

# Psychophysiology Today

The mind body magazine



*BFE 2014 Meeting Edition*

VOLUME 9, ISSUE 1 - 2014



# TABLE OF CONTENTS

<b>PRESIDENTIAL NOTE .....</b>	<b>3</b>
<b>ORIGINAL ARTICLES .....</b>	<b>4</b>
Support Healthy Brain Development: Implications for Attention Deficit/ Hyperactivity Disorder' .....	4
A Word About the Biofeedback Certification International Alliance .....	15
Stress Tip.....	16
<b>HIGHLIGHTS FROM BFE VENICE MEETING .....</b>	<b>17</b>
Biofeedback Federation of Europe 2014 Awards Ceremony .....	17
Meeting Attendees Share Their Experience .....	18
Student Scholarship Program .....	21
<b>ABSTRACTS FROM BFE VENICE MEETING .....</b>	<b>22</b>
<b>ABSTRACTS FROM BFE VENICE MEETING - POSTERS.....</b>	<b>37</b>
<b>BFE 18TH ANNUAL MEETING .....</b>	<b>53</b>
Dates and Location Coming Soon.... ..	53
<b>SUBMIT AN ARTICLE TO PSYCHOPHYSIOLOGY TODAY .....</b>	<b>54</b>
Guidelines for Submission for <i>Psychophysiology Today</i> .....	54

## PRESIDENTIAL NOTE



Enjoy this issue of *Psychophysiology Today*. It includes an original article, stress tip, abstracts of the 17<sup>th</sup> BFE annual meeting, participants' experiences of the meeting, request for submissions for the next meeting and requests to submit articles for possible publication in the next issue of *Psychophysiology Today*.

The meeting blended bio- and neuro-feedback and nurtured the integration of clinical/educational applications and basic research. It provided a learning opportunity for interdisciplinary exchanges between researchers, educators, students and beginning as well as seasoned practitioners. It confirmed that bio-neurofeedback is a dynamic growing field.

All meetings depend upon the unselfish generous effort of many people who volunteered their time and energy. I thank each of you for making this meeting such a remarkable success where participants and presenters could share and learn from each other. I especially want to thank Jay Gunkelman for organizing the EEG/neurofeedback program part. I also give a heartfelt thanks our host university, Instituto Universitario Salesiano Venezia (IUSVE) for sponsoring and providing the space to host the BFE meeting and to the corporate sponsors who exhibited the newest bio-neurofeedback equipment and software. Specific thanks goes to Thought Technology and their staff for the sponsorship of *Psychophysiology Today*.

The dynamic meetings would not be possible without the active involvement of the host institution. The BFE is always looking for new locations to host future meetings so that people in that region can easily attend the event. In most cases, we are able to offer a workshop track in the language of the country of the host institution. Hosting the BFE meeting provides a remarkable opportunity for an institution to bring internationally recognized researchers and clinicians to their location and offers faculty and students the opportunity to attend their presentations. If your institution would like to host the BFE meeting, please contact: [conferences@bfe.org](mailto:conferences@bfe.org).

We are now in the early planning stages for our next meeting which includes identifying and inviting potential workshop presenters and speakers and calling for submissions for workshops, symposia, oral and poster presentations. If you would like to be actively involved in this process we invite you to join the program committee. If you wish to join the committee, or if you would like to make a recommendation or submission, please contact: [conferences@bfe.org](mailto:conferences@bfe.org).

Planning for the next meeting takes much lead time in order to arrange the workshops presenters, invited speakers, symposia, oral and poster presentations. Submissions are now being accepted. [Forms and deadlines can be found on page 54.](#)

Finally, we invite you to submit articles for possible publication in an upcoming issue of *Psychophysiology Today*. [See page 55 for manuscript requirements and submission information.](#)

*I look forward to seeing you at the next meeting.*

Warmly,  
Erik

Erik Peper, Ph.D.

## ORIGINAL ARTICLES

### Support Healthy Brain Development: Implications for Attention Deficit/ Hyperactivity Disorder<sup>1, 2</sup>

Erik Peper, Ph.D.

San Francisco State University

**Abstract:** Neglecting and disregarding our evolutionary background during infant, toddler and childhood stages of development may contribute to the increase in diagnosis and treatment of attention deficit/hyperactivity disorder (ADD/ADHD). To optimize healthy brain development, the following factors need to be supported: 1) Breast feed children at least for one year and concurrently introduce new foods slowly after 6 or 8 months to reduce the risk of developing food allergies; 2) Respect the importance of face-to-face contact to provide safety, develop empathy and nurture social connection; 3) Provide routine and ongoing parental attention and support circadian rhythms; 4) Integrate vision with touch and movement by encouraging motor development such as crawling, playing in nature, and physical movement that occurs while playing games instead sitting and being entertained by smartphones, computers, tablets or TV screens; and 5) Provide face-to-face reassurance when overwhelmed with rapidly changing visual and auditory stimuli. Health implications of new digital devices are discussed.

**Keywords:** attention deficit/hyperactivity disorder (ADD/ADHD), digital devices, breast feeding, motor development, neurofeedback

*In class, he fidgets, every auditory and visual stimulus distracts him-- he gets up, talks to other students and disrupts the class. Nothing seems to hold his attention, he looks at the page and moments later turns around and disturbs the boy behind him. At home, he grabs his food and leaves the table. He is continuously distracted. The only thing that seems to capture his attention is his computer games.*

Health is optimized when we live in harmony with our biological and evolutionary background. These behaviors allowed survival for thousands of generations. Disorders often occur when we neglect our evolutionary background during infant, toddler and childhood stages of development. Diabetes, obesity, allergies, asthma, attention deficit disorder/attention deficit and hyperactivity disorder (ADD/ADHD) and other illnesses are more common in our modern life style.

From the moment of birth, parents realize that each child is different- some are quiet and others react to every sound and movement. Yet, how the infant develops depends upon the

---

<sup>1</sup> I thank Drs. Stephen Porges, Linda Thompson, Michael Thompson, Monika Fuhs, and Annette Booiman for their constructive feedback.

<sup>2</sup> Correspondence: Erik Peper, Ph.D., Institute for Holistic Health Studies, Department of Health Education, San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132. email: [epeper@sfsu.edu](mailto:epeper@sfsu.edu) web: [www.biofeedbackhealth.org](http://www.biofeedbackhealth.org) blog: [www.peperperspective.com](http://www.peperperspective.com)

synergetic interaction between the biology (nature) and environment (nurture). ADD/ADHD disorder is only a disorder if the behavior is too dysfunctional in the cultural setting or if the learning style is not supported by the culture. Drs. Lynda and Michael Thompson, directors of the ADD Centre & Biofeedback Institute of Toronto observed that in running a boys' camp--ADHD boys are often sent off to camp--that ADHD kids were the best on really difficult canoe trips. They were far faster learners of difficult mathematic concepts concerning the relationship of sails and wind if they were taught in the right conditions (wild approaching hurricane winds etc.). They were terrible if you insisted they sit on a dock and just listen (Thompson & Thompson, 2014).

ADD/ADHD has become an epidemic in the last 30 years. Now one in seven boys by the time they reach the age of 18 have received this diagnosis according to the Centers for Disease Control and Prevention, as shown in Figure 1.

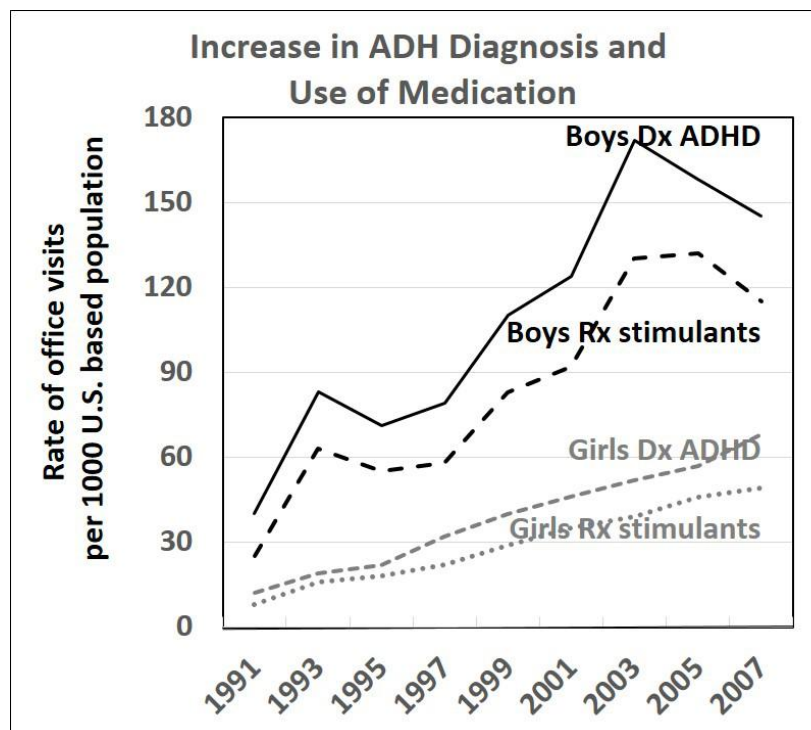


Figure 1. Rate of office-based visits per 1000 US population aged 5 through 18 with diagnosis (Dx) of ADHD and rate of use of medication (Rx) for boys and girls. Redrawn from: Sclar, D. A., Robison, L. M., Bowen, K. A., Schmidt, J. M., Castillo, L. V., & Oganov, A. M. (2012). Attention-Deficit/Hyperactivity Disorder among Children and Adolescents in the United States Trend in Diagnosis and Use of Pharmacotherapy by Gender. *Clinical pediatrics*, 51(6), 584-589.

The increase in ADD/ ADHD diagnoses or diabetes, obesity and allergies cannot be explained by genetics alone. It may depend upon the interaction of genetics and the environment. It may develop into a disorder as a result of disrespecting and not understanding our evolutionary background during our development. Diabetes and obesity has increased because of a decrease in mobility and an increase in sugar intake from about



10 lbs in the 19<sup>th</sup> century to 150 lbs per year today (O’Callaghan, 2014).<sup>3</sup> Similarly, allergies previously were very rare; however, during the last 20 years they have tripled (Branum & Lukacs, 2009). This spring I was shocked when I asked my students at San Francisco State University how many had allergies. More than 25% of the students said, “Yes”. When these illnesses occur(s) we attempt remedy them with medications. The medications for ADD/ADHD (e.g., Adderall, Concerta and Ritalin) provide an 8 billion dollar revenue stream for pharmaceutical companies. Yet, there is little or no evidence of long term benefits (Molina et al, 2008; Schwarz, 2013). Self-mastery approaches such as Neurofeedback have demonstrated long term benefits in improving reading, writing, and mathematical scores as well as decreasing impulsive behavior (Monastra et al, 2002; Arns et al, 2009; Gevensleben et al, 2009; Steiner et al, 2014). Neurofeedback training teaches children how to control their brain function. It is similar to learning a new language, mastering a musical instrument, or becoming proficient in a sport. It takes time and practice to retrain and rewire the brain.

