seems sensible to combine NFB and BFB. We almost always use both and find this a parsimonious approach: even though you are dealing with more parameters when you combine the approaches. It is also parsimonious because the training results with BFB may be seen more quickly and this will keep your client motivated to train for enough sessions to get lasting NFB results. Heart rate variability, for example, can be learned in half a dozen sessions, which is a shorter time frame than is needed for reduction in excess theta or an increase in low frequency beta. Metacognitive strategies are also incorporated into the training during periods when the client is in a receptive state for learning (as indicated by EEG parameters). Medications can also be used with this combination, often with the dose being reduced as self-regulation skills improve. Although the emphasis of this paper is on neural networks which we can influence through NFB combined with BFB, we remind the reader to always combine this work with appropriate other assessments and interventions. It is not a stand-alone treatment. For example, patients who have correct nutritional and supplemental interventions based on good lab data can be expected to respond better to NFB (Hagedorn & Thompson, 2011: Schelten, Kamphuis, Verhey, Olde, Rikkert, Wurtman, et al., 2010).

This paper attempts to introduce the concept of networks. Under the salience and affect network discussions we mention more than one function and more than one network. By doing this we are attempting to suggest that the reader should understand that each network group (attention, salience, affect, executive, placebo) is just a starting point for understanding that our work at different cortical sites with EEG feedback (or tDCS or pIRS, for that matter), combined with peripheral BFB such as HRV training, will affect more than single areas and single functions. Our work will always affect networks, usually through cortex-basal ganglia-cortex connections. It is even possible that the specific tasks we ask the patient to do during the feedback, such as reading or listening tasks, may influence which of a number of networks are stimulated.

**Conclusion**

For treatment, there now exists an array of neuromodulation tools. When and how we can best use the various combinations of neurofeedback, biofeedback, evoked potentials, z-score training, LORETA neurofeedback, (tDCS), balance board assessments and training, virtual reality, HRV training, sound and light entrainment (AVE), SAMONAS sound therapy, LENS, cranial electrical stimulation CES, pIR, HEG, advanced blood and urine analysis, medication, education, counseling, and other available methodologies can only be determined by extensive research. Until more is published on newer techniques and combined interventions, our experience suggests that practitioners can still begin to do excellent work with quite basic single channel EEG assessments (with 19 channel QEEG and ERP being used in more complex cases). Single channel training combined with basic biofeedback, especially HRV, may often be best.

Two last notes of caution, however: First, by focusing initially on training appropriate networks you should avoid the risk of incorrectly downtraining unpredicted positive compensatory mechanisms, or of training down activity at sites that involve specific high
functioning behaviors. Training at a single location can often have an effect on many symptoms due to the influence the training has not only on the structure beneath the site (such as the anterior cingulate when you train at Fz or Cz) but on the entire network(s), of which that site is a part. And, second, when you move to other sites not over the CMS be sure you understand the functional neuroanatomy underlying that site (such as Wernicke’s area relating to dyslexia) and can correlate the site with the presenting symptoms of your patient.

We hypothesize that the approach of using NFB plus BFB & strategy training with sufficient sessions (at least 40) and careful monitoring of changes at a central location is the reason we achieved excellent results early on at our centre, as reported in our 1995 presentation, Exceptional Results in Exceptional Children Thompson & Thompson, 1995, and why we continue with that basic approach, augmented with some newer techniques, today.

Biographies

Michael Thompson, MD

Michael Thompson, MD devotes his time to the administration of the Biofeedback Institute and to teaching. When formerly practicing medicine he was Associate Professor and head of post-graduate education in Psychiatry, University of Western Ontario, examiner for the Royal College of Physicians (Canada) and chairman of their examinations committee in psychiatry. Numerous professional publications include A Resident’s Guide to Psychiatric Education. While Associate Professor; University of Toronto, he was psychiatric consultant to The Hospital for Sick Children’s neurology department.


Lynda Thompson, PhD

Lynda Thompson, PhD is a Psychologist who has done teaching, clinical psychology, school psychology and owned learning centers. She became Executive Director of The ADD Centre in Toronto in 1993 after discovering the world of neurofeedback and deciding to specialize in that intervention. Her doctoral dissertation (1979) dealt with hyperactive children treated with methylphenidate. She is co-author with William Sears of The A.D.D. Book: New Understandings, New Approaches to Parenting Your Child.

James W.G. Thompson, PhD, BCN

Dr. James Thompson holds a both a Masters and Doctorate degree in Kinesiology (specializing in sports related brain injury and electrophysiology, Pennsylvania State University) and a B.Sc. in Human Kinetics (athletic training & rehabilitation) and a minor in Business and Marketing (University of British Columbia). While practicing in Canada he was a Certified Kinesiologist with the Canadian Kinesiology Association. He has been certified in electroencephalography (EEG) since 2002, is Board Certified in Neurofeedback, and is an Associate Fellow of the Biofeedback Certification Institute of America.

Dr. Thompson specializes in the use of Neurological and Physiological testing and training techniques. His doctorate studies focused on neural assessment metrics of brain injury using electrophysiological measures. Dr. Thompson has specialized in the field of neural functioning for over a decade. Dr. Thompson is a leader in the field of technological developments and clinical applications of assessment of brain injury. Dr. Thompson is the Chief Science Officer of DJ Technologies, a company specializing the development and deployment of functional biometric assessment and rehabilitation equipment. Dr. Thompson was formerly the Director of Brain Injury Research Programmes at the International Brain Research Foundation and the Neurophysiology Program Director at the Comprehensive Neuroscience Center in New Jersey. Dr. Thompson has worked with many high level athletes including the Penn State Football, Rugby and Hockey programs, Canadian Junior Alpine Ski Team and consultation to the scientific coordinator of the UFEA (Union of European Football Associations) 2007 League Champions, AC Milan, and to the Sport Science team at Chelsea Football Club in London, England. Dr. Thompson holds level 4 technical coach certification in sailing and level 3 in alpine skiing.

Dr. Thompson has been an invited speaker at international conferences in the United States, Canada, Mexico and Europe, has published multiple articles and book chapters in the areas of EEG, Traumatic Brain Injury, Sports Related Concussions, and Peak Performance & biofeedback, and is considered one of the top experts in the world in the specialized field of electrophysiological assessment and training.

David Hagedorn, PhD, BCN

David Hagedorn, PhD, BCN has worked in various clinical and private practice settings for 20 years and is currently a neuroscience and mental health consultant for U.S. Navy Family Medicine Practice Residents. He is president of DJ Technologies, Inc., an Associate Professor for the U.S. Military Medical School, Uniformed Services University of the Health Sciences and serves as an international neuroscience and biofeedback research consultant and instructor. Dr. Hagedorn consults with several military and civilian traumatic brain injury and post traumatic stress research and treatment facilities.

References:


Beware of his false knowledge:  
It is more dangerous than ignorance  
—GB Shaw (1856-1950)

In science we have to decide how best to measure a phenomenon. We can easily sample a phenomenon too tightly or too loosely. One of our goals in science is to figure out how to measure a phenomenon so it best captures its nature, allowing maximal analysis and communication of results. Let me explain with an example.

Suppose we want to estimate the number of people who are baseball fans and we make our sample very tight chronologically. We measure a single day or even at a single game and those who attended the game or attended any baseball game during this day are considered baseball fans and those who did not are considered non-fans. Obviously this is too tight a sample by most people’s standards. However if we loosen our definition and consider anyone who has ever attended a major league game a fan, or anyone in the greater Boston metropolitan area, we include many people who do not consider themselves fans. Too tight or too loose a definition or measurement makes for unreliable data, even nonsensical. So we often want to measure the middle ground of a definition, and this is how I developed the Brodmann montage, in light of well-known structural and functional variability across people.

Our hands are designed for grasping and our feet for motion and balance; a member of an alien species could discern the role and actions of our hands and feet from a cadaver, without ever seeing a person take a step. Different structures allow different functions, and this is true for the brain on many scales. Korbinian Brodmann (1868-1918), a pioneer and synthesizer of neuroanatomy, divided the human neocortex into areas much as other neuroanatomists divided the brain stem and limbic system into functional systems based on structural commonalities and differences, and his divisions have stayed with us for more than a century (Brodmann, 1905; 1909).

The human brain is a functional and structural mosaic at multiple scales of size and Brodmann was interested in the cerebral cortex in particular. He subdivided the cortex on features such as the presence or absence of cellular layers in the cortex and the distributions of Betz, stellate, granular, and other cell types. Using cytoarchitectural criteria he identified 52 areas in monkey and 47 in human brains (Brodmann 1909) (see Table 1). His divisions were initially criticized by other experts in the field, as other anatomists focused on myelination patterns (Vogt & Vogt, 1919) and other features (von Economo & Koskinas, 1925; von Bonin & Bailey, 1925) but Brodmann’s designations have stood the test of time, despite the fact that the pattern of convolutions varies considerably from one individual to the next and the irregularity and variability of these convolutions pose major challenges in analyzing neuroimaging data including source EEG. We can model current distribution within the human cortex from scalp potentials using a variety of promising...
source solutions, also called inverse solutions, known by a variety of acronyms including VARETA, LAURA, MUSIC, BESA, with the most popular being LORETA. To this list I add the Brodmann montage, a solution based on different assumptions.