### **Medications often mask the symptoms.**

We need to recognize that many of the patterns associated with ADD/ADHD have a genetic component. Rapid orienting to external stimuli is very useful for a hunter’s survival (Thompson & Thompson, 2014). The hunter with mentorship learns while doing. The learning process is part of body movement, action and changing environmental cues. Presently, we tend to support only a single learning strategy: sitting in chair while observing, thinking, and performing. Being aware of one’s learning style and optimizing the environment for that style may facilitate achieving success. Numerous successful people have an ADD/ADHD diagnosis; however, they eventually figured out how use their learning style to their advantage. If the behavior is too dysfunctional then achievement and success is compromised.

Our modern lifestyle has compromised the healthy development of the brain and behavior. Public health education needs to focus on prevention and support the concept that health is promoted when infants during their early developmental stages live in harmony with their evolutionary background. This means optimizing those factors that during the course of evolution promoted increased survival, reproductive fitness and promoted healthy brains.

- 1) Breast feed children at least for one year and concurrently introduce new foods slowly after 6 or 8 months to reduce the risk of developing food allergies.
- 2) Respect the importance of face-to-face contact to provide safety, develop empathy and nurture social connection (Porges, 2011).
- 3) Provide routine and ongoing parental attention. As Edward Melhuish of Birkbeck, University of London states, “children under five who don’t receive consistent affection and responsive communication from care-givers may have impaired social and emotional development. Crucially, this affect their language skills, which Melhuish says is a major

---

<sup>3</sup> New evidence suggests that antibiotics use in early childhood changes the bacteria in the babies’ guts and makes them more prone to obesity. The same phenomena which has been observed and purposely used to increase animal growth. Kennedy, P. (2014). The fat drug. *New York Times, Sunday Review*, March 8, 2014. <http://www.nytimes.com/2014/03/09/opinion/sunday/the-fat-drug.html>

reason why children from disadvantaged families generally do poorly at school” (Bond, 2014; Melhuish et al, 2008).<sup>4</sup>

4) Encourage motor development such as crawling, playing in nature, and physical movement that occurs while playing games support brain development instead sitting and being entertained by smartphones, computers, tablets or TV screens. Physical movement during play-- without being distracted by the overwhelming rapid changing stimuli shown on LED and TV screens--is necessary for brain development.

### **Provide support for healthy brain development.**

We need to create an environment that promotes brain development and nurtures healthy children or we can continue to disrespect our evolutionary background and pay the long term cost of treating ADHD and other disorders. Although there are many other risk factors, evidence suggest that the following enhances brain development.

**Breast feed an infant for at least for one year.** Breast milk contain immune factors and appropriate fatty acids that are necessary for brain development (Oddy, 2001; Labbok et al, 2004; Verhasselt et al, 2008; Makrides et al, 1994). Simply put, formula fed babies are malnourished with respect to necessary fatty acids and immune factors that are necessary for brain development. Using formula is like building a large building with substandard materials. Breast fed babies have slightly higher IQ, less obesity, less anxiety, lower rates of atopic eczema and celiac disease and less hyperactivity than formula fed babies when they get older (Horwood, 2001; Belfort et al, 2013; Harder et al, 2005; Julvez et al, 2007; Odijk et al, 2003). When foods are slowly introduced while the baby continues to breast feed there is a significant lower allergy rate such as celiac disease than if breast feeding is abruptly discontinued (Ascher et al, 1991; Cavell et al, 1992; Carlsson et al, 2006; Kull et al, 2002). More importantly, breast feeding supports the critical social development of face-to-face bonding that is necessary for developing empathy and self-directed attention (Porges, 2009).

Although many mothers would like to breast feed and take care of their babies, they are thwarted by the economic necessity to return to work and/or lack of social and community support to breast feed. In the process of industry and government saving money by not supporting mothers, we all end up paying much higher medical and social costs to treat the illnesses as these babies become adults.

**Reestablish circadian (daily) rhythms.** Until the 19<sup>th</sup> century our biological and activity rhythms were controlled by natural light. It is hard to imagine not having light at night to read. When the sun went down, we went to sleep. Now, bright lights everywhere--from the moment at birth in delivery room to the ongoing glow of night lights, monitors, tablets and the street lights, or flashes of car headlights leaking through the windows. Light not only illuminates, it affects our physiology by regulating our biological rhythms by blocking melatonin production which interferes with sleep (Brzezinski, 1997). A child that stays awake after their normal bedtime often loses control and, instead of becoming sleepy, tends to become hyperactive. By disrupting the biological rhythms with light, we are contributing to sleep disturbance which is associated with ADHD. Numerous children with ADHD have mild

---

<sup>4</sup> A superb summary that a good start in life has far-reaching benefits for health and social functioning is summarized in the publication, *Life Gets Under Your Skin*, <http://www.ucl.ac.uk/icls/publications/booklets/lguys.pdf>

obstructive sleep apnea and when that is resolved their ADHD symptoms decrease significantly (Huang, 2007; Garetz, 2008).

We keep the light on in the room because the child is afraid of the dark. Fear of the dark is a normal evolutionary fear. Throughout human history this was resolved by babies and children sleeping together with their mothers, family members and other siblings. We have forgotten that by placing babies in a separate room away from the reassuring skin contact, we have created a situation whereby the child can not feel safe. We then alleviate the fear of darkness with light that interrupts sleep and reduces memory consolidation. In some cases, we can reduce this risk factor by letting the child sleep with their parents or siblings or in the same room as thousands of human generations did—sleeping together.

### **Support touch and movement with vision and sound to develop the brain.**

During the first years of life, the baby/toddler integrates the visual and auditory world with touch and movement. Motor development is the underpinning of brain development (Wolpert, 2011)<sup>5</sup>. Early seminal studies by Professors Held and Hein at Brandeis University in 1963 showed that seeing and making sense of the world occurred if kittens tactilely interacted with the visual world. In an ingenious study, they paired kittens so that one could walk on a carousel and the other kitten would have the same visual experience except they were carried and did not walk. The kitten who walked developed normal depth perception while the kittens who were carried became behaviorally blind (Held & Hein, 1963; Noë, 2004). The interaction between seeing, touching and movement is necessary for development.

The more hours children watch TV, the higher is the incidence of ADD/ADHD (Healey, 2004). Babies and toddlers are now entertained by watching smartphone screens, tablet screens and monitors instead of kinesthetically exploring the world and integrating/connecting visual and auditory stimuli with touch and movement as shown in Figure 2.



<http://images.gameskinny.com/gameskinny/c9689c75994e58a03dbc5e489d346e55.jpg>

Figure 2. Being captured by a digital device. From:  
<http://images.gameskinny.com/gameskinny/c9689c75994e58a03dbc5e489d346e55.jpg>

<sup>5</sup> See neuroscientist, Daniel Wolpert's superb Ted video presentation:  
[http://www.ted.com/talks/daniel\\_wolpert\\_the\\_real\\_reason\\_for\\_brains](http://www.ted.com/talks/daniel_wolpert_the_real_reason_for_brains)



This lack of interconnection is observed in numerous people with learning disabilities. Some have incomplete motor development, e.g., when they skip, they tend to lift the arm and leg on the same side of the body instead of lifting their opposite arm and leg. This incomplete coordination may have been caused by excessive triggering of the defense (flight/fight) reaction to excessive auditory and visual stimuli. By spending the majority of the time fixated and captured by a screen and sound instead of crawling, walking and playing in nature, children are less likely to develop a mature integrated motor pattern. Children with ADD/ADHD who are re-exposed to nature and play in nature show a decrease in ADD/ADHD symptoms (Kuo & Taylor, 2004; Louv, 2008; Faber Taylor & Kuo, 2011).

### **Provide constancy and reduce novelty.**

*A cacophony of sounds, I could not make any sense of it. I finally comprehended one word when the action, a polite bow, and words were repeated time and time again. All of a sudden I could recognize and even say “Konnichiwa” – good afternoon in Japanese. My hosts wanted to help me learn some more words; however, they said one Japanese word after another. I could not remember any of them. Only when a few words with appropriate action were repeated time and time again were they stored in my memory.*

When reading a bedtime story, the child wants to hear the same story again and again. If part of the story is skipped, the child interrupts and reminds us to read correctly. When the child is stressed, it wants to hear a past story for comfort and safety. Repetition while feeling safe allows memory to create appropriate neural connections. Learning implies making neural connections and during sleep the information of declarative memory is encoded into long term memory (Walker & Stickgold, 2006). If too many new stimuli occur, the next stimulus overrides and erases the previous one. It isn't rocket science! Neural growth depends upon the appropriate level and type of stimuli.

Too few stimuli hinders brain development. Rumanian orphans who were warehoused with limited stimuli have brains with less grey and white matter than children who were brought up in an enriched environment (Mehta et al, 2009). These Romanian children had difficulty keeping focused attention and making social connections (Chugani et al, 2001; Porges & Furman, 2011). Similar reduced brain development was shown much earlier in studies with rats by anatomy professor Marian Diamond at UC Berkeley. Rats that were raised in sensory deprived environment had 4% less cortical thickness (fewer number and smaller in size of synaptic junctions) than rats raised in an enriched environment (Møllgaard et al, 1971; Diamond et al, 1975; Mohammed et al, 2002).

Too many novel stimuli may also decrease brain development. When rats were raised in a sensory overload environment--too many toys to play with and too many choices to make--the cortical thickness was slightly less than rats who had a normally enriched sensory environment.

The more hours children watch TV, the higher is the incidence of ADD/ADHD. Babies and toddlers are now entertained by watching smartphone screens, tablet screen and monitors instead of kinesthetically exploring the world and integrating/connecting visual and auditory stimuli with touch and movement.<sup>6</sup> Children need more time crawling, walking and playing in

---

<sup>6</sup> See Cris Rowan' blog, 10 Reasons Why Handheld Devices Should Be Banned for Children Under the Age of 12. [http://www.huffingtonpost.com/cris-rowan/10-reasons-why-handheld-devices-should-be-banned\\_b\\_4899218.html](http://www.huffingtonpost.com/cris-rowan/10-reasons-why-handheld-devices-should-be-banned_b_4899218.html)

nature to develop an integrated motor pattern. In a study by Taylor and Kuo in 2011 children with ADD/ADHD who are re-exposed to nature and play in nature show a decrease in ADD/ADHD symptoms.

The rapidly changing visual stimuli from these screens evokes the biological reflexes to attend-- there is something new and it could be safe, dangerous or life threatening. The physiological processes and the important implications for health and illness have been elucidated by the polyvagal theory developed by Professor Stephen Porges (Porges, 2011). This reactivity does not train self-control or internally generated attention. Over-stimulation with digital devices has been associated with impaired learning and decreased ability to self-regulate (Rowan, 2014; Christakis, 2004). The flood of novel visual and auditory stimuli trains the brain to react, to react again, and again. The ongoing external novelty captures the child's attention, instead of directing attention from within.