In addition to anatomical designations based on gyri and sulci, the ridges and folds of the brain, we can also impose a 3-dimensional coordinate system that relates all points within the brain to an arbitrary axis, plane, or point in space. The Talairach (Talairach & Tournoux, 1988) and Montreal Neurological Institute (MNI) (Collins, 1994) coordinate systems are two popular approaches, measuring all action points in the brain in terms of their distance from the midline of the anterior commissure, an arbitrary point to start our measurements, point (0,0,0) in 3-dimensional (xyz) space. Stereotaxic coordinates for an ideal head (x,y,z-space e.g., Talairach or MNI) can greatly aid our investigations, but we need to be aware how functional and structural heterogeneity is the rule across humans and other higher species, not homogeneity.Akin to the Heisenberg principle, the tighter we localize higher species, not homogeneity is the rule across humans and other higher species, not homogeneity.

We’ve been aware of individual differences in “localization” of brain function ever since this paradigm emerged (Bouillaud, 1825, Broca, 1865). Because of this functional variability, functional correspondence across individuals is uncertain at the level of mm-diameter voxels, and probably even at the level of cm-diameter voxels. Rajkowski and Goldman-Rakic (1995) were early to characterize the considerable variability of Brodmann areas across individuals. They focused on BA 9 and 46 in 7 human left hemispheres and they argued that inconsistency in functional neuroimaging findings across studies may likely be due to morphological variability -- e.g., an effect reported in area 9 based on Talairach coordinates in one individual was as likely to be in areas 45 or 46 in another individual. They also suggested that the variability of classical maps of Brodmann (1905), von Economo and Koskinas (1925), and Sarkissov (Sarkissov, Filimonoff, Kononowa, Preobraschenskaja, & Kukuew, 1955) may have been due to normal variation among the brains they analyzed, a reconciliation of brain atlases not widely recognized.

A histological evaluation by Fischl et al (2008) revealed that association cortex (higher order cortical areas) exhibits more variability than primary and secondary areas across individuals. For instance, primary visual cortex (BA 17) was determined to be the most predictable of all areas, with a mere 2.7mm median variability in boundary location across individuals. Primary motor areas(i.e., BA 2 and 4) showed slightly more variation, a median of 3.7mm uncertainty on surface-based coordinates, whereas areas 44 and 45 showed twice the inter-individual variability of the motor areas, and three times that of the primary visual cortex, up to 9mm median uncertainty, with the greatest variability in the right hemisphere.

Neuroanatomical variation is substantial between healthy individuals (Kennedy, Lange, Makris, Bates, Meyer, et al, 1998; Thompson, Schwartz, Lin, Khan & Toga, 1996), even in identical twins (Thompson, Cannon, Narr, van Erp, Poutanen, et al, 2001). For example, everyone possesses Heschl’s
I’m pleased to see there has been some movement towards the integration of peripheral measures with neurofeedback training and assessment. Last year, out of personal revelations, I created the “Are You Only Looking at the Tip of the Iceberg” ad, where I urged you to not only look at EEG, but to at least observe changes in peripheral measures, such as SC, fingertip temperature, heart rate, and heart rate variability and respiration. Even though this sounds like some additional work, in the over 150 sessions I personally did with Dr. Ray Pavlov, setup took less than five minutes. Pavlov reported,

“In 2001, I started using Thought Technology’s Infiniti products to add simultaneous multi-monitoring and training to neurofeedback. I discovered I could clearly see if clients try too hard to accomplish a task, since they usually produce changes in other physiological signals. These changes often include a rise in SC, SEMG, heart rate or respiration and a drop in peripheral temperature. Now I always have my clients observe and/or train all parameters. It is part of my permanent arsenal, since it has led to faster training and client satisfaction.”

I can attest to the power of having one or more of these signals available. When I initially trained to enhance the SMR/theta ratio, I found I was gradually succeeding, but felt stressed at the end of the sessions. When we reviewed one session with the added peripheral measures, it was clear I was breathing too quickly (14 breaths/min) and had activated sympathetic arousal, evidenced by decreasing fingertip temperature and increasing SC and heart rate over the 5-minute training trial. With the added peripheral measures visible on the training screen, the SMR/theta training task became much easier, as I kept my breath in the range of 6-8 breaths/min and my SC, HR and temperature readings stable. Even if you don’t use the peripheral measures to provide feedback, I’m certain you will reap benefits by observing what covaries when clients succeed or fail. It might even turn out that much of this super low frequency training is primarily due to changes in sympathetic arousal. I would certainly like to see this studied.

Hal Myers, PhD

**BCIA Mailbag**

*Fred Shaffer, PhD, BCIA Chair*

**Why does BCIA feel it is important to promote certification standards outside of the US?**

There is a growing interest in biofeedback and neurofeedback internationally. Some of the best research is coming from outside our borders. BCIA certification is one way to standardize proficiency to use the modality, gaining respect from the entire health care field.

**How are the exams performing among people where English is not their first language?**

BCIA is delighted to report a high level of success in our exams outside of the US, and in fact, they often meet or exceed the North American pass rate. Our international partners have well-developed education and training programs that promote hard work and mastery of the scientific foundations of biofeedback and neurofeedback.

**Why has BCIA recently taken a stronger interest in ethics education?**

With our field gaining so much attention, we realize that it is important for our certificants to uphold rigorous standards that would be acceptable across all health care guidelines. Because biofeedback and neurofeedback are used across so many different professions, there isn’t one common board to set policy and address concerns. Practitioners must first answer to their state licensing boards and their national professional organizations. It is our goal to uphold the highest standards to protect the consumer and elevate the field.

I am required to complete ethics hours to maintain my professional license. May I use those hours to complete the 3-hour CE requirement?

Yes, you may and you should. Your licensing body plays a stronger role in the regulation of your professional standards; therefore, course work sponsored by them would be an important educational tool. You may also read three ethics articles that are listed on our website and then complete online quizzes to satisfy our ethics CE requirement for a nominal fee. Go to the Certificants menu, select Recertification, and then choose How Can I Earn Continuing Education Credits By Reading Articles?

**Why do some BCIA-certified professionals have more information listed with their name from the Find a Practitioner directory at www.bcia.org?**

We encourage all BCIA-certified professionals to update their profiles to provide more detailed information. Go to the Certificants menu, select Market Your Practice, and then choose Update Your Professional Listing. Think of this listing as a free Yellow Pages advertisement for your practice.

**I know that we are encouraged to use BCB, BCN or BCB-PMD after our names to signify our board certification. But, what if I want to continue to use BCIA?**

We encourage everybody to consider the best way to educate people who will be seeing your credentials. If you have room for it, please do add text that includes the Biofeedback Certification International Alliance (BCIA). We urge you to search in all the places where your name is listed and to update the credential to include BCB, BCN, or BCB-PMD. This includes, but is not limited to, any website listings, presentations, memberships, or publications.

**How do I teach my clients about this new credential?**

As always, we encourage you to spend a little time during the initial intake letting new clients know who you are professionally and including information about your certification. This could be a great promotional tool as well by adding a line that says “I am the only BCIA-certified professional in this area” as is appropriate. Many clients may be too embarrassed to ask you to explain what these letters mean. This is also a good opportunity to explain any of the other professional designations you may list. Don’t assume that clients know what all of those letters mean!

**May I use the logo on my website or my business card?**

Yes. We encourage you to use the logo on all professional correspondence as is appropriate with the Logo Usage Guidelines posted at www.bcia.org.

**May I link to my website from www.bcia.org?**

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Signal quality is key! Working with microvolt level physiological signals means that great care must be taken to ensure effective artifact reduction and rejection. NeXus uses proprietary carbon technology to its own digital amplifier is in combination with active noise cancelation technology. Instead of "hiding" noise and artifacts with a classic filter, we simply measure the external noise existadnt. Not unlike those smart headphones you see people using in noisy airplanes. Cleaner signals, less artifacts.

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If the NeXus, metaphorically speaking, was a 2D+3D+megapixel digital camera, what about the lens quality? Having lots of megapixels with a poor lens, won't get you very far. This is why the NeXus engineers spent a lot of R&D on the sensors and carbon technology. It is also the reason why we use heavy duty, brushed metal connectors that lock in less worry about poor contact. Better pins or connectors breaking where someone inadvertently "picks" a cable.

BETTER RESOLUTION: 24 BIT ULTRA HIGH PRECISION
In a digital world, resolution is everything. When you buy a digital camera, no sensor can do anything with less than 10 megapixels. A two megapixel camera would show pixelated, blurry images. You could zoom in or zoom out but at any down. The same principle applies to physiological signals. In our opinion systems with less than 32 bit AD resolution are simply outdated. NeXus uses 26 bit technology, resulting in ultra high resolution and a huge dynamic range.

ULTRA WIDE BAND AMPLIFIERS: MORE COST EFFECTIVE
Because of its unique amplifier design and carbon technology, you can now get better signals, you save money! For the typical price of a single (1) channel active sensor, the NeXus DC-EEG sensor gives you 2 channels of EEG, or DC-EEG, sEMG, ECG, EOG or a combination. When you take sensor price into account, you will be amazed about how cost effective NeXus is!

DIGITAL SENSORS: BETTER INTERFACING, MORE CHANNELS
There are digital times and MedMedia is proud to introduce the new series of NeXus digital sensors as an industry first. Digital sensors have a multi-channel design and extend your NeXus with 3 to 16 channels of physiological using a single connector. They provide asynchronous, real-time recording. NeXus is a clinician or a researcher, the digital sensor will have something in store for you.

BETTER CONNECTIVITY: WIRELESS DESIGN
We believe that having only a cable connection to your PC can be limiting. That is why the Mark II, like its predecessor, comes with built-in Bluetooth. It is a fully embedded system that can work stand-alone and store sessions on SD flash memory for more than 24 hours. In addition we added a USB 2.0 access line for those of you wanting higher sample rates.

MORE POWER: LITHIUM POLYMER TECHNOLOGY
Because only the best is good enough, MedMedia integrated a state of the art Lithium-Polymer battery pack into the Mark II, offering over 24 hours of operation in a single charge. A built-in supercapacitor buffers the power, while you switch battery packs for uninterrupted recording. No wait that smart!

BETTER SOFTWARE, MORE FLEXIBILITY AND EASE OF USE
The BioTrace+ software offers unmatchable versatility for clinicians and researchers for recording, data processing and report generation, allowing you to incorporate high level tasks without having to learn that it is easier than ever to get started with NeXus! Our easy point-and-click BioFeedback and NeuroFeedback protocol suites are included in the standard price. BioTrace+ software updates are free.

THE NEUXUS-10 MARK II is a family of systems
NeXus** was introduced in 2004 and now consists of a series of NeXus digital systems with tens of systems in the market and many leading universities and clinics using NeXus, either as a stand-alone system or as a (wireless) 21 channel digital EEG system with GEEs export and real time neuromapping. Its sensors are compatible with NeXus-10.

** NeXus is manufactured in an ISO 13485 certified facility (TMSI BV, Netherlands), FDA registered and certified as a medical CE class IIa for the EU. More NeXus systems from 4 to 32 channels. With thousands of systems in use around the world, NeXus is the market leader in an industry that is one of the fastest growing areas of research. It provides a broad range of digital sensors are compatible with NeXus-10. It is also a (wireless) 21 channel digital EEG system with GEEs export and real time neuromapping. Its sensors are compatible with NeXus-10.

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THE NEXUS-10 MARK II
THE ULTIMATE NEURO AND BIOFEEDBACK PLATFORM

BETTER DESIGN: BETTER CONSTRUCTION
The new design of the NeXus-10 Mark II does not just impact the outside. Its cutting edge electronics inside and its study mechanical design make it one of the most reliable Bio- and Neurofeedback platforms ever created for demanding users. The Mark II comes with an optimal 3 year warranty on the encoder.

BETTER SIGNALS: ACTIVE NOISE CANCELLATION
Signal quality is key! Working with microvolt level physiological signals means that great care must be taken to ensure accurate artifact reduction and rejection. NeXus uses proprietary carbon technology to its own unique combination with active noise cancellation technology. Instead of ‘hiding’ noise and artifacts with a classic filter, we simply measure the external noise and subtract it. Not unlike those smart headphones you see people using in noisy airplanes. Cleaner signals, less artifacts.

BETTER SIGNALS: ULTRA HIGH PRECISION
In a digital world, resolution is everything. When you buy a digital camera, you don’t want no sensor to go with anything with less than 10 megapixels. A two megapixel camera would show blocky images, on any zoom or in any lighting at any time. The same principle applies to physiological signals. In our opinion systems with less than 24 bit AD resolution are simply outdated. NeXus uses 24 bit technology, resulting in ultra high resolution and a huge dynamic range.

ULTRA WIDE BAND AMPLIFIERS: MORE COST EFFECTIVE
Because of its unique amplifier design and carbon technology, you not only get better signals, you save money! The typical price of a single (18) channel sensor-set, the NeXus-10 DUAL sensor gets you 2 channels of EEG, or DC-EEG, sEMG, ECG, EOG or a combination. When you take sensor price into account, you will be amazed about 2 channels of EEG, or DC-EEG, sEMG, ECG, EOG or a combination.

DC-EEG, SCP, ERP, P300, EOG, TIOFEEDBACK, HEG, ARE, U, EMG, RSP, N, ECG HRV, AND PROFORCE

BETTER SENSORS, BETTER CONNECTORS MORE RELIABILITY
If the NeXus, metabolically speaking, was a 2D+ megapixel digital camera, what about the lens quality? Having lots of megapixels with a poor lens, won’t get you very far! This is why the NeXus engineers spent a lot of R&D on the sensors and carbon technology. It is also the reason why we use heavy-duty brushless metal connectors that lock in, less worry about poor contact, bent pins or connectors breaking where someone inadvertently ‘picks’ a cable.

BETTER SOFTWARE: MORE FLEXIBILITY AND EASE OF USE
The BiTrace software offers unmatched versatility for clinicians and researchers. If flexible feedback and frequency settings, easy configurations, programmable data processing and graphical display sound rather daunting, then you may be interested to know that it is easier than ever to get started with NeXus! Our easy point-and-click Biofeedback and Neurofeedback protocol suites are included in the standard price. BiTrace software updates are free.

NEXUS IS A FAMILY OF SYSTEMS
NeXus was introduced in 2004 and now consists of a series of NeXus digital systems as an industry first. Digital sensors have a multi-channel design and extend your NeXus with 1 to 16 channels of physiology using a single connector. They provide a series of NeXus digital sensors as an industry first. Digital sensors are compatible with NeXus-10.

MIND MEDIA
MIND MEDIA is a family of companies that design, manufacture and market EEG-based, Neuro and Biofeedback systems. Our product line includes the NeXus digital systems, digital EEG sensors, BioTrace+ software, and Neuro- and Biofeedback functions, including a (wireless) 21 channel digital EEG system with QEEG export and real-time neuromapping. NeXus is a registered trademark of NeXus-10. Digital sensors are compatible with NeXus-10.

MORE POWER: LITHIUM POLYMER TECHNOLOGY
Because only the best is good enough, Mind Media integrated a state of the art Lithium-Polymer battery pack into the Mark II, offering over 24 hours of operation in a single charge. A built-in supercapacitor buffers the power, while you switch battery packs for uninterrupted recording. Now isn’t that smart?

NEXUS IS MANUFACTURED IN A ISO 13485 CERTIFIED FACILITY (TMSI BV, NETHERLANDS)
** NeXus** was introduced in 2004 and now consists of a series of NeXus digital systems as an industry first. Digital sensors have a multi-channel design and extend your NeXus with 1 to 16 channels of physiology using a single connector. They provide a series of NeXus digital sensors as an industry first. Digital sensors are compatible with NeXus-10.

DUAL CONN. 2-CH. DUAL-EOG, NE2000, NE8000, NE1000, NE8000+TIOFEEDBACK, TIOFEEDBACK, ECG HRV, BLOOD PRESSURE, ACCEL, EMG, RSP, N, ECG HRV, AND PROFORCE.
We are proud to present

The Nexus-10 Mark II

The Ultimate Neuro and Biofeedback Platform

Better design: Better construction

The new design of the NeXus-10 Mark II does not just impact the outside. Its cutting edge electronics inside and a fully mechanical design make it one of the most reliable Bio- and Neurofeedback platforms ever created for demanding users. The Mark II comes with an optimal 3 year warranty on the encoder.

Better signals: Active noise cancelation

Signal quality is key. Working with micro level physiological signals means that great care must be taken to ensure effective artifact reduction and rejection. NeXus uses proprietary carbon technology in its design. This sensor is compatible with active noise cancellation technology instead of hiding noise and artifacts with a classic filter. We simply measure the external noise and subtract it. Not unlike those smart headphones you see people using in noisy airplanes. Cleaner signals, less artifacts.

Better resolution: 24 bit ultra high precision

In a digital world, resolution is everything. When you buy a digital camera, no sensor is going to give you anything with less than 10 megapixels. A two megapixel camera would show pixelated, blurry images on your screen no matter how you zoom in or start looking at it up close. The same principle applies to physiological signals. In our opinion systems with less than 32 bit AD resolution are simply outdated. NeXus uses 24 bit technology, resulting in ultra high resolution and a huge dynamic range.

Better ultra wide band amplifiers: More cost effective

Because of its unique amplifier design and carbon technology, you not only get better signals, you save money. For the typical case of a single (1) channel active sensor, the NeXus ES5D sensor gives you 2 channels of EEG, or DC-EEG, EOG, ECG, EDS or a combination. When you take sensor price into account, you will be amazed about how cost effective NeXus is!

Digital sensors: Better interfacing, more channels

There are digital times and Mind Media is proud to introduce the new series of NeXus digital sensors as an industry first. Digital sensors have a multi-channel design and extend your Nexus with 3 to 16 channels of physiology using a single connector. They provide access for precise event recording, P300 reaction time measurement, oxygen saturation, multi-axis acceleration and more. Whether you are a clinician or a researcher, the digital sensor will have something in store for you.

Better connectivity: Wireless design

We believe that having only a cable connection to your PC can be limiting. That is why the Mark II, like its predecessor, comes with built-in Bluetooth. It is a fully ambulatory system that can work stand-alone and store sessions on SD flash memory for more than 24 hours. In addition we added a USB 2.0 wired link for those of you wanting higher sample rates.

Better Power: Lithium Polymer Technology

Because only the best is good enough, Mind Media integrated a state of the art Lithium-Polymer battery pack into the Mark II, offering over 10 hours of operation on a single charge. A built-in supercapacitor buffers the power, while you switch battery packs for unattended recording. Now isn’t that smart?