Something similar is observed in college students. Professor Andrew Lepp and colleagues at Kent State University discovered that the more the students use their cell phones and text, especially while studying, the lower is their grade point average and the higher their anxiety (Lepp et al, 2014). In our 2013 survey of university students almost all students reported texting or internet surfing during lectures, dinner, and social gatherings (Lin et al, 2014). Their attention is continuously interrupted instead of staying on focus. Students can learn to reverse this distractive process through neuro- and biofeedback as well as arranging their environment so that there are time periods without any interruptions. Even adults can experience the paralysis of too many choices and stimuli. If you have only one or two choices, you become happier and content. With too many choices, you keep thinking, "May be the other one would have been better".

In the last 50 years we have radically increased the visual and auditory input to a developing baby following the concept of more is better. Babies are now exposed to visual and auditory stimuli which rapidly pass by them without repetition or the ability to kinesthetically interact with them. Until the 19th century babies were carried either against the chest of their mother so that they would face their mother or be in continuous contact in a sling on their back. Babies also faced their mothers in the 19<sup>th</sup> century baby carriages. Now babies are often carried on the chest or in baby carriages/strollers facing forward- leading the charge into the unknown--instead of receiving face-to-face reassurance from the parent, touching the parent, or hiding behind the parent for safety as shown in Figure 3 and 3b.



Figure 3a. Babies being terrified while facing forward. Source: Source: [http://1.bp.blogspot.com/-1Mp59-tg-QI/UZvLWOxGhEI/AAAAAAAAANw/RhuX-K3k\\_mM/s1600/Baby-Stroller.jpg](http://1.bp.blogspot.com/-1Mp59-tg-QI/UZvLWOxGhEI/AAAAAAAAANw/RhuX-K3k_mM/s1600/Baby-Stroller.jpg)



Figure 3b. Baby being bored and missing attention. The modern style of neglect—physically present while being emotionally and mentally somewhere else. Source: <http://www.momlogic.com/images/mom-carrying-her-baby-pm-thumb-270x270.jpg>

On the average babies spend more than two hours a day in a baby carriage and there is much less social interaction between the mother/caretaker and the baby when the baby faces forward. In a study of 2722 observations of parent-child pairs by developmental psychologist Dr Suzanne Zeedyk (2008), parents talked twice as much to their babies when they faced them than when the baby was facing forward in the stroller. The impact of stress was measured by the decrease in baby laughing. Babies who faced their mother/caretaker while being pushed laughed 90% more than those who faced forward. As babies become older they do want to face the environment as it is more interesting; however, when the infants feel overwhelmed or threatened there is an opportunity to automatically reconnect with the caretaker to feel safe.

Finally, we park children in front of smart phones, tablets, Gameboys, and television screens that flood the auditory and visual senses without the ability to integrate it through touch and movement. Although TV and computer games are superb baby sitters, it is not the same as interacting and playing with a baby and toddler to develop the appropriate motor and emotional control. Sitting and watching computers, tablets or TV screens gives rapidly changing stimuli of the screen and overwhelms the person by choices and contributes to increase in physical and mental illness (Mentzoni et al, 2011; Rowan, 2014). Let's create an environment that is in harmony with our evolutionary background--An environment where infants play interactively with objects, explore nature and have face-to-face contact with their caregiver.

Even if the initial conditions during growing up were less than optimum, the brain can change—a process known as neuroplasticity. Thus, nurture inner directed attention by having your child develop skill mastery. Learning these skills can include neurofeedback training, back-to-nature explorations, learning to play a musical instrument, practicing a sport or martial art technique, or participating in yoga and meditation. These and many other practices will change the neural structure: it is never too late to learn, change, and optimize health.

## References

- Arns, M., de Ridder, S., Strehl, U., Breteler, M., & Coenen, A. (2009). Efficacy of neurofeedback treatment in ADHD: the effects on inattention, impulsivity and hyperactivity: a meta-analysis. *Clinical EEG and neuroscience*, 40(3), 180-189.
- Ascher, H., Krantz, I., & Kristiansson, B. (1991). Increasing incidence of coeliac disease in Sweden. *Archives of disease in childhood*, 66(5), 608-611.
- Bartley, M. (ed.) (2008). *Life gets under your skin*. UCL Research Department of Epidemiology and Public Health on behalf of the ESRC International Centre for Lifecourse Studies in Society and Health. ISBN: 978-0-9527377-8-0  
<http://www.ucl.ac.uk/ics/publications/booklets/lguys.pdf>
- Belfort, M. B., Rifas-Shiman, S. L., Kleinman, K. P., Guthrie, L. B., Bellinger, D. C., Taveras, E. M., ... & Oken, E. (2013). Infant feeding and childhood cognition at ages 3 and 7 years: Effects of breastfeeding duration and exclusivity. *JAMA pediatrics*, 167(9), 836-844.
- Bond, M. (2014). The science of success: Blood, or sweat and tears? *New Scientist*. 2559. 30-34.
- Branum, A. M., & Lukacs, S. L. (2009). Food allergy among children in the United States. *Pediatrics*, 124(6), 1549-1555.
- Brzezinski, A. (1997). Melatonin in humans. *N Engl J Med*, 336(3), 186-195.
- Carlsson, A., Agardh, D., Borulf, S., Grodzinsky, E., Axelsson, I., & Ivarsson, S. A. (2006). Prevalence of celiac disease: before and after a national change in feeding recommendations. *Scandinavian journal of gastroenterology*, 41(5), 553-558.
- Cavell, B., Stenhammar, L., Ascher, H., Danielsson, L., Dannaeus, A., Lindberg, T., & Lindquist, B. (1992). Increasing incidence of childhood coeliac disease in Sweden. Results of a national study. *Acta Paediatrica*, 81(8), 589-592.
- Christakis, D. A., Zimmerman, F. J., DiGiuseppe, D. L., & McCarty, C. A. (2004). Early television exposure and subsequent attentional problems in children. *Pediatrics*, 113(4), 708-713.
- Chugani, H. T., Behen, M. E., Muzik, O., Juhász, C., Nagy, F., & Chugani, D. C. (2001). Local brain functional activity following early deprivation: a study of postinstitutionalized Romanian orphans. *Neuroimage*, 14(6), 1290-1301.
- Diamond, M. C., Lindner, B., Johnson, R., Bennett, E. L., & Rosenzweig, M. R. (1975). Difference in occipital cortical synapses from environmentally enriched, impoverished, and standard colony rats. *Journal of Neuroscience Research*, 1(2), 109-119.
- Faber Taylor, A., & Kuo, F. E. M. (2011). Could exposure to everyday green spaces help treat ADHD? Evidence from children's play settings. *Applied Psychology: Health and Well-Being*, 3(3), 281-303.
- Garetz, S. L. (2008). Behavior, cognition, and quality of life after adenotonsillectomy for pediatric sleep-disordered breathing: summary of the literature. *Otolaryngology-Head and Neck Surgery*, 138(1), S19-S26.
- Gevensleben, H., Holl, B., Albrecht, B., Vogel, C., Schlamp, D., Kratz, O., ... & Heinrich, H. (2009). Is neurofeedback an efficacious treatment for ADHD? A randomised controlled clinical trial. *Journal of Child Psychology and Psychiatry*, 50(7), 780-789.



- Harder, T., Bergmann, R., Kallischnigg, G., & Plagemann, A. (2005). Duration of breastfeeding and risk of overweight: a meta-analysis. *American journal of epidemiology*, 162(5), 397-403.
- Healey, J.M.K. (2004). Early television exposure and subsequent attention problems in children. *Pediatrics*, 113(4), 917-918
- Held, R., & Hein, A. (1963). Movement-produced stimulation in the development of visually guided behavior. *Journal of comparative and physiological psychology*, 56(5), 872.
- Horwood, L. J., Darlow, B. A., & Mogridge, N. (2001). Breast milk feeding and cognitive ability at 7–8 years. *Archives of Disease in Childhood-Fetal and Neonatal Edition*, 84(1), F23-F27.
- Huang, Y. S., Guilleminault, C., Li, H. Y., Yang, C. M., Wu, Y. Y., & Chen, N. H. (2007). Attention-deficit/hyperactivity disorder with obstructive sleep apnea: a treatment outcome study. *Sleep medicine*, 8(1), 18-30.
- Julvez, J., Ribas-Fitó, N., Forns, M., Garcia-Esteban, R., Torrent, M., & Sunyer, J. (2007). Attention behaviour and hyperactivity at age 4 and duration of breast-feeding. *Acta Paediatrica*, 96(6), 842-847.
- Kull, I., Wickman, M., Lilja, G., Nordvall, S. L., & Pershagen, G. (2002). Breast feeding and allergic diseases in infants—a prospective birth cohort study. *Archives of disease in childhood*, 87(6), 478-481.
- Kuo, F. E., & Taylor, A. F. (2004). A potential natural treatment for attention-deficit/hyperactivity disorder: evidence from a national study. *American journal of public health*, 94(9), 1580.
- Labbok, M. H., Clark, D., & Goldman, A. S. (2004). Breastfeeding: maintaining an irreplaceable immunological resource. *Nature Reviews Immunology*, 4(7), 565-572.
- Lepp, A., Barkley, J. E., & Karpinski, A. C. (2014). The relationship between cell phone use, academic performance, anxiety, and Satisfaction with Life in college students. *Computers in Human Behavior*, 31, 343-350.
- Lin, E., Lau, S., Mitose, J., Rogers, E., Williams, T., Harvey, R., & Peper, E. (2014). Smartphone and Tablet Use Survey. Poster presented at the 45th Annual Meeting of the Association for Applied Psychophysiology and Biofeedback. Savannah, GA.
- Louv, R. (2008). *Last child in the woods: Saving our children from nature-deficit disorder*. Algonquin Books.
- Makrides, M., Neumann, M. A., Byard, R. W., Simmer, K., & Gibson, R. A. (1994). Fatty acid composition of brain, retina, and erythrocytes in breast-and formula-fed infants. *The American journal of clinical nutrition*, 60(2), 189-194.
- Mehta, M. A., Golembo, N. I., Nosarti, C., Colvert, E., Mota, A., Williams, S. C., ... & Sonuga-Barke, E. J. (2009). Amygdala, hippocampal and corpus callosum size following severe early institutional deprivation: the English and Romanian Adoptees study pilot. *Journal of Child Psychology and Psychiatry*, 50(8), 943-951.
- Melhuish, E. C., Phan, M. B., Sylva, K., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2008). Effects of the home learning environment and preschool center experience upon literacy and numeracy development in early primary school. *Journal of Social Issues*, 64(1), 95-114.
- Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouerø, K. J. M., Hetland, J., & Pallesen, S. (2011). Problematic video game use: estimated prevalence and associations with mental and physical health. *Cyberpsychology, behavior, and social networking*, 14(10), 591-596.
- Mohammed, A. H., Zhu, S. W., Darmopil, S., Hjerling-Leffler, J., Ernfors, P., Winblad, B., ... & Bogdanovic, N. (2002). Environmental enrichment and the brain. *Progress in brain research*, 138, 109-134.
- Molina, B. S., Hinshaw, S. P., Swanson, J. M., Arnold, L. E., Vitiello, B., Jensen, P. S., ... & Houck, P. R. (2009). The MTA at 8 years: prospective follow-up of children treated for



- combined-type ADHD in a multisite study. *Journal of the American Academy of Child & Adolescent Psychiatry*, 48(5), 484-500.
- Møllgaard, K., Diamond, M. C., Bennett, E. L., Rosenzweig, M. R., & Lindner, B. (1971). Quantitative synaptic changes with differential experience in rat brain. *International journal of Neuroscience*, 2(3), 113-127.
- Monastra, V. J., Monastra, D. M., & George, S. (2002). The effects of stimulant therapy, EEG biofeedback, and parenting style on the primary symptoms of attention-deficit/hyperactivity disorder. *Applied psychophysiology and biofeedback*, 27(4), 231-249.
- Noë, A. (2004). *Action in perception*. MIT press.
- O'Callaghan, T. (2014). Sickly sweet: The dark side of our sugar hit. *New Scientist*, 221(2954), 34-39.
- Oddy, W. H. (2001). Breastfeeding protects against illness and infection in infants and children: a review of the evidence. *Breastfeeding Review*, 9(2), 11.
- Odijk, J. V., Kull, I., Borres, M. P., Brandtzaeg, P., Edberg, U., Hanson, L. Å., ... & Wille, S. (2003). Breastfeeding and allergic disease: a multidisciplinary review of the literature (1966–2001) on the mode of early feeding in infancy and its impact on later atopic manifestations. *Allergy*, 58(9), 833-843.
- Porges, S. W. (2009). Reciprocal influences between body and brain in the perception and expression of affect. *The Healing Power of Emotions: Affective Neuroscience, Development, and Clinical Practice*, 27-54.
- Porges, S. W. (2011). *The Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, Communication, and Self-regulation*. New York: WW Norton.
- Porges, S. W., & Furman, S. A. (2011). The early development of the autonomic nervous system provides a neural platform for social behaviour: A polyvagal perspective. *Infant and child development*, 20(1), 106-118.
- Rowan, C. (2014). 10 Reasons Why Handheld Devices Should Be Banned for Children Under the Age of 12. [http://www.huffingtonpost.com/cris-rowan/10-reasons-why-handheld-devices-should-be-banned\\_b\\_4899218.html](http://www.huffingtonpost.com/cris-rowan/10-reasons-why-handheld-devices-should-be-banned_b_4899218.html)
- Schwarz, A. (2013). A.D.H.D. Experts Re-evaluate Study's Zeal for Drugs. *New York Times*, December 29. <http://www.nytimes.com/2013/12/30/health/adhd-experts-re-evaluate-studys-zeal-for-drugs.html>
- Sclar, D. A., Robison, L. M., Bowen, K. A., Schmidt, J. M., Castillo, L. V., & Oganov, A. M. (2012). Attention-Deficit/Hyperactivity Disorder Among Children and Adolescents in the United States Trend in Diagnosis and Use of Pharmacotherapy by Gender. *Clinical pediatrics*, 51(6), 584-589.
- Steiner, N. J., Frenette, E. C., Rene, K. M., Brennan, R. T., & Perrin, E. C. (2014). In-School Neurofeedback Training for ADHD: Sustained Improvements From a Randomized Control Trial. *Pediatrics*, 133(3), 483-492.
- Thompson, L. & Thompson, M. (2014). Personal communication.
- Verhasselt, V., Milcent, V., Cazareth, J., Kanda, A., Fleury, S., Dombrowicz, D., ... & Julia, V. (2008). Breast milk-mediated transfer of an antigen induces tolerance and protection from allergic asthma. *Nature medicine*, 14(2), 170-175.
- Walker, M. P., & Stickgold, R. (2006). Sleep, memory, and plasticity. *Annu. Rev. Psychol.*, 57, 139-166.
- Wolpert, D. (2011). The Real Reason for Brains. [www.ted.com](http://www.ted.com) presentation. [http://www.ted.com/talks/daniel\\_wolpert\\_the\\_real\\_reason\\_for\\_brains.html](http://www.ted.com/talks/daniel_wolpert_the_real_reason_for_brains.html)
- Zeedyk, S. (2008). What's life in a baby buggy like? The impact of buggy orientation on parent-infant interaction and infant stress. *London: National Literacy Trust*. Retrieved November, 21, 2008.

## ORIGINAL ARTICLES

### A Word About the Biofeedback Certification International Alliance Dr. Frederic Shaffer

BCIA is recognized as the certification body for the clinical practice of biofeedback and neurofeedback by the Association for Applied Psychophysiology and Biofeedback (AAPB), the Biofeedback Federation of Europe (BFE), and the International Society for Neurofeedback and Research (ISNR). BCIA currently represents professionals in 29 countries and its newest certificants come from Egypt, Germany, Hong Kong, Ireland, Singapore, and South Africa.



#### BCIA at the Biofeedback Federation of Europe Annual Meeting

The 17th Annual BFE Annual Meeting featured three Biofeedback Certification International Alliance (BCIA) didactic workshops. Michael and Lynda Thompson offered a 5-day Neurofeedback Program; Donald Moss, Erik Peper, and Fred Shaffer taught a 5-day Biofeedback Program; and Donald Moss and Fred Shaffer presented a 2-day HRV Biofeedback Certificate of Completion workshop. (Participants of these workshops can find information on the next steps in the certification process on the BCIA website at <http://www.bcia.org>.) Saturday, at the end of the meeting, BCIA proctored Neurofeedback and Biofeedback certification exams.

#### Update on BCIA in Europe

Donald Moss, PhD, BCB, BCN, and Fred Shaffer, PhD, BCB, representing BCIA, met with their European colleagues to better understand their challenges in providing clinical services within a changing European Union (EU) environment. Dr. Moss offered to host regular meetings to facilitate communication among national societies to help them shape EU policy regarding biofeedback.

Representatives from BCIA were invited to attend a meeting of the Neurofeedback Division of the Dutch Psychology Association in Utrecht, the Netherlands on January 30, 2014. Leslie Sherlin, PhD, BCB, BCN, Chair Elect and Judy Crawford met with representatives from Germany, the Netherlands, and the UK with the goal of learning from each other about differences and similarities of neurofeedback in their countries. It was hoped that we could reach some kind of agreement about the minimal demands a neurofeedback therapist should meet.

All attendees agreed on the importance of a workable, international credential with minimum requirements regarding pre-requisite education in health care, knowledge about mind and body, Neurofeedback fundamentals, and hands-on clinical experience with Neurofeedback under the guidance of a more seasoned professional. It is hoped that there would be an overlap between the standards of BCIA and the demands of Europe to make a statement and get an internationally-accepted agreement. The Society for Applied Neuroscience (SAN) has already started to consider basic guidelines for competency.

The SAN Annual Conference was jointly organized with the National Initiative Brain and Cognition (NIHC) and was held from January 30th to February 2nd, 2014 in the Royal Dutch Jaarbeurs, the Netherlands. Drs. Niels Bierbaumer and John Gruzelier were among the invited speakers for the scientific program. BCIA was an exhibitor at the conference and met with many already certified and some who were interested to learn more.

---

*The BFE is pleased to offer BCIA certification courses as part of its annual meeting. The courses remain a popular part of our program are attended by healthcare practitioners from around the world. Special thanks to Dr. Fred Shaffer for proctoring the BCIA exam and allowing us to offer a European venue for writing the exam.*

### **Stress Tip** **Relax at Work: Go to your Cabin<sup>7</sup>**

**Arnold Shapiro, M.D.**  
Montana State University

On a busy day, mini-breaks of a minute or so can be taken two or three times each hour, without harming your productivity. Here is a pragmatic, enjoyable, one-minute sequence to follow at your desk or work station that uses the letters of the word “cabin”. “Cabin” already bears the connotation, for many people, of a place of retreat, relaxation, and peace.

*Follow these steps:*

**Close your eyes.**

The simple act of closing your eyes gives your brain a significantly reduced workload starting the relaxation process.

**Adjust your posture.**

Release any forward leaning, and have your spine be comfortably vertical. Employ low-back support if desired. If a body part feels tense, move it gently or stretch it gently for a few seconds, then simply settle down

**Breathe slowly, smoothly, and deeply (three or more breaths).**

Feel and listen to the inhalations and exhalations. Loosen any restrictive clothing. Use a slow, even pace.

**Imagine a tranquil place.**

Enter the scene and take in its peaceful, soothing qualities.

**Nurture yourself.**

Compliment yourself for your efforts. Use simple, soothing touch or words. Smile. Then, open your eyes and return to work, refreshed and recharged.

---

<sup>7</sup> Correspondence: Arnold Shapiro, M.D., Student Health Services, Montana State University, Bozeman, MT 59715 Tel: 406.580.3692 Email: [ashapiro@montana.edu](mailto:ashapiro@montana.edu)

## HIGHLIGHTS FROM BFE VENICE MEETING

### Biofeedback Federation of Europe 2014 Awards Ceremony

Every year the BFE offers recognizes outstanding work in the field of biofeedback. This years' awards went to:



#### **Dr. Stephen Porges**

The 2014 Biofeedback Federation of Europe Research Award was presented to Dr. Stephen Porges for his contribution to the science of psychophysiology.



#### **Jay Gunkelman**

The 2014 Biofeedback Federation of Europe Educator Award was presented to Jay Gunkelman, QEEGD for his support of student education and contributions to the science of psychophysiology and neurofeedback.

### Previous BFE Award Winners

#### **1997 - Groningen, Netherlands**

John Basmajian - Scientific Contribution

#### **2000 - Eilat, Israel**

Niels Birbaumer - Scientific Contribution

#### **2002 - Amsterdam, Netherlands**

Erik Peper - Scientific Contribution  
Gabe Sella - Scientific Contribution

#### **2003 - Udine, Italy**

Howard Glazer - Scientific Contribution  
Joe Kamiya - Scientific Contribution

#### **2004 - Winterthur, Switzerland**

Winfried Rief - Scientific Contribution

#### **2005 - Hasselt, Belgium**

Maurice B. Sterman - Scientific Contribution  
Hans Stodel - Service

#### **2006 - Vienna, Austria**

Gert Pfurtscheller - Scientific Contribution  
Richard Gevirtz - Scientific Contribution  
Danielle Matto - Service

#### **2007 - Berlin, Germany**

Vietta E. Wilson - Scientific Contribution  
Bruno Demichelis - Scientific Contribution  
Monika Fuhs - Service

#### **2008 - Salzburg, Austria**

Steve Fahrion - Scientific Contribution  
Patricia Norris - Scientific Contribution

#### **2009- Eindhoven, Netherlands**

Paul Lehrer - Scientific Contribution  
Don Moss - Scientific Contribution

#### **2010 - Rome, Italy**

Michael and Lynda Thompson - Scientific Contribution  
Ute Strehl - Scientific Contribution

#### **2011 - Munich, Germany**

Erik Peper - Supporting Internationalizing Biofeedback  
Lawrence Klein - Service (Corporate Support)

## HIGHLIGHTS FROM BFE VENICE MEETING

### Meeting Attendees Share Their Experience

We were honored to welcome attendees from around the world to our meeting in Venice with a total of 25 countries represented! The five day meeting included workshops and a Scientific Day where the latest research in the field was presented. Many participants took advantage of their time in Italy to enjoy a few sights and and experience the warmth of our Italian hosts. Here are some of their comments:

---

The meeting was held in a town everyone dreams of visiting...Venice. A beautiful city with its remarkable canals, old houses, palaces and special flavour. The organisation made it possible for the participants to see this city with a guide. The congress itself was held at the university, located on the mainland. During the meeting we could all connect with each other during the coffee breaks and lunchtime. That is always very enriching, because of all the different cultures and professions. The different backgrounds of everybody made an exchange of knowledge possible and that blending gives space for new ideas in treating clients or setting up another research project. The scientific program with tracks in Italian, neurofeedback and biofeedback made a real exchange of information possible. The information provided me with new insights about some things I was wondering over for years. That made attending the congress worthwhile and I've already integrated some of the information learned in the treatment of my clients.