Better software: More flexibility and ease of use

The BioTrace software offers unmatched versatility for clinicians and unattended power for researchers. If flexible feedback and frequency settings, easy configurations, programmable data processing and on-the-fly display sound rather daunting, then you may be interested to know that it is easier than ever to get started with NeXus! Our easy point-and-click Biofeedback and Neurofeedback protocol suites are included in the standard price. BioTrace software updates are free.

Nexus is a family of systems

NeXus® was introduced in 2004, and now consists of a series of digital EEG systems spanning from 2 to 16 channels. Our top-of-the-line Neurotronics 21-225-ER has 21 channels of physiology using a single connector. It runs on the 32-bit Windows operating system. There is also a Jontronics 21 channel digital EEG system with GEEs export and real time neuromapping, its sensors are compatible with NeXus-10. NeXus® is manufactured in an ISO 13485 certified facility (TMSI BV, Netherlands), FDA registered and certified as a medical CE class IIa for the EU. **NeXus® was introduced in 2004.**
ABOUT MIND MEDIA

Ever since its foundation (Netherlands, 1992), Mind Media has been creating leading edge products for Psychophysiology, Neuroscience, Biofeedback and Neurofeedback. After the launch of the revolutionary NeXus-10 in 2004, NeXus quickly became recognized as the best Biofeedback and Neurofeedback technology in the world, setting new standards for others to follow. The products of Mind Media are now used worldwide and distributed through a network of resellers in over 50 countries.

If you are interested in the new NeXus-10 Mark II (available spring 2011) or in our limited time competitive upgrade program, then feel free to contact us, or one of our resellers. We’ll be happy to help you.

ABOUT STENS CORPORATION

The Stens Corporation, incorporated in 1976, is internationally recognized as the #1 provider of Biofeedback and Neurofeedback training in the United States, Canada, and abroad. Over the past 31 years Stens has trained and introduced more than 14,000 new people into our industry! President and C.E.O., Stephen Stern, was honored with the AAPB Presidential Award in 2005 for his role in fostering the growth of the Biofeedback/Neurofeedback industry over the past 31 decades. Stens is proud of its excellent reputation of providing service and carrying the finest systems available. We are extremely proud to be the exclusive distributor of the NeXus for the U.S. & Canada; truly the finest system that is out there. The products of Mind Media are now used worldwide and distributed through a network of resellers in over 50 countries.

It seems that from electronics today, like professional audio-systems, digital cameras, camcorders or televisions. It is time for a change.

Why on Earth would you settle for anything less?
PLUG INTO THE FUTURE WITH THE

NEXUS-10
MARK II

...AND EXPERIENCE WHY NEXUS IS THE ULTIMATE BIO- AND NEUROFEEDBACK PLATFORM!
gyrus as part of our primary auditory cortex, but the geometry and size varies considerably across individuals (Rademacher, Morosan, Schormann, Schleicher, Werner, et al., 2001), a variability observed in every cortical region studied so far (Ono, Kubik & Abernathey, 1990; Amunts, Malikovic, Mohlberg, Schormann & Zilles, 2000). Folding and functional differences also vary by a factor of two or more between individuals in terms of BA size, shape, and location (Van Essen, Drury, Dickson, Harwell, Hanlon, & Anderson, 2001).

Morphological variability plays a more minor role in compact or symmetrical BAs, but it can be devastating in how we interpret activation patterns in elongated BAs such as BA 4 (Fischl et al., 2008). Gender and age differences also factor in when it comes to structural variability. In a small study of brain area volume, 4 of 5 males had comparable BA 45 volume in the left and right hemisphere but all the women (5 of 5) had a larger BA 45 in the left hemisphere (Uylings Rajkowska, Sanz-Arigita, Amunts & Zilles., 2006). Age-based neuron loss can also alter BA boundaries with time (e.g., Simic, Bexheti, Kelovic, Kos, Grbic, Hof & Kostovic, 2005).

The Brodmann montage was developed with these limitations in mind, in an attempt to be as accurate as possible for use in normative EEG assessment, neuropsychology applications, and neurotherapy (Kaiser, 2007). The Brodmann montage is an advance on the spherical harmonic expansion model of energy distribution (Pascual-Marqui et al., 1988), a weighted-average solution, which itself was an advance over the original two-dimension (or infinitely-distant source) Laplacian model (Hjorth, 1975; 1980). If humans exhibited no structural or functional variability across individuals, we could cut up the brain into an infinite number of voxels and accurately resolve functional activity in all individuals, but this is not the case. The cortex folds and unfolds differently across individuals and it exhibits amazing diversity of structure and function for the same brain areas across individuals, ranging from reverse dominance (speech motor centers in the right hemisphere), differences associated with handedness, gender, age, maturation, history of injury, and other factors. Accordingly the Brodmann montage has only 55 sources or mega-voxels unlike the thousands of other solutions so as to improve the reliability of each source estimation.

Most EEG source solutions are isomorphic, cutting the brain into equally-sized volumes (voxels) evenly distributed across the cortex. For instance LORETA (low-resolution EEG tomography) relies on 2,394 relatively evenly-spaced voxels. But the Brodmann montage compensates for individual variability by leveraging what we know about brain organization. It is a heteromorphic solution, dividing the cortex along cytoarchitectural distinctions. Each source is positioned in the center of gravity of a Brodmann area instead of in relation to an artificial grid or coordinate systems. Not every BA is included the solution; only those Brodmann areas of sufficient size and proximity to the scalp were selected, amounting to 94% of the neocortex. This limits the possibility of EEG activity being inaccurately assigned to other BA areas due...
Brodmann
continued from page 21

to structural and functional variance. In fact I am not the first to caution
investigators about dividing the brain too finely and arbitrarily. Uylings
and colleagues (2005) argued that a specification of Brodmann areas via
the Talairach atlas is ill-advised given the large interindividual differences
in 3-D location of primary visual cortex as well as heteromodal associational
areas (prefrontal cortex), even after correction for differences in
brain size and shape.

This center-point approach of the Brodmann montage also addresses
the issue of electrical source orientation. Cortical tissue contours in
every direction and nearly 70% of all human cortex is buried in sulci (Van
Essen & Drury, 1997). Scalp electrodes are limited to measuring those
electrical potentials projecting towards the scalp (as opposed to parallel to
the scalp). Given the many folds of the brain, we can see how little of the
cortex actually contributes significantly to surface EEG signals. With this
knowledge, it seems prudent to limit our number of potential sources, as
the Brodmann montage does.

Table 1
BA names are locations, prominent cell types in the area, or both.

<table>
<thead>
<tr>
<th>Area</th>
<th>LEFT</th>
<th>RIGHT</th>
<th>HEMISPHERE</th>
</tr>
</thead>
<tbody>
<tr>
<td>po1</td>
<td>C3</td>
<td>C4</td>
<td></td>
</tr>
<tr>
<td>po2</td>
<td>C3</td>
<td>C4</td>
<td></td>
</tr>
<tr>
<td>po3</td>
<td>C3</td>
<td>C4</td>
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</tr>
<tr>
<td>po4</td>
<td>C3</td>
<td>C4</td>
<td></td>
</tr>
<tr>
<td>po5</td>
<td>C1</td>
<td>C2</td>
<td></td>
</tr>
<tr>
<td>po6</td>
<td>FC3</td>
<td>FC4</td>
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<tr>
<td>po7</td>
<td>P1</td>
<td>P2</td>
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</tr>
<tr>
<td>po8</td>
<td>F1</td>
<td>F2</td>
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</tr>
<tr>
<td>po9</td>
<td>AF3</td>
<td>AF4</td>
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<tr>
<td>po10</td>
<td>FP1</td>
<td>FP2</td>
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<tr>
<td>po11</td>
<td>AF7</td>
<td>FPz</td>
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<td>O2</td>
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<tr>
<td>po13</td>
<td>O1</td>
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<tr>
<td>po14</td>
<td>P07</td>
<td>P04</td>
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</tr>
<tr>
<td>po15</td>
<td>FT9</td>
<td>FT10</td>
<td></td>
</tr>
</tbody>
</table>

Table 2
Closest 10-10 Electrode position to the center of each Brodmann area in the
Brodmann montage

<table>
<thead>
<tr>
<th>Area</th>
<th>LEFT</th>
<th>RIGHT</th>
<th>HEMISPHERE</th>
</tr>
</thead>
<tbody>
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<td>T8</td>
<td></td>
</tr>
<tr>
<td>po2</td>
<td>T7</td>
<td>T8</td>
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<tr>
<td>po3</td>
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<td>po4</td>
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<tr>
<td>po5</td>
<td>Pz</td>
<td>Pz</td>
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<td>po6</td>
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<tr>
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<td>FT9</td>
<td>FT10</td>
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<td>P5</td>
<td>P6</td>
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<td>T8</td>
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<tr>
<td>po14</td>
<td>T7</td>
<td>T8</td>
<td></td>
</tr>
</tbody>
</table>

An analysis of the geometry and functional organization of the human neocortex reveals a total surface area of 1570 square
cm with an average spatial uncertainty for activation sources of
1 cm (Van Essen & Drury, 1997). Divide 2,394 voxels into 1570
square cm and we find ourselves within the error range (1 cm) of our
localization technique and in need of smoothing to minimize the
possibilities of false source estimations. This is not to say that
LORETA and similar inverse solutions are not exceedingly useful,
as 367 current publications in Medline attest to, but that we may
develop a false confidence in their accuracy, especially in terms of
their voxel-BA correspondences.