**Annette Booiman, Oefentherapeut-Mensendieck**  
**The Netherlands**

---

The BFE meeting in Venice was for me a perfect combination between an exciting learning experience and pleasure. It began with two fascinating days in Dr. Stephen Porges' workshop on the Polyvagal Theory. Understanding the problem of very stressed students trying to record every word he said, and wanting us to fully understand and experience in our body the concept of social behaviors leading to feelings of safety, Dr. Porges began his workshop with beautiful slides conveying human and animal interactions. Instead of bombarding us with a lot of scientific data, this was a very creative and a great way to help us comprehend the response hierarchy that regulates behavioral and physiological adaptation to safe, dangerous, and life threatening environments. In his workshop Dr. Porges exposed us to many insights regarding social engagement, emotion regulation and the application of his theory to therapy. We were also very fortunate to enjoy a few hours of a fascinating lecture given by Dr. Porges' wife, Dr. Sue Carter on the Healing Power of Love and the Oxytocin Hypothesis. The night tour in Venice was a wonderful way to end the day with great food and scenery. The second workshop I attended – on Mindfulness and Acceptance Approach to Biofeedback by Dr. Inna Khazan was very well presented with many very calming exercises that deepened the understanding of how important it is to help our patients not to try too hard to relax while training with biofeedback. The gala dinner was the happiest I've ever attended at the BFE meetings expressing the Italian way of celebrating life. I am really looking forward to the next BFE in 2015...

**Yuval Oded, PhD.**  
**Tel Aviv, Israel**



## HIGHLIGHTS FROM BFE VENICE MEETING

Sometime last year I received an email about the 17<sup>th</sup> BFE meeting that was going to happen in Venice! I thought to myself- I will meet and learn from all the experienced seniors and also I will get to see Venice, so why not! Although the trip became a bit costly from South Africa to Venice I still didn't know what to expect but my excited heart knew that I was going to love it.

As soon as I sent the email for registration to the admin in less than five minutes I received a reply with on-going support that covered all my questions and needs, until, there I was in Mestre near Venice, collecting my name tag. I want to thank the president of BFE Erik Peper and the entire faculty and administration desk and whoever else that had any sort of contribution to hold this meeting in the most professional and memorable way.

I am now back in Cape Town sitting at my desk and savoring all the wonderful moments of this meeting in my heart. I found each and every lecture amazingly scientific and research based and each and every lecturer humble and compassionate and generous with sharing their experiences and knowledge, and with a willingness to stay in touch via email. Everyone was equal no matter if one had come to do some inquiries about Biofeedback or has been learning and practicing it, to the senior experienced ones who are our teachers in this field.

It was amazing to connect with so many practitioners who have incorporated Bio/Neurofeedback in different professions, and know that there is so much to share and learn from each other no matter where you live in this small world. There seems to be a sense of international community now. I also want to thank Thought Technology (Frank DeGregorio) and the BFE's Jon Bale for their professional support and their patience with all our questions about using the system and software suites.

I look forward to the next BFE meeting,

**Nazanin Madadi, Registered Counsellor, MA (Neuro-psych) UCT,  
Mindfulness & CBT Approach  
Cape Town, South Africa**



## HIGHLIGHTS FROM THE VENICE MEETING

A few years ago, when I heard about Neurofeedback, I decided to contact its pioneer – Barry Sterman. I asked him for the opportunity to participate in his trainings. He mentioned that a few months later the BFE conference would be held in Berlin, and I should come. It was 2007, and since then my career has changed. In the following years, I had the opportunity to participate in four BFE conferences, and I accepted the proposal to describe this year's edition with pleasure. Every time we meet great people from many countries engaged in our neuro field.



This year, the 17th BFE Meeting took place in a lovely area of Venice, Italy, on 10–15 February 2014. The weather was typical for Italy at this time of year – the first spring sunshine alternating with torrential rains.

The workshops were very intense. Every day, we could choose from 4–7 classes in English or Italian, in biofeedback, neurofeedback, QEEG and sports psychology. They were traditionally taught by leading clinicians and researchers from multiple disciplines, who share a common interest in the dissemination of information about this rapidly growing field. Highly experienced teachers like Drs. Linda and Michael Thompson provided a five-day BCIA Neurofeedback program, which was sequentially translated into Italian. Whereas Drs. Donald Moss, Erik Peper and Fred Shaffer covered a five-day BCIA Biofeedback program also translated into Italian.

Other lectures were conducted by: Dr. Jay Gunkelman, Dr. Inna Khazan, Dr. Michael Linden, Antonio Martins-Mourao, PhD, Dr. Danielle Matto and Eveline Kempenaar, Dr. Stephen Porges, Dr. Ute Strehl and Dr. Kirsten Mayer, Dr. Paul G. Swingle, Dr. Leah Lagos, Frank DeGregorio; in the Italian program: Dott. Marianna Munafo PhD, Dott. Davide Pierini, Dott. Carlo Prunetti, Giuseppe Sacco, PhD, Gabriel Sella, MD, Lorena Zanus, Ph.D.

On the second day we were invited by the Thought Technology company for a sightseeing tour around Venice. The guide showed us the unknown secrets of this historic island.

Due to the large number of sessions (50, including 18 in Italian), the scientific day was divided into a section on biofeedback, neurofeedback and EEG and the Italian track. Every day during the coffee break, we were able to try famous Italian espresso and croissants. Also, it allowed us to make new acquaintances and share our experiences. The fourth evening featured a traditional Gala Party with live Italian music as well as a delicious fish dinner. We enjoyed ourselves until the dawn.

We do hope that the contacts established during the 17th BFE Meeting will allow us to begin cooperation between our centers, whereas extensive trainings and new methods will contribute to an even better job of using Bio and Neurofeedback. Thank you to the organizers and all the participants for another week in a friendly atmosphere.

**Piotr Sobaniec, BCIA-BCN**  
**Specjalista Neurofeedback, Fizjoterapeuta**  
**Białystok, Poland**

## HIGHLIGHTS FROM THE BFE VENICE MEETING

### Student Scholarship Program

The BFE was pleased to award a number of scholarships for students to attend Scientific Day at our conference in Venice.



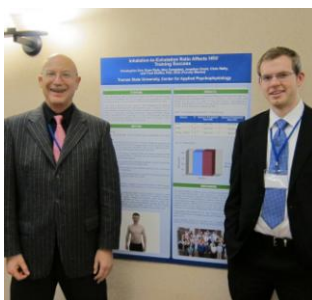
***The BFE would like to thank all students who submitted an application for the Student Scholarship Program.***

#### BFE 2014 Scholarship Recipients

Christopher Zerr - USA  
Alec Cangelosi - USA  
Evan Fluty - USA  
Lillian Konicar - Germany  
Milena Żochowska-Sobaniec - Poland

Attending the 17<sup>th</sup> Annual BFE meeting in Venice, Italy was quite literally the opportunity of a lifetime, especially for undergraduate students. We found ourselves immersed in a collaborative, professional, scientific environment that served to strengthen our understanding of Biofeedback as well as the most current research on the topic. We learned an incredible amount of information concerning Neurofeedback from a workshop taught by Dr. Michael Thompson and Dr. Lynda Thompson. World-renowned researchers were supportive of the studies we presented, providing us with friendly suggestions and offering encouragement. The greatest experience of all was the diversity of the meeting, with representatives from all parts of the globe with incredibly different backgrounds, collectively sharing research and our hopes for the field. Presentations were engaging and thought provoking, especially the new insights regarding mindfulness and meditation in Biofeedback by Dr. Inna Khazan and the Polyvagal Theory by Dr. Stephen Porges. We had enlightening discussions with graduate students from Italy, France, Afghanistan, and other parts of the world, sharing stories of our experiences (which were not always so different). Best of all, we had a chance to learn words in different languages (which we managed to horribly mispronounce). The BFE meeting was a tremendous experience for which we are grateful.

**Christopher Zerr (Junior) on  
behalf of Alec Cangelosi (Senior) and Evan Fluty (Senior)**



## ABSTRACTS FROM BFE VENICE MEETING

### **Abstracts of Scientific Papers presented at the 14<sup>th</sup> Annual Meeting of the Biofeedback Foundation of Europe**

The 17<sup>th</sup> annual meeting of the Biofeedback Foundation of Europe was held February 11<sup>th</sup> – 15<sup>th</sup>, 2014, in Venice, Italy. The meeting consisted of a number of intensive 1- and 2-day invited workshops that teach in-depth knowledge and skills and a scientific program. The journal is pleased to publish the abstracts from the scientific portion of the meeting.

### **New Directions In Psychiatric Clinical Practice - Role of QEEG in Diagnostics and Therapeutics and Combining Neurofeedback With TDCs and TMS**

**Hasan Asif**

*Email: [hasanasifmd@gmail.com](mailto:hasanasifmd@gmail.com)*

**Abstract:** Psychiatric practice for decades has been confined to a diagnostic and treatment model which relied on a symptoms checklist model of DSM criteria for diagnosis, and intervention based on a simplistic neurochemical model. A new conception of personalized psychiatric practice is emerging where diagnostics and therapeutic procedures aim at individualized treatment planning based on an individual's specific treatment needs. Recent advances in acquisition and processing of EEG has made it possible to look into deviant brain wave patterns which can guide us in understanding brain functions and their role in producing symptoms. Digitized quantitative analysis of the brain wave patterns in research and now in clinical practice is proving itself to be a significantly valuable tool not only in diagnostics but also in selection of treatment options. On the therapeutic front, recent advances in neuro-stimulation, neurofeedback, trans-cranial magnetic stimulation has opened up the field towards non medication based treatment practice options and is proving to be less costly, more efficacious and with fewer side effects. The purpose of the presentation is to explore a multimodal diagnostic and therapeutic approach focused on developing a model for personalized psychiatric practice using EEG as a guide in choosing psychotropics, TMS protocol, Neuro-stimulation montage, neurofeedback independently or in combination for enhanced efficacy. Presentation includes case studies in a clinical private practice setting.

### **Practical applications of Heart Rate Variability Biofeedback: Clinically and Scientifically**

**Kees Blase, Netherlands**

*Email: [k.blase@hartfocus.nl](mailto:k.blase@hartfocus.nl)*

Training by breathing in your personal resonance frequency will effect more balance in the Autonomic Nervous System. This balance in ANS creates resilience after moments of stress and anxiety. 15 years of clinical experience of the National Centre Stress management in the Netherlands show that treatment of burnout and stress management is shortened and more effective and affective when cognitive behaviour therapy is integrated with HRV-biofeedback. Body-mind integration originally was the foundation of stress and anxiety treatments. Nine steps are developed in the protocol at three levels : 1. Autonomic Balance 2. Emotion regulation and 3. Selfregulation. In the literature search on HRV, PTSD, depression and anxiety we found 6 randomized controlled research projects showing the



significance of HRV/biofeedback treatment compared to Treatment As Usual or relaxation training (Universities in San Diego, San Francisco, Houston, New Jersey USA and Germany. All studies show significant changes in the Beck Depression Inventory and some also with STAI (Stress&Anxiety) scores. After searching last ten years which HRV devices are scientific (with personal setting of breathpacer, and inhalation/exhalation setting) , clinical effective and client friendly we selected four different devices: computer program Balance Manager, breath pacer Respiroguide Pro for I-phone and Android, mobile device StressEraser and the different expected biofeedback devices on I-phone, I-pad and Android smartphones. With HRV- frequency spectre analysis we can follow the processing (connecting with felt sens or suppressing emotion) during processing EMDR, somatic experience or mindfulness)

## **What the Sella Protocol Can Tell us About Muscle Functioning**

**Annette Booiman, Netherlands**

*Email: [acbooiman@zonnet.nl](mailto:acbooiman@zonnet.nl)*

**Abstract:** Discomfort and pain are often the reason for a less energetic and joyful life. The performance of the muscles is very essential for the wellbeing of a person. The Sella protocol is a quick and very useful assessment protocol for the clinician to get an idea of particular muscle function. The protocol can show unnecessary covert muscles co-contractions or if muscles stay tense after performing a task. The protocol can also give information about left-right differences or recruitment of the muscles. In this oral paper the implications of what the Sella protocol tells us will be explained and showed by several case examples. In summary, SEMG allows the invisible differences in muscle tension to become visible and helps to develop a tailor made treatment.

## **TBI Diagnosis and Treatment: Utility of EEG/qEEG and ERP**

**Jay Gunkelman, USA**

*Email: [qeeqjay@sbcglobal.net](mailto:qeeqjay@sbcglobal.net)*

**Abstract:** Current TBI neuroscience literature will be reviewed, with special attention to the use of EEG/qEEG and ERP in evaluating and treating TBI cases. The focus of this presentation will be the discussion of the diagnostic sensitivity and specificity of measures, as well as differentiating therapeutic clinical utility from diagnostic specificity. Both the use of ERP to identify the location and nature of the change in brain function, as well as the use of EEG/qEEG to design therapeutic interventions will be illustrated in this brief presentation.

## **The Efficacy of HRV Biofeedback and Neurofeedback for a Case of Chemotherapy Induced Peripheral Neuropathy**

**Morayo Jimoh, South Africa**

*Email: [mobilehealthconsult2000@yahoo.co.uk](mailto:mobilehealthconsult2000@yahoo.co.uk)*

**Abstract:** Chemotherapy-Induced Peripheral Neuropathy (CIPN) is a common and potentially dangerous side effect of many chemotherapy drugs. The main objective of this article is to ascertain the suitability of HRV Biofeedback and Neurofeedback treatment as alternative therapies for CIPN. Neurofeedback protocol was aimed at enhancing SMR at the sensorimotor cortex, which corresponds with the legs, using the Pinefield's method. Precisely twenty sessions of HRV Biofeedback training was done with Heartmath. McGill's



Pain questionnaire was analysed to evaluate the effectiveness of HRV Biofeedback and neurofeedback training for this condition. Following treatment, client's symptoms were found to have improved relative to pre-treatment on the pain qualities. Additional improvement was seen in his ability to partake in simple exercises and his walking pace. HRV Biofeedback and Neurofeedback are effective alternative treatments for CIPN. Further research is needed to determine the relative contribution of Neurofeedback and HRV training to Chemotherapy Induced Peripheral Neuropathy.

## **Can EEG Biofeedback (Neurofeedback) Improve Executive Functions in Autism: Two case studies**

**Morayo Jimoh, South Africa**

*Email: [mobilehealthconsult2000@yahoo.co.uk](mailto:mobilehealthconsult2000@yahoo.co.uk)*

**Introduction:** Neurofeedback is believed to elicit growth and changes at cellular levels of the brain, which in turn support brain functioning and behavioral cognitive performance. This study explores improving cognitive performance of Autistic children. Two children diagnosed with autism spectrum disorders (ASD) received a neurofeedback treatment that aimed to improve their level of executive control. Neurofeedback protocol was aimed at inhibiting theta and high beta enhancing SMR 13 -15 Hz over sessions. The two children received 80 sessions each. The results after treatment showed that children's executive capacities were found to have improved greatly relative to pre-treatment assessment on a range of executive function tasks. Additional improvements were found in children's social, communicative and self-stimulating behaviors. The findings from this study suggest that neurofeedback can improve basic executive function impairment in ASD.

## **Meditation and Biofeedback: Combining Eastern Traditions with Western Gadgets**

**Inna Khazan, USA**

*Email: [inna.khazan@gmail.com](mailto:inna.khazan@gmail.com)*

**Abstract:** Meditation in general and mindfulness meditation in particular have become increasing popular and better accepted in Western culture in the recent decades. There now exists a wealth of empirical evidence demonstrating the positive effect of mindfulness meditation on physical and mental health, as well as its ability to influence brain structure and function. Mindfulness meditation enhances internal awareness of physiological states, facilitates passive volition, improves attention, and encourages structural and functional brain changes conducive to lower sympathetic arousal. All of these factors are vital to biofeedback success. It is therefore important to explore ways of integrating meditation into traditional biofeedback treatment. This talk will provide an introduction to mindfulness meditation, its effect on physical and mental health, and ways of integrating meditation into biofeedback.

## **Adding a Mindfulness Based Meditation Component to Biofeedback Treatment in the Pain Management of Medically Complex Patients**

**Urszula Klich, USA**

*Email: [MyMindfulwayoflife@gmail.com](mailto:MyMindfulwayoflife@gmail.com)*

**Abstract:** Mindfulness-Based Biofeedback is based on merging two scientific methodologies into a modality that is useful for clinical practice. Eastern Meditation techniques are integrated with state of the art technology of biofeedback in this Mindfulness-Based Biofeedback program. Individuals with complex medical diagnoses often experience physical and emotional needs that fluctuate considerably, presenting a challenge for treatment. The resulting psychological impact is often inadequately resolved with an exclusively medically based program. Research behind this approach will be discussed and guidelines for effective and evidence-based practice will be offered. This presentation will cover the fundamental principles of Mindfulness-Based Biofeedback and how patients benefit from this combined training approach. Connections will be made with other mindfulness based programs such as Mindfulness Based Stress Reduction and Cognitively Based Compassion Training meditation practices. This program will cover up to date research related to using these mindfulness and biofeedback techniques with a variety of clinical populations. We will examine the ways in which these treatment modalities further facilitate effective coping and stress management training with a medical population. Special emphasis will be placed on chronic pain within multiple sclerosis, traumatic brain injury, and post-traumatic stress disorder, including unique considerations with veterans. The program will further provide a pragmatic set of skills for applying these methods in clinical practice with a variety of populations in accordance with the Mindfulness-Based Biofeedback model of treatment

### **Neurophysiological and Behavioural Effects of Slow Cortical Potentials (SCP) Feedback in Adults with ADHD - Preliminary Results**

**Kirsten Mayer, Germany**

*Email: [kerstin.mayer@uni-tuebingen.de](mailto:kerstin.mayer@uni-tuebingen.de)*

**Abstract:** Adults with attention deficit/hyperactivity disorder (ADHD) show persistent cardinal symptoms, but also neurophysiological differences observed in children. Functional and structural abnormalities in the frontostriatal circuitry are still present in adulthood, as well as a general slowing of the electrical brain activity. The impaired self-regulation ability reflected in slow cortical potentials (SCP) is the target of SCP neurofeedback. Following SCP feedback, symptom improvements and increased amplitude of the contingent negative variation (CNV) were observed in children with ADHD. The CNV is a SCP reflecting attention and preparation and was found to be diminished in children with ADHD. This study was designed to assess whether adults with ADHD differ from healthy controls in tests of attention, reaction time (RT), and CNV. Further it assessed whether adults with ADHD are able to learn self-regulation with SCP feedback and whether this leads to changes in symptomatology and neurophysiology.

Twenty-one adults with ADHD and 21 healthy controls underwent different measurements of neurophysiological and neuropsychological variables (19-channel electroencephalogram with a Go-No/Go CNV task and behavioural questionnaires) for baseline comparison. Eleven patients received 30 one-hour sessions of SCP feedback. Neurophysiological and neuropsychological variables were calculated pre and post treatment. Changes in ADHD symptoms, as well as CNV, were correlated with training performance. The results demonstrated baseline differences between the ADHD and the healthy control group were confirmed for slower RT, larger RT variability, and smaller CNV. Following SCP feedback, symptoms on all symptom scales diminished significantly, RT decreased, and the CNV increased. This study confirmed that the differences in adults with ADHD and healthy controls were similar to children with ADHD. SCP feedback led to symptom improvements over 25%, as well as decreased RT and increased CNV, both related to attentional processes. However, more patients are needed to confirm these preliminary results.

## Applications of Biofeedback in Musical Performance

**Marja Mosk, Netherlands**

*Email: [marja.mosk@gmail.com](mailto:marja.mosk@gmail.com)*

**Abstract:** Biofeedback is included in the curriculum of the “Conservatorium van Amsterdam” as part of the course “The Musical Body”. A Biofeedback assessment is taken at the beginning of the 12 lessons and again at the end. The master students, while playing instruments like piano, percussion, flute or viola, are wired up to the Nexus 10 (Mind Media). The test includes a Biofeedback assessment while they are playing or singing. The findings of the assessments are then used in the lessons to inform the music students about stress management, posture, breathing, etc., to help improve their musical performance.

## Evidence-Based Practice of Pediatric Biofeedback

**Don Moss, USA**

*Email: [dmoss@saybrook.edu](mailto:dmoss@saybrook.edu)*

**Abstract:** 23.7% of the US population was under 18 years of age in 2011, almost 74,000,000 persons (US Census, 2013), yet research and training in both biofeedback and neurofeedback have often focused on adults. Biofeedback is evidence-based in orientation, with strong research traditions. Biofeedback elicits a healing response within the human being as a neurobiological organism. It produces transformation subjectively, in neural activation, and in general psychophysiology. This presentation will review current guidelines for assessing the efficacy of applications in biofeedback and neurofeedback. The presenter will provide an overview of biofeedback instrumentation and training protocols, and summarize current evidence for use of biofeedback with children, especially in anxiety, ADHD, chronic pain, diabetes, epilepsy, fecal disorders, headache, insomnia, and traumatic brain injury.