Table 3
Closest Brodmann area to each 10-10 electrode

<table>
<thead>
<tr>
<th>ELECTRODE SITE</th>
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<th>RIGHT</th>
<th>HEMISPHERE</th>
</tr>
</thead>
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<td>ba06L</td>
<td></td>
</tr>
<tr>
<td>CP2</td>
<td>ba08L</td>
<td>ba09L</td>
<td></td>
</tr>
<tr>
<td>CP3</td>
<td>ba11L</td>
<td>ba12L</td>
<td></td>
</tr>
<tr>
<td>CP4</td>
<td>ba14L</td>
<td>ba15L</td>
<td></td>
</tr>
<tr>
<td>CP5</td>
<td>ba18L</td>
<td>ba19L</td>
<td></td>
</tr>
<tr>
<td>CP6</td>
<td>ba22L</td>
<td>ba23L</td>
<td></td>
</tr>
<tr>
<td>CP7</td>
<td>ba26L</td>
<td>ba27L</td>
<td></td>
</tr>
</tbody>
</table>

Continued on page 36
Working with Athletes with ADHD and Autistic Spectrum Disorder (ASD)

Michael K. Linden, PhD

An estimated 15 to 20 percent of professional athletes have attention deficit-hyperactivity disorder (ADHD), compared to 4-8% of the general population of adults. Many undiagnosed athletes with Asperger’s excel at technical positions such as pitcher, goalie, surfing, running, and martial arts.

Since 2000, subtypes of AD/HD are identified with QEEG, including an over-focused type that often becomes worse with activating treatments (i.e., stimulant medication) (Chabot, 1996).

Asperger’s Syndrome is the most under-diagnosed of ASD because these individuals are very bright and articulate and can over-focus intensely on technical aspects such as goalie saves, pitching techniques, and golf swings. However, since 2004, we have utilized QEEG brain mapping patterns to confirm not only diagnoses of autism and Asperger’s but to determine specific subtypes of ASD for more individualized and successful treatments (Linden, 2004; Coben, Linden, & Meyer, 2010). We have been using QEEG-guided neurofeedback with individuals with ASD to specifically target improvements in communication, socialization, anxiety, obsessiveness, and overactive behavior.

Many athletes who have mild to moderate ADHD or autistic spectrum disorder are able to excel in sports if they find the right fit. Some individuals and athletes have both ADD/ADHD and Asperger’s. If their ADHD or Asperger’s symptoms are severe, most of them will need to be treated. However, the use of medication is not allowed in most professional sports.

What are some of the individual sport advantages of having ADHD? Some sports do not require intense concentration for long periods but rather short periods of attention (15 seconds) or short shifts as in football or hockey. Athletes with ADHD perform better in individualized or fast sports; they have quick speed and reaction time if they can control their impulsivity. Athletes with ADHD have a heightened awareness of their environment. They have the ability to do well under pressure and under chaotic situations, for example, a quarterback rolling out to avoid a rush and completing a pass across the field. Athletes with ADHD have unique and creative problem solving abilities and can make a novel play out of a problem situation. Because their impulsivity leads them to often live in the present, they also may have a lack of concern about losing at the moment.

On the other hand, sometimes athletes with ADHD will need to be referred to a sport psychologist who is experienced with ADHD. An athlete may be performing inconsistently or be streaky. They may perform well in practice but not in games, or be bored or unmotivated in practices. They have breakdowns in concentration, such as taking their eyes off the ball, and may be forgetful (e.g., outs, plays, time outs remaining). Athletes with ADHD may be late to or miss practices, which can lead to conflicts with coaches and teammates. They may become easily frustrated and act impulsively, throwing equipment or getting into a fight. They often have problems going to sleep because they cannot stop their thoughts or calm down at night and may use prescription medications or drugs/alcohol to help them sleep.

Some of the advantages of having Asperger’s in sports are being able to over-focus on technical aspects, such as throwing a curveball, three-point shooting, making the perfect jump in skiing, turning in surfing, or goalie save techniques. They are able to hyper-focus on their techniques and practice for long periods of time. The most successful athletes can increase their hyper-focusing when necessary, such as a pitcher in a full pitch count or a goalie in a shootout. In addition, athletes with Asperger’s have a greater ability to stay calm in high-pressure situations and when they make a mistake, as a result of having less emotional responsibility.

Some of the reasons to refer athletes with Asperger’s or high-functioning autism to a sport psychologist who is experienced with ASD are if they have difficulty with unfair or incorrect official/referee calls. They also often have difficulty with lack of structure, such as overtime or extra innings. Athletes with Asperger’s will have difficulty socially bonding with other players and end up playing positions that are more individualized, such as goalies, relief pitchers, or field goal kickers. Finally, they may remain over-focused on techniques, even if these techniques are unsuccessful — for example, a quarterback’s or relief pitcher’s throwing motion.

Assessment of ADHD/ASD

The following steps and tests are recommended to accurately assess ADD/ADHD/ASD. For additional information, please refer to www.attentionlearningcenter.com.

1-Clinical Interview
2-Behavior Rating Scales
3-Continuous Performance Tests
4-Personality Tests (MMPI)
5-QEEG Mapping Evaluation

Professional Athletes with ADHD

MLB player with ADHD and Anxiety

Randy (name changed to protect his confidentiality) was diagnosed with ADHD and anxiety. He was prescribed the stimulant medica-

Continued on page 24
Athletes with ADHD
continued from page 19

addition Adderall but had side effects. Randy underachieved in college baseball his first few years. A QEEG map was administered, and the results indicated high theta (daydreaming, ADHD) and high beta (anxiety) (Figure 1). Randy was trained using QEEG guided neurofeedback to enhance SMR (lowers impulsivity and anxiety, increases relaxation) and inhibit theta (increases focus) and inhibit beta brainwaves (lowers anxiety).

Randy also was trained with HRV and GSR biofeedback to decrease anxiety and increase batting performance. Furthermore, he was trained in the use of mental skills such as visualization. As a result of Randy’s training, he became more successful in college baseball and was drafted by a MLB team.

Conclusion:
It is likely that athletes will become more open to investigating a diagnosis of ADHD or ASD as knowledge of more accurate brain functioning assessment, such as QEEG, increases and more awareness of non-drug treatments without side effects, such as neurofeedback occurs. This should create alternative options for these athletes to improve their performance and overall functioning.

This article is an excerpt from the book, Biofeedback & Neurofeedback Applications in Sports Psychology, published by the Association of Applied Psychophysiology and Biofeedback (AAPB), Wheat Ridge, Colorado. More information is available at www.aapb.org.

Many of the authors of our book train athletes using Thought Technology hardware and Infiniti software (Thought Technology, Montreal, Canada), including professional golfers, Olympic teams (Canadian Winter Olympic Skaters, Free Style and Skiers; Canadian Tennis: Indian Olympic archery), professional soccer (AC Milan), professional hockey/NHL (Vancouver Canucks), professional tennis, college teams (UCLA), Major League Baseball. Several teams have set up Mindrooms, which include up to 8 systems to train groups of athletes simultaneously. The small portable Thought Technology Procomp 2 encoder is well suited for ambulatory sport and wireless applications.

References

Michael Linden, PhD
Dr. Michael Linden is a licensed Clinical Psychologist and BCIA Certified as a senior fellow in BFB and NFB. Dr. Linden has been the director of the Attention Learning Centers and the biofeedback and neurofeedback programs at Mission Psychological Consultants in San Juan Capistrano, Irvine, and Encinitas California since 1988. He works with both athletes in general and athletes with ADD and Asperger’s using biofeedback and neurofeedback to enhance performance, increase attention and manage anxiety. He has presented on biofeedback and neurofeedback applications in sport psychology at conferences such as Winterbrain, ISNR and AAPB.

In 1990, Dr. Linden won the “Outstanding Research Award” given by the Biofeedback Society of California and in 1993, Dr. Linden & Associates were awarded the “Outstanding Research Award” from AAPB. Dr. Linden published the first randomized controlled study of neurofeedback with children with ADD in the Journal of Biofeedback and Self-Regulation in 1996; his QEEG assessment studies were published in The Journal of Neurofeedback Therapy in 1999 and in 2001. His current research on QEEG Subtypes and neurofeedback with Autistic Spectrum Disorder was published in the Journal of Applied Psychophysiology and Biofeedback in 2010.
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This review shows the first results of sLoreta-based neurofeedback (LNFB) in the clinical application in a neurofeedback practice in Switzerland. Patients who trained with 1-, 2- or 4-channel NFB using BioExplorer Software (Cyberevolution, USA) also trained with LNFB at the anterior cingulate, intraparietal sulcus (Brodmann Area 40; P4) and on Brodmann Area 6 (fronto-central).

We analyzed the efficacy of LNFB while training on the anterior cingulate (BA 32) as a region that receives inputs from several sensory areas and which therefore plays a critical role in information processing, modulation of attention, executive functions, emotional control and monitoring (error detection). In addition to BA 32 the patient with sensory integration deficit was trained at intraparietal sulcus (Brodmann Area 40) and the patient with depression at Brodmann Area 6 (fronto-central).

**Method**

A 19-channel EEG was recorded during LNFB with Mitsar (St Petersburg, Russia) and Braintrainer Software (Mitsar, St. Petersburg, Russia). Patients were watching a DVD that began jamming when feedback-criteria were not matched.