## Integration of Biofeedback into European Health Systems: Do we need our own, more active policy for Biofeedback\* in the EU?

**Lothar Niepoth, Germany**

*Email: [mail@biofeedback-lab.de](mailto:mail@biofeedback-lab.de)*

**Abstract:** In the last years, the Biofeedback movement in Europe has been continually growing. Against this background, many ways of establishing models of account of charges have been tested and Biofeedback practitioners have had a lot of experience in settling costs (insurance companies, etc.). But, these efforts did not lead to Biofeedback to be seen as a healthcare service paid by health insurance. On the other hand, in the last 10 years the EU has set up various rules and laws to regulate different kinds of systems, which used to be subject to state policy in former times. The time when the EU will start to regulate (parts of) national health systems draws near and the question of when the EU will establish rules and laws for Biofeedback (when Biofeedback is practiced as a healthcare service) will arise. This presentation aims to describe the development of the integration of Biofeedback into German and other European health systems. The pros and cons of "being regulated" vs. starting an active regulation policy will be discussed.

\* for simplification the term "Biofeedback" is used instead of "Bio and Neurofeedback"

## **Mismatch Negativity and Neurofeedback Training to Improve Cognitive Skills in People with Intellectual Developmental Disorders**

**Sara Ottonello, Dott, Gualtiero Reali, Giuliano Monteleone, Marco Bertelli, Italy**

*Email: saraottonello@hotmail.it*

**Abstract:** The mismatch negativity is a change detection response of the brain elicited by any discriminable change in auditory stimulation; is thought to reflect an automatic process that detects a difference between an incoming stimulus and the sensory memory trace of preceding stimuli. The MMN indexes different types of central auditory abnormalities in different neuropsychiatric, neurological, and neurodevelopmental disorders. The diminished amplitude/prolonged peak latency observed in patients is commonly considered a correlate of auditory discrimination reduction. This neurophysiological reactivity may be improved by specific techniques, particularly by Neurofeedback Training (NFT). In the present study, 23 adults with IDD and 23 healthy controls underwent a procedure of MMN recording. We used a repeated Anova. The stimuli presented were two different pure tones (1940 and 851 Hz sinusoidal waves), presented at random interstimulus intervals (ISI) using a passive "Oddball paradigm" in which the participant ignores the auditory stimuli. We analysed electrodes Fz, Cz, Pz and mastoid locations. At this time 3 adults with IDD and 3 healthy controls completed 15 sessions of Alpha NFT at Cz. The results showed that Mean Amplitude of MMN in people with IDD was significantly lower than in controls, which is consistent with previous finding. This may reflect impairment of attention or auditory sensory memory. The preliminary data of pre-post NFT comparison of MMN recordings seems to indicate an improvement of pre-attentive abilities. We need more data to support applicability and utility of MMN and Alpha NFT in this population.

## **The Role and Function of The Alpha-Wave and an Evaluation of the Effects of Its Enhancement With Cranial Electrotherapy Stimulation**

**Lesley Parkinson & Alan Parkinson, United Kingdom**

*Email: lesleyparkinsoncp@hotmail.com*

**Abstract:** Anxiety disorders involve psychological and physiological conditions. The combination of physiological and psychological features is additive and worsens/intensifies the anxiety disorder. This study investigated the hypothesis that increasing alpha waveband amplitude through Cranial Electrotherapy Stimulation (CES) would lead to a reduction in the physiological and psychological symptoms of anxiety disorders. 16 patients complaining of Stress or Anxiety were recruited. They completed the DASS (Depression, Anxiety and Stress Scale). Baseline CNS Measurement of BrainWave activity occurred at the Central SMS. Patients were put on a one month waiting list and then re-assessed with the same measures as at baseline. They were provided with an Alpha-Stim CES device to use for 2 months 20 minutes per day. Post –Trial re-assessment then occurred. The results showed that Statistical Analysis revealed that using CES led to a significant increase in alpha-wave activity and a significant reduction in self report measures of anxiety and stress. The study demonstrated the importance of the alpha-wave in reducing the physiological and psychological symptoms of anxiety and stress.

## Reducing Chronic Pain with SEMG Feedback Pandiculations; Case Example of Chronic Neck and Head Pain

Erik Peper, USA

Email: [epeper@sfsu.edu](mailto:epeper@sfsu.edu)

**Abstract:** Chronic pain may be caused by muscle tension and dysfunctional movement patterns. These covert dysfunctional muscle bracing patterns (dysponesis) can be identified with surface electromyography (sEMG). In some cases the location of the chronic pain is not caused by the muscle in the area of the pain but referred from muscles at the opposite side of the body. The dysponetic muscle patterns can be identified with an adapted Sella protocol (tighten a muscle for 10 seconds, relax for 10 seconds, repeat five times) while monitoring multiple muscle locations at the same time. In some cases, the dysfunctional muscle are observed in the opposite side of the body from the reported location of pain. The dysfunctions include ongoing muscle activity after contraction during the relaxation period (the subject thinks/feels the muscle has relaxed even though it has not) and significant amplitude differences between the right and left muscles while performing the similar tasks. sEMG biofeedback training is usually used to normalize muscle function. Although SEMG feedback can be successful in teaching clients to relax the muscle, in some cases, the client has difficulty relaxing the muscle after tightening. In those cases, a somatic therapy such as pandiculation is an effective complementary technique to normalize muscle activity within a few minutes. The integration of SEMG assessment and training with pandiculation is illustrated through a clinical case example of a 50 year old female translator who had suffered 30 years of headaches and 20 years of severe left shoulder pain. After assessment she could not relax her trapezius muscle with SEMG feedback however with pandiculation she could relax her trapezius muscle after tightening. This integrated approach allowed her to sense the muscle pattern by which she changed her work style and significantly improved her health and reduced her pain.

## The Polyvagal Theory: Demystifying the Link Between Social Behavior and Health

Stephen Porges, USA

Email: [sporges@gmail.com](mailto:sporges@gmail.com)

The Polyvagal Theory provides a new perspective to explore how autonomic nervous system function relates to social behavior, emotional regulation, and health. The Polyvagal Theory links the evolution of the autonomic nervous system to affective experience, emotional expression, facial gestures, vocal communication, and contingent social behavior. The theory, by being informed by the phylogeny of the autonomic nervous system, expands our understanding of normal and atypical behavior, mental health (e.g., coping with stress and novelty), and psychiatric disorders (e.g., autism, anxiety disorders, PTSD). The theory emphasizes that the core deficit in behavioral and affective regulation that is associated with several psychiatric disorders, especially disorders diagnosed in children, is related to neural regulation of the autonomic nervous system. By incorporating a developmental perspective, the theory explains how typical and atypical maturation and regulation of autonomic function forms the neural “platform” upon which social behavior and the development of safe trusting relationships are based. The theory explains how the nervous system evaluates risk in the environment, without awareness and often independent of a cognitive narrative, through a process labeled “neuroception.” Neuroception attempts to support adaptive behaviors by matching autonomic state with the neuroceptive state of risk (i.e., safe social environment, danger, and life threat). Abuse and trauma may reset neuroception to protect the individual



from others when there is no “real” danger resulting in defensive and often aggressive responses to friends and caregivers.

The presentation will have four objectives: 1) to provide an explicit statement of the Polyvagal Theory, 2) to illustrate how a Polyvagal perspective provides insights into the clinical assessment and treatment of several clinical conditions, 3) to describe a face-heart connection that defines a social engagement system that links our bodily feelings with facial expression, vocal intonation, and gesture, and 4) to describe how “faulty” neuroception is associated with mental health problems.

## **Cognitive Functioning in Elders: Could the GSR Be a Reliable Marker of Memorization, Rememorization and Learning?**

**Carlo A. Pruneti, D. Sgromo, & C. Cosentino, Italy**

*Email: [carlo.pruneti@unipr.it](mailto:carlo.pruneti@unipr.it)*

**Abstract:** Actually there are only a few studies in elderly psychophysiological assessment. As the GSR has a straight relationship with activating tasks such as mental stress, and given that the Yerkes-Dodson law suggests that moderate stress can lead to a cognitive activation with beneficial effects on memory and attention tasks, we tested the hypothesis that people with a good brief arousal during and immediately after a mental stress task would have better performance in some brief neuropsychological tests than people with a pattern of low GSR arousal. Thus the aim of the study is to evaluate if the supposed difference in basal activation can be a reliable marker of a better cognitive performance before and after a series of sessions of reminiscence therapy. Preliminary data will be reported and discussed.

## **Heart Rate Variability: What if Mind-Body Integration Lies in a Breath?**

**Carlo A. Pruneti , Ph.D, Chiara Cosentino, & Domenico Sgromo, Italy**

*Email: [carlo.pruneti@unipr.it](mailto:carlo.pruneti@unipr.it)*

**Abstract:** Will discuss State of the Art use of the physiological index Heart Rate Variability, the changes in the time intervals between consecutive heartbeats (Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology, 1996). In healthy conditions, it reflects the dynamic balance between Sympathetic Nervous System (SNS) and Parasympathetic Nervous System (PNS) on Heart Rate (Shaffer & Venner, 2013). The influence of PNS on HRV implements through the Vagus Nerve, which allows the physiological mechanism of Respiratory Sinus Arrhythmia (RSA). The HR oscillations change in correspondence of breathing; in particular they should be systematically increased during relaxed states and decreased in stress phases. HRV can serve as signal markers for various physiological or pathological events such as unplanned readmission for geriatric patients, infections in critically ill patients and risk of myocardial infarction.

The relation of HRV and specific pathologies has been shown in chronic illnesses, in which a higher vagal tone, registered through HRV, controls the activation of the anti-inflammatory reflex, acetylcholine mediated. Moreover, in patients with cardiac diseases and chronic kidney diseases, there is a significant negative correlation between HRV and inflammation. Also in cancer, some evidence of the influence of PNS activity on cancer prognosis have been reached. There is evidence that a higher HRV is significantly associated to survival. It is possible to deal with HRV, enhancing PNS activity. Physical activity has proved to be a good instrument to improve HRV. Moreover, in a randomized trial on healthy subjects, HRV biofeedback through abdominal breathing induced a short term carry-over effect during both the rest period and laboratory induced stress.