All subjects have been investigated by a QEEG at the beginning of their treatment. We compared QEEG data from the LNFB training sessions with the data from the QEEG at the beginning of the training.

**Subjects**

1. 14-year-old boy with increased frontal midline theta
2. 14-year-old boy with alpha excess in central (mu rhythms) and parietal regions
3. 57-year-old male with depression, alpha excess over whole cortex and alpha asymmetry

**Results**

**Subject #1**

14-year-old boy with increased frontal midline theta

The complained symptoms were hyperactivity, ADHD, problems with sustained attention and impulse control. The patient showed significant amount of frontal midline theta in the QEEG. He received the following trainings:

**36 sessions (1/2 hour) with conventional Neurofeedback:**

- ACC training on Fz
- Hemoencephalography (BioExplorer (Cyberevolution), Neuroamp and pIRx3 Sensor from EEGInfo, Switzerland) on Fp1/Fpz/Fp2

8 sessions with sLoreta Neurofeedback

- ACC left on -5/29/31

He was the only one of the subjects where we recorded another QEEG after the treatment.

Figure 4 (page 28) shows a significant decrease of theta activity in frontal regions. The patient reported much decreased hyperactivity, improved concentration and impulse control and no more need for treatments at the psychiatrist.

The shift is also visible in the ERP component for impulse control (figure 5):

The indicator for the improved impulse control is the P3 supF component, which shows much more activity after treatment than before.

**Subject #2**

14-year-old boy with alpha-excess in central (mu rhythms) and parietal regions.

The QEEG at the beginning of the treatment showed excessive alpha activity over central and parietal regions. The complaints of the boy were sensory integration deficit (proprioception), problems with sustained attention, hyperactivity and math problems mostly in geometry. He was medicated with 8 mg Dexam (dexamphetamine) per day. His trainings were adapted to his alpha

Continued on page 28
excess by stopping 8-12 Hz instead of 4-8 Hz in ACC protocol.

He got the following trainings:

18 sessions (1/2 hour) with conventional Neurofeedback:
- 4 channel training on C3/C4 and P3/P4 alpha stop and gamma go
- Hemoencephalography on Fp1/Fpz/Fp2

14 sessions with LORETA Neurofeedback
- ACC left on -5/29/31 with alpha stop
- Intraparietal sulcus on 39/-53/47 with alpha stop

The comparison of the QEEG file with a file recorded during a sLORETA neurofeedback session shows a significant decrease in the alpha activity in central and parietal regions. The boy reported improved proprioception and improvements in geometry. He also reported improved concentration and planning and also decreased hyperactivity. His Dexamin dose could be reduced to 2mg/day.

Subject #3
57-year-old male with depression, alpha excess over whole cortex and alpha asymmetry

The QEEG at the beginning of the therapy showed a dominance of alpha rhythms over the frontal, central and parietal regions. The patient complained of depression since 1986 with symptoms such as poor self-image, negative and unhappy, low energy level, problems with socializing, hopelessness about the future and not seeing any positives in life. His ACC training protocol in sLORETA neurofeedback was adapted to his alpha excess by stopping 8-12 Hz instead of 4-8 Hz. We also developed an individual protocol for a region in BA 6 in reference to his QEEG data that showed a significant source of his alpha activity in this region.

He got the following trainings:

36 sessions (1 hour) with conventional Neurofeedback
- ACC training on Fz
- Alpha-asymmetry training on F3/F4
- Hemoencephalography on Fp1/Fpz/Fp2

8 sessions with sLORETA Neurofeedback
- ACC left on -5/29/31 with alpha stop
- BA 6 left on -35/-15/45 with alpha stop

The comparison of the QEEG file with a file recorded during a sLORETA neurofeedback session shows a significant reduction in

Continued on page 28
his overall alpha activity, though it is still too much in comparison with the database in central regions. The patient reported much less depressive feeling, less problems with socializing, he is much more energetic and enthusiastic - he began with a theater course and with traveling. He also feels much more positive about the future and finds pleasure and enjoyment in life.

**Conclusion**

LNFB seems to be a very effective way for neurofeedback training. The training is stronger than in conventional neurofeedback, so that the training time with twice 5 minutes is long enough. The EEG patterns all showed significant changes and patients all reported improvements. Although the improvements certainly can’t be attributed only to the LNFB, patients reported much stronger improvements when we began to train them with LNFB. The additional time needed for the montage of the full cap is counterbalanced by the shorter training time. This makes LNFB practicable for clinical application.

**Biography**

Susanne Schmid-Grether, MTh, is a neurofeedback therapist and director of the Neurofeedback Center of Excellence “SCHORESCH” in Wetzikon, Switzerland that provides an own high level neurofeedback education. Susanne is also a lecturer at the “Neurofeedback-Akademie Schweiz.”

LORETA neurofeedback will work best for areas that are relatively large, for example the cingulate gyrus. We have done and published studies showing that it is possible to learn to change current density in the cingulate and that this is helpful for a variety of problems including ADHD, possibly depression, and may even be helpful in treating chronic pain. One of the areas in which people are very interested is the amygdala. The problem is that the amygdala is a relatively small region and consists of two main divisions one of which receives olfactory input and the other, the basolateral division is involved in a variety of functions. This latter division has at least eight sub nuclei, such as the central, lateral, basal and others. Back in the 1960s Birger & Kaada and Holger & Ursin published many studies and monographs showing that with stimulation of the amygdala in a variety of species an enormous number of autonomic, emotional, sexual, and repetitive responses could be elicited. These were shown to be precise to specific sub nuclei of the amygdaloid complex. At present LORETA only has a 7 mm resolution confined to 2,394 voxels. Even MRI and fMRI utilizing five and seven Tesla coils cannot get very far below 1 mm resolution, still not sufficient to target in detail the individual sub nuclei of the amygdaloid complex. Another problem is that the Talairach Atlas is based on an average of 305 MRIs and therefore mapping an individual onto that atlas can lead to errors as large as 5 mm which might actually target outside of the amygdaloid complex completely. So the question for me is what happens when you try to train activity using LORETA neurofeedback in the region of the amygdala which has so many different functions. This could be quite dangerous and should be approached with great caution.

I also have some concerns about training in the insular cortex. Dirk De Ritter pointed out that the left insular cortex is involved with parasympathetic functions and the right insular cortex with sympathetic functions. All of our internal organs are mapped within the insular cortex so it is not unreasonable that we could impact psychophysiological disorders of internal organ functions such as irritable bowel syndrome as one example. Again the resolution of LORETA is so low that it cannot target the individual regions within the insular cortex representing different organ systems with any degree of precision. Furthermore, for both the amygdaloid complex and the insular region we don’t know which frequency bands or even which individual frequencies are best to train for specific disorders. The point of all this is that we must be very cautious and training these internal structures whether we use LORETA neurofeedback or fMRI neurofeedback. My best advice would be before training these areas and patients try it on your self and note carefully what kind of experiences take place.

Joel Lubar
Tom Budzynski
1933 - 2011

We are saddened to hear that our dear friend and biofeedback luminary Thomas Budzynski has passed away. Tom was a very special person, kind, loving and gentle in spirit. His publications to the biofeedback and neurofeedback field are legend. His vision, open mindedness and belief in human potential energized the fields of biofeedback and neurofeedback for many decades. Tom’s insistence in scientific validation for our industry has helped create a firm foundation for those following in his footsteps with similar vision.

Tom was also extremely supportive of others contributing to the field and helped elevate their contributions. We send our heartfelt love, thoughts and prayers to his wife, life and work partner — Helen, “the love of my life” as he so often proudly stated.... We will all deeply miss him... Terri and Tom Collura

Judith and I were very saddened hearing that Tom had passed away. We had been good friends for more than 35 years. Tom was a kind, caring and wonderful person. He was one of our pioneers and made many significant contributions to our endeavors. Our condolences to his wife Helen. We know that Tom will be remembered by ISNR, AABP and BCO for all that he has done. We will miss him very much, Joel and Judith Lubar

I, too, am very sad to hear that Tom no longer is with us. When I first read some of his work in the 1970s I was impressed, but had no idea that twenty five or so years later I would get to know him, and he would agree to write chapters for neurofeedback-related books I edited. Then, just a couple of years ago, I was privileged to be co-editor of another book which he and Helen published. Throughout all of these associations Tom proved to be most congenial and competent. Yes, the field has lost a major figure—one of the truly great pioneers in neurofeedback. Jim Evans.

I am greatly saddened to hear of Tom’s passing. I had the honor and privilege of working with and learning from him for an all too brief time in Sarasota a few years back. We remained friends through the years and I always looked forward to seeing him and his lovely wife, Helen at annual meetings. We have lost a legend in the field but his legacy shall live on. My thoughts and prayers are with Helen. George Rozelle

We have definitely lost a warm-hearted brilliant giant in our field. He was always one of my most favorite heroes in our profession. Tom was a presenter at the first NF training I went to 11 years ago and I always so looked forward to seeing him at the conference every year. I am so very grateful to have known him and learn from him — he will be missed so very much.

Nancy Wigton

It seems like only yesterday that we all saw him. One of our great founders as passed. May he and his family and those that grieve his passing be blessed with grace and peace.

Jerry Gluck

Tom and his work touched so many. The legacy he leaves is that of a genius and made us proud to follow in his footsteps. I did not know him well but conversed with him several times, and he was always willing to share his ideas; a great human who will be missed.

Susan Diamond
1957
Tom started as an electrical engineer and helped develop the Blackbird SR-71

1960s
His “Feedback-Induced Muscle Relaxation and Activation” dissertation encouraged the development of the first analog-to-digital biofeedback system with John Picciottino

1970s
THE TWILIGHT LEARNING SYSTEM
Consciousness and Creativity
The State of Reverie
Psychology Today article:
Tuning in on the Twilight Zone

1980s
STRESS MANAGEMENT
A grant from Synetics supported development of Tom’s stress management products. Tom produced popular relaxation tapes with drumming, chanting and natural sounds. Rescripting whispering tracts to induce stress reduction further enabled effective psychotherapy. Based on Tom’s ideas, these tapes subconsciously ‘redirected’ left brain messaging to the right brain.

1990s
The Decade of the Brain
MIND TECHNOLOGIES
The “Danger” of Mind Subversion
THE BIRTH OF MODERN BIOFEEDBACK
The Power of Biofeedback and AVE

Today’s z-score training is based largely on Tom’s interests

2000s
Work with the Elderly
BRAIN BRIGHTENING:
Restoring the Aging Mind
Light/Sound Program
Work with Photic Stimulation

Work with Energy Medicine
Priming the Unconscious
CES for healing and pain management
NANOTECH PATCHES
Restorative Medicine

Cynthia Kerson and Helen Budzynski
LORETA is an abbreviation of LOw RESolution TomograPHY and is an inverse technique whose goal is to map measurements (EEG) on the 2-dimensional plain of the skull into a 3-dimensional space of sources of the EEG. To understand how this technique works we have to look at the physiology background of the EEG. The EEG is a measurement of the post synaptic potentials of the pyramidal cells in the brain, the PSPs. These potentials can be excitatory or inhibitory, respectively EPSPs and IPSPs.

A neuron at rest has a negative charge on the inside compared to the outside. This is called the resting potential; the value of this is -70 mV. The potential is stable. Due to its impenetrable nature, the ions cannot penetrate the wall without the use of normally closed ion-channels. The ions are prevented from following passively the concentration gradient. At the event of an excitatory potential, EPSP, Sodium, Na+ enters the cell through the active opening of an ion-channel. This opening can be an effect of stimulation of nearby axons or an effect of a change from the rest potential. The Sodium ion can then passively follow the concentration gradient through the cellular wall. To a lesser extent Potassium ions, K+ move out of the cell. Due to the following change of the potential other ion-channels start to open too, hence a snowball effect occurs. The electric charge will rapidly change from negative state and overshoot into a positive state. On the other side of the cell the charge will change in the opposite way, it will become more negative. This concept describes a dipole system.

In order to measure a scalp electrical signal (EEG), two conditions have to be met. The dipoles (pyramidal cells) should all have the same alignment. Otherwise the dipoles would cancel out each other’s potentials and the net to signal would be merely noise. Nature was generous in this case. All the pyramidal cells are aligned perpendicular to the cortical layers they are in. This means that from all the cortical layers that are aligned horizontal to the skull a proper signal can be measured. This is also the reason why EEG is known not to measure a signal from the gyri and sulci in the brain. For gyri and sulci MEG, magnetoencephalography, is used, since a magnetic signal has a perpendicular orientation from an electrical signal.

A second condition that has to be met is gross synchronized firing of the neurons. Only the synchronization of at least 10,000 neurons will be measurable. The frequency at which the periods of intense firing alternate with rest occurs in the range of the brain wave frequency bands we commonly as theta, alpha, etc. Realize that the firing rates of single neurons is much faster, around 1,000 Hz. It is the groupings of firing moments that make the brain rhythms appear.

With the EEG we measure the potentials on a 2 dimensional surface, which is embedded in a three dimensional space. We can think of the head as a grid of small cubes (voxels) all with their own position and electrical activity. Mathematical equations, known as the “lead field equations,” calculate how, depending on position and orientation of a potential, this is transformed. It is with a transformation matrix linked to the locations of measurement on the scalp of a person. The model used for these equations takes into account the dipole character of the neurons and other relevant properties such as conduction. All the voxels have their own contribution to the potential as measured on the scalp at each electrode site. When the equations are correct...
and we know the potentials in the voxels, we can calculate one accurate solution of this equation, this is called the forward solution. Unfortunately we have to work backward in the case of source localization of EEG. However, the scalp measurements don’t have enough information to provide a solution to the question, what is the source of this energy? The potentials and orientations can be altered in many different ways to give the same result for the scalp measurement. The amount of results is infinite.

LORETA is a technique that locates sources of the EEG energy. It makes use of the constraints/condition explained above. LORETA gives probable solutions to the backward (or inverse) problem of the EEG by setting a constraint for the solution. The constraint that is used results from the idea that it is likely that neuronal activity spreads from a source in a fluent way. Since the EEG reports synchronized firing of large groups of neurons oriented in the same way and not randomly. It is presumed, that the EEG activity is highest at the source and that it gradually declines as we go further away from it, similarly compared to a source of heat. The LORETA technique looks for the solution in which the transition of activity between the voxels is most fluent and calculates this transition. LORETA favours the equation that has the lowest total sum of transitions between voxels. Due to the density of the neurons this condition is largely, but not completely, realized by the real human brain. For example gyri and sulci activity abruptly change naturally. Also only pyramidal cell activity can be localized; the cerebellum for example doesn’t have pyramidal cells and hence there is no EEG or a possibility of source localization by LORETA. LORETA is also not so successful in locating activity of neural activity perpendicular to the skull in gyri and sulci. To plot the data in a brain, normally Talairach coordinates are used. This system uses 3 axes from which the 0(x), 0(y), 0(z) point is in the middle of the brain. The x-axis corresponds to the frontal plain, negative number corresponding to the left brain part and positive to the right brain part. The y-axis corresponds to the sagittal plane, negative number being posterior to the middle of the brain, positive numbers being anterior to it. Lastly the z-axis corresponds to the transversal plane, negative numbers being ventrally from the middle and positive numbers being dorsally from it. As a model for a brain the MNI (Montreal Neurological Institute) atlas is used that is based on MRI studies.

An enhanced version of LORETA is sLORETA, or standardized LORETA. This method is based upon the understanding that activities around a source are distributed in a noisy, Gaussian way and uncorrelated to other sources. This method has been proven to give better results and should ideally have zero error. From a clinical perspective it can be said that sLORETA gives better results, which are more in line with knowledge from psychophysiology. One of its biggest advantages is the increased sensitivity for artifacts. LORETA often locates maximal activity near the eyes, since there is almost always some EOG left even in de-artifacted EEG. sLORETA seems to be more sensitive to this, excluding it from the data.

Both LORETA and sLORETA are based on finding a transformation matrix that gives the solutions for the given data input. Calculating the matrix is a time and capacity consuming process. But once the calculations are done the LORETA and sLORETA-based transformation matrices can be used as a spatial filter, which does not take heavy resources when used with real-time data. On every datum, exactly the same transformation matrix is used. When we ascertain voxels of interest we can calculate in real-time the activity in these voxels according to the LORETA or sLORETA method. This opens the possibility for neurofeedback, based on activity in vox-
Figure 5
Source localization of frontal theta activity with LORETA at the medial frontal gyrus

Figure 6
Source-localization of alpha-activity with the use of sLORETA

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LORETA continued from page 31

Some advantages of (s)LORETA neurofeedback can be:
+ Specific training of brain regions based on measurement and/or theory.
+ Interesting research tool, what happens deep in the brain with normal or LORETA neurofeedback.
+ When several sources seem to have same activity (for example alpha), the LORETA neurofeedback will only focus on the activity from the given region.
+ Less prone to artifacts because artefacts will have another source than the region that is correctly chosen.
- Less laborious method than traditional neurofeedback that is unpleasant for client, especially for children.
- Extensive research is necessary to clarify if there is a difference in effectiveness between normal and LORETA neurofeedback.

els and hence 3-dimensional activity in the brain. Mitsar (St. Petersburg, Russia) developed software for this type of training.

Additionally, the NeuroGuide software and database (NeuroGuide, St Petersburg, Florida, USA) developed a normative database, which shows deviations from the norm in the shape of maximal negative or positive deviation (z-scores). For every voxel a distribution can be determined after being normalized to a Gaussian curve. For each frequency the maximum deviation is located, whether negative or positive. In addition to seeing the activity referenced to a normed group, the sLORETA is less prone to artefact influences. This is because also the normed group will also have a slight amount of artefacts in the EEG.

For neurofeedback we can decide to train a subcortical location based on LORETA or sLORETA. This can be the wish to train a brain region that lies deeper in the brain. An example can be theta activity from the anterior cingulate, a commonly seen pattern, and the anterior cingulate lies deep in the brain, not on the surface. The decision to train deep in the brain can be based on a finding of activity in a certain structure, based on theory of ADHD, based on the wish to train a certain structure with functionality as described in Brodmann areas, or for example around a location where there has been an infarct or trombose.

Marco Congedo was the first to develop and test LORETA neurofeedback. The method used is currently available for Deymed (Payette, USA) amplifiers. In this method a region of interest (ROI) is chosen, a method originating from MRI. A ROI is a sphere around a certain voxel with a radius that is chosen in order to allow a larger or smaller area to be trained. The radius can be adjusted within a one voxel resolution. Aside from the ROI a frequency band can be chosen, so amplitude changes of defined frequencies originating from the ROI can be trained.

LORETA neurofeedback serves good for training locations deep in the brain. Congedo (2003) trained a small group of participants in decreasing alpha activity. In only five sessions there seemed to be a decrease in activity and increased control of this alpha activity. Another explanation could be that also surface neurofeedback gives the same control and decrease, but due to blurring of the signal this cannot be measured as well as with the LORETA method.

Continued on page 36
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- Past President, Neurofeedback Division of AAPB
- President of the American Board of QEEG Technology
- Practitioner of Neurofeedback for 30 years

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sLORETA neurofeedback seems to be a very interesting tool for neurofeedback therapy. Due to the facts mentioned above till so far in our clinic sLORETA neurofeedback is only chosen as an alternative option when traditional neurofeedback isn’t satisfactory. With normal neurofeedback a considerable range of protocols can be tried, that can make a big difference in effect as all experienced neurofeedback therapists know. Some clients that tried the sLORETA neurofeedback could localize the training very accurately when asked, which may validate the method. At least one client with tinnitus experienced more effect from the sLORETA neurofeedback asked, which may validate the method. At least one client with tinnitus experienced more effect from the sLORETA neurofeedback asked, which may validate the method. At least one client with tinnitus experienced more effect from the sLORETA

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BIO:

Roland Verment received his master degree in 2005. His thesis studied nonlinear dynamics and neurofeedback at the university of Groningen in the Netherlands. From 2006 he is running Neurobics, www.neurobics.nl. Besides running the clinic he is working on a dissertation about neurofeedback.

Contact him at neurobicsgroningen@gmail.com.
QEEG / TOPOGRAPHIC BRAIN MAPS:
Generalized Anxiety Disorder Subtypes

- **High Beta Subtype**: Anxiety, Insomnia, Alcohol / Drug Abuse
  - Delta Theta Alpha Beta

- **Cingulate Dysfunction**: Anxiety, Ruminations, Obsessive Compulsive Disorder
  - 22Hz 23Hz 24Hz 25Hz

- **High Mean Frequency Beta**: Anxiety, Alcoholism, Insomnia
  - 9Hz 10Hz 11Hz 12Hz

- **High Mean Frequency Alpha**: Anxiety, Insomnia
  - 3.0 0.0 -3.0

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

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02) **EuroKa3! - Nova Tech EEG LORETA Analysis System and Adult Normative Database - Eyes Closed**

- B) Eyes Open Linked Ears Z-scores // Eyes Open Laplacian Z-scores $70.00

03) **Neuroguide - R. Thatcher Normative Database**

- A) Eyes Closed Linked Ears Z-scores // Eyes Closed Laplacian Z-Scores $70.00/each

- B) Eyes Open Linked Ears Z-scores // Eyes Open Laplacian Z-Scores $70.00/each

04) **Neurorep - W. Hudspeth QEEG Analysis System**

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- B) Eyes Open - Weighted Average, Z-scores, Magnitude, % Power, Laplacian, Average Spectrum, coherence, connectivity $70.00

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**total value: $630**
Research Foundation Workshop in Phoenix

David Trudeau, MD

During its two and a half years of existence the RF has attempted many different avenues of defining and executing its mission. After many attempts and ideas, many not fruitful at all, we have narrowed our efforts. Our focus today is twofold: 1) collaborating on projects that gather ideas and pilot data to successfully apply for governmental and non-governmental agency research grants either as a coordinating or administrating or advising agency, and 2) raising significant funding from direct and deferred gifts from ISNR members and friends of ISNR to develop grant awards and administration.

With significant funding there is a lot we can do to facilitate research. Our horizon for significant money raising is over decades, not just years. To help us all learn more about long-term fundraising the RF will sponsor a workshop at our annual conference in Phoenix that will feature Bill J. Harrison, CFRE. Bill has 34 years of fundraising experience. For seven years he was an instructor at the Arizona State University Center for Nonprofit Leadership and Management. He’s the author of the award-winning textbook, Fundraising: The Good, The Bad, and The Ugly (and how to tell the difference) and has published more than 250 articles on fundraising, management and leadership. Bill is a Certified Fund Raising Executive and a graduate of the Association of Fundraising Professionals (AFP) Executive Leadership Institute, the AFP Executive Management Institute, and the AFP Faculty Training Academy, and is the recipient of several important awards, including the 2005 Fundraising Executive of the Year Award. Over the past ten years, Bill has worked with numerous organizations including Valley Lutheran Hospital, John C. Lincoln Hospital, Blood Systems, Habitat for Humanity, Chandler Cultural Foundation, Goodwill International, and the Community Anti-Drug Coalitions of America.

Bill’s interactive workshops have proven to be successful in educating and motivating attendees. At the conclusion of the workshop, participants will not only understand fundraising programs and techniques, they will also have the tools necessary to incorporate fundraising into the organizational strategic plan. To learn more about Bill visit www.ITeachFundraising.com for more information about his educational programs.

This workshop will be open to anyone at the ISNR conference and free of charge. If you are interested in learning more about how you can help the RF achieve its long term goals this free workshop is for you.

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Research Foundation Donations Since Last Issue

Total = $3,326

Theta Level:
Vicky Jones $25
SMR Level:
Bob Gurnee (SNI) $50* (recurring donation)
Gamma Level:
Don Bars $500
Martijn Arns $1,825

Brodmann Booklet Sales:
$140
Thank you to the authors: Michael Thompson, James Thompson and Wu Wenqing

Multi-Component Treatment for PTSD Book Sales:
$531
Thank you to the author: John Carmichael

Art of Artifacting Book Sales:
$255
Thank you to the authors: Cory Hammond and Jay Gunkelman

*Set yourself up for a Recurring Donation to the ISNR Research Foundation. A convenient way to make regular contributions to further research in our field. Contact us at cynthia@isnr.org. As always, your donation is tax-deductible
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Join the Elite who Trust Thought Technology
For over 35 years, Thought Technology has been the world’s leader in Biofeedback, Neurofeedback and Peak Performance, providing the tools and training to help people learn to help themselves.

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Your biofeedback practice is not a game. You need more than just a fancy new toy. Thought Technology products have been at the heart of the biofeedback industry for over 35 years. Around the world, our Infiniti systems are advancing psychophysiology research, educating students, training heart surgeons, monitoring NASA astronauts, coaching Gold Medal athletes and even sensing an audience’s emotional responses during a Boston Symphony Orchestra concert!

More Devices to Suit Your Needs
Choose from 5 encoders with 2, 5, 8 or 10 channel options, all with BioGraph Infiniti, the world’s most powerful user-programmable software.

Connection Options for All Circumstances
In our electrically noisy environments, a fiber-optic cable connection is the most secure. We also offer Flash Memory data logging & 2 Bluetooth options:
• A small add-on module for ProComp 2 & MyoTrac3
• A high-speed long range (up to 300/100m) CF module.

Optimal Accuracy for Best Results
We design for signal quality, not for marketing specifications. Our equipment can detect and record changes in EEG, EMG and EKG as small as 0.01 microVolts (μV) with extremely low noise. A 24 bit system offers no real advantage, since tracking changes smaller than 0.01 μV is of little benefit. Our focus is on low noise, accuracy and reliability, achieved by combining stringent design with built-in sensor and encoder calibration. Each time you use your Infiniti device, you can be assured you are getting clean and accurate data.

Applying the Right Technology Where it Matters
We believe that built-in impedance checking – either prior to or during a session – will do more to guarantee the cleanest EEG & EMG signals than any other method. No peer-reviewed research publication will accept EEG studies where the impedance was not verified, so why would you use a system that doesn’t check impedance for your research or clinical work?

Minimal Artifacts & Maximal Flexibility
External active sensors provide the cleanest signals by amplifying the signal right at the measurement site to minimize electrical or movement artifacts. External sensors also allow you to connect any sensor to any channel, and as many sensors of the same type as you need. Unlike other competitive devices, you can record from 10 EMG, 8 EEG, 4 EKG with 4 peripherals – even 10 temperature sensors if you need to – simultaneously! No other system offers such flexibility.

Custom Designs for Improved Practicality
Instead of using bulky off-the-shelf metal connectors, we spent over $100,000 to develop a patented, miniature, light-weight protected-pin connector with durable glass-filled plastic strengthening. Our custom gold and sintered silver/silver chloride electrodes also provide the most comfortable ear clip fasteners.

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New BioGraph Features:
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• DC slow cortical potential (SCP) sensor/hardware
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Get started right away with our Physiology, EEG and Rehab suites that include feedback displays, report screens and session scripts, implementing the latest clinician-designed protocols for your area of interest - from day one. Third-party developers also offer hundreds more screens and protocols ready for use.

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UL
electrical and test your system or course on our website, download or start from the comfort of your home or office while a qualified clinical specialist shows you how to use the system for clinical biofeedback on your own computer. A growing number of certified biofeedback professionals (over 60 to date) are also offering on-line training courses on their favorite BioGraph applications.

Ultimate Reliability
Infiniti systems are by far the most reliable and crash-proof Bio/Neurofeedback systems available. Our exclusive pause-on-disconnect feature allows recovery from virtually any mishaps that may occur during your session, including sensor disconnection and dead batteries. Your session data is always safe.

The Largest Team of Professionals for Innovation and Quality
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Best Service in the Industry
Three of our staff of 57 are full-time product support specialists available to guide you through the use of your product, optionally taking direct control of your PC. They are backed up by our always available engineering and marketing staff, for rapid information and repair.

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