## Biofeedback in the Prophylactic Treatment of Chronic Migraine with Drug Overuse: A Randomized Study-Preliminary Results

Marialuisa Rausa 1 2, Daniela Palomba 2 3, Anna Franco, Sabina Cevoli1, & Giulia Pierangeli, Italy

*Email: m.rausa@gmail.com*

**Abstract:** Chronic migraine with drug overuse is a major clinical concern and a common health risk. The purpose of the study was to evaluate in a randomized controlled, single blind, trial the effects of biofeedback associated with traditional pharmacological therapy, in the prophylactic treatment of chronic migraine with drug overuse. 24 subjects were randomized to biofeedback associated with pharmacological therapy (Bf+Ph), or to pharmacological treatment alone (Ph). The principal outcomes were: a) number of headache days, b) analgesic intake per month before (T1) and after (T2) treatment in both groups. Coping strategies in pain management were also evaluated by means of the Pain Related Self-Statement Scale-PRSS, and Pain Related Control Scale-PRCS. ANOVA were performed on all the variables of interest. Results showed significant reduction at T2 in headache frequency ( $F[1,22]= 11,771$  ;  $p= ,002$ ) and analgesic intake ( $F[1,22]= 4,753$  ;  $p= ,041$ ) in the Bf+Ph group only. Moreover, ANOVA on coping questionnaire's results showed significant increase in coping at T2 in Bf+Ph group.

**Conclusions:** Biofeedback added to traditional pharmacological therapy in the treatment of chronic migraine with overuse is a promising approach in order to reduce the headache frequency and analgesic intake. Modification of coping cognitions in Bf+Ph group needs more evaluations to understand the role of biofeedback in changing coping skills.

## On the Collection, Integration, and Analyses of NeuroBiofeedback and Psychometric Instrument Data for the Purpose of Personal and Professional Development: Issues and Insights

Al H. Ringleb & Christopher Ancona, Italy

*Email: ringleb@cimba.it*

**Abstract:** In this era of “big data,” large databases, the methods for integrating diverse information sources ranging from psychometric to neurobiofeedback data and then used for the purpose of personal and professional development are very limited, and perhaps non-existent. More specifically, CIMBA is unaware of the existence of any such database in use to assist in developing coaching intervention strategies in a business context – despite assertions by that profession of being “data-driven.” Built upon a highly-sophisticated IT infrastructure across computer, web, and mobile environments, CIMBA is constructing and implementing such a database using psychometric data (NEO®, MSCEIT®, FIRO-B®, Strengthfinders®, and others), digital assessment data (MyBrainSolutions® and others), hormonal data (cortisol, testosterone, dHEA, and others), neurobiofeedback data (brainwaves, heart-based metrics, breathing, and skin temperature), and data drawn from personal performance devices (FitBit® and others). This data integration allows for the statistical analyses of data gathered from multiple sources in both “paper-based” (often computer administered) and experiential test conditions, generating a variety of interesting insights directly and indirectly affecting the personal development experience. Use of wireless neurobiofeedback technology in experiential testing environments has allowed for “real world” measures of such fundamental personal development variables as resilience and empathy. As advances are made with evolving data collecting technology and infrastructure, we expect to be able to shed light on many issues between neuroscience and psychology.

## **The Role of Biofeedback in Cocaine Addiction Treatment**

**Barbara Santini, Ph.D, Benato Sara, Andrea Pasetto, Gianandrea Perego, Roberta Setti, Federica Turri, Franco Baldini, & Loredana Pagliarani, Italy**

*Email: [barbara.santini@univr.it](mailto:barbara.santini@univr.it)*

**Abstract:** Biofeedback (bfb) has been used since the past century to treat addictions. It has been useful to manage stress and anxiety disorders in methadone takers (Brinkman 1978). The presentation describes a new integrated cognitive-behavioral protocol and the treatment of cocaine addiction which incorporates biofeedback with 25 patients. The results show a decrease in helping craving symptoms, an increase in coping abilities and self control, an increase in recognition of emotions (in case of alexithymia). The results showed that biofeedback was very useful as a complementary tool for the treatment of addiction.

## **Neurofeedback Treatments Enable the EEG-Normalization and Total Seizure Control of Epilepsy – A Case Study**

**Rivi Sela & Meirav Shaked Toledano, Israel**

*Email: [rivi.sela@braingames-israel.com](mailto:rivi.sela@braingames-israel.com)*

**Abstract:** Over the past 40 years, researchers have examined various non-drug approaches to the treatment of epilepsy. Neurofeedback is an approach that has been proven efficient in reducing seizure frequency. Our experience in treating children and adolescents with epilepsy shows that QEEG guided amplitude training enables one to reach total elimination of seizure activity in a relatively short time (3-5 months of training). In addition, our patients' EEG, which before treatment included numerous appearances of spike & wave complexes, was sampled again towards the end of treatment and was found to be normal (with no spikes and discharges). The case study presents two cases of epilepsy patients who were treated with QEEG guided neurofeedback at our clinic. Both of them experienced total cessation of seizures at an early stage in the treatment and displayed substantial behavioral and cognitive improvement during the course of treatment. Both patients displayed a normal EEG at the end of the treatment. The cases described in this case study support the assumption that neurofeedback treatments enable the EEG-normalization and total seizure control of epilepsy patients who do not respond (or only partially respond) to anti-convulsant medicines. Many of these patients do not have an epileptic focus, and therefore are not considered suitable candidates for neurosurgery. Other alternatives are expensive and have low efficiency. These results lend support to the idea that tailoring the neurofeedback treatment protocol specifically to each individual patient by doing QEEG tests improves treatment quality and precision in a way which enables the achievement of full control over seizures and full EEG-normalization.

## **SEMG, A Fun and Useful Tool in Muscular Dysfunction Investigation and Rehabilitation**

**Gabriel E. Sella, USA**

*Email: [paris10@aol.com](mailto:paris10@aol.com)*

**Abstract:** SEMG is an instrument that can be understood best in terms of the appearance and function of a Swiss army knife: it is compact, one piece, easy to carry and it has multiple essential tools attached. It endeavors to assess and measure normal muscular activity and

resting amplitude potentials. It verifies the veracity of those potentials in a variety of fields such as ergonomics, athletics, health and disease as well as in the forensic field. It assesses different aspects of muscular dysfunction including dysponesis, hypertonus, hypotonus, spasm, fasciculations, co-contraction and co-activation, loss of bilateral functional symmetry and inability to rest/relax. SEMG can be utilized successfully in overall muscular biofeedback in conjunction with all other biofeedback modalities. It is particularly useful in muscular rehabilitation for soft tissue injuries and any re-education aimed at optimizing muscular function. The author utilizes the SEMG investigation and rehabilitation procedures on well established protocols based on a database of 4800 muscles.

## **Evaluation of the Efficacy of Neurofeedback Training Compared with Traditional Approaches for Children With Autism**

**Sobaniec Piotr, Milena Żochowska, & Magdalena Cholewa, Poland**

*Email: [piotr.sobaniec@umb.edu.pl](mailto:piotr.sobaniec@umb.edu.pl)*

**Abstract:** Many various methods are used to improve the functioning of autistic children. This presentation is based on our results of the evaluation of the efficacy of neurofeedback training, compared with traditional methods including pedagogical, cognitive, behavioral and hippotherapy for young children with autism. Furthermore, we summarized subtypes of brain dysfunction and endophenotypes seen in this group of children and put a proposal of possible neurotherapy based on quantitative EEG analysis (QEEG).

This study included a group of 27 patients, diagnosed with autism (ICD-10), at age 4 - 13 years, hospitalized in the Department of Developmental Neurology and Rehabilitation at the Medical University of Białystok, Poland. Each patient received the initial and final assessment including psychological, neurological rehabilitation, speech therapy, EEG with its further quantitative analysis and surveys: The Autism Treatment Evaluation Checklists (ATEC) and author's.

Using a repeated baselines design, patients were divided into two matched groups. The first started with Intervention #1 including 40 sessions of traditional approaches such as: pedagogical and behavioral intensive treatment, hippotherapy and after their completion Intervention #2 - 40 sessions with neurofeedback training were conducted. In the second group therapy begins with Intervention #1: neurofeedback training and upon its completion Intervention #2 with pedagogical, behavioral and hippotherapy will be carried out. To evaluate the efficacy of neurofeedback training, we administered EEG, QEEG compared to a normative database and surveys at the outset and after each intervention.

## **Resonant Frequency Breathing for Stress Management and Increased Heart Rate Variability for University Students**

**Katie Steck, Louise Fidalgo, Barbara Morrell, & Patrick Steffen, USA**

*Email: [katie.steck@gmail.com](mailto:katie.steck@gmail.com)*

**Abstract:** This study builds on the research on resonant frequency (RF) breathing of Yvgeny Vaschillo, Paul Lehrer, Richard Gevirtz and others. They used heart rate variability (HRV) biofeedback to determine the rate of breathing between 4.5 and 7.0 Breaths-per-Minute (BPM) at which an individual achieves autonomic balance. A sample of 25 university students were given the Trier Social Stress Test (TSST). To assess physiological reactivity and recovery their blood pressure and heart rate were measured. Their RF BPM was estimated using both the PPG and ECG method. They were instructed to practice breathing at their RFBPM 20 minutes a day for 4 weeks. The findings show that:

1) Thirty-nine percent of the sample accurately guessed their RF BPM and 71% guessed within .5 BPM and were accurate in one biofeedback session ( $R = .82$   $p < .001$ ); the PPG measure of RF BPM correlated .85% with the ECG measure ( $P < .001$ ), with practice students were able to breathe at their RF BPM without a pacer ( $R = .80$ ,  $P < .001$ ); most individuals demonstrated increased HRV at follow-up; and students reported that RF breathing was helpful in managing stress.

The results of the 4 week follow-up retest of the TSST showed that systolic blood pressure decreased ( $p = .05$ ) and females on average had decreased heart rate and males on average had an increased heart rate. This research indicates that RF breathing is a promising technique for use with normal young adults to manage stress and protect heart health.

### **Neurofeedback = operant conditioning? What We Can Learn From Learning Theory in Order to Establish (optimize) Neurofeedback Protocols in Practice and Research**

**Ute Strehl, Germany**

*Email: [ute.strehl@uni-tuebingen.de](mailto:ute.strehl@uni-tuebingen.de)*

**Abstract:** In nearly every publication NF is defined as a treatment approach that aims at self-regulation of brain activity by operant learning. This is correct but not sufficient. Mechanisms of classical conditioning as well skills learning are involved, too. The impact of these paradigms on the development of a protocol and the evaluation of existing protocols will be discussed.

### **QEEG-neurometric Analysis Guided Neurofeedback (NF) Treatment in Dementia: 20 cases. How Neurometric Analysis is Important for the Treatment of Dementia as Well as Diagnosis**

**Tanju Surmeli, Ayben Ertem, Ismet H. Kos, & Emin Eralp, Turkey**

*Email: [neuropsychiatry@yahoo.com](mailto:neuropsychiatry@yahoo.com)*

**Abstract:** Dementia is characterized by a loss of cognitive function. Dementia patients may have co-morbid mood problems, sleep problems, or agitation. They may need additional psychotropic drugs to address these problems. Therefore, an effective non-drug alternative would be very useful in this population that not only treats the cognitive symptoms but the co-morbid symptoms associated with this disorder. In this study, we wanted to show the outcomes of a clinical case series using QEEG in the assessment and NF in the treatment of dementia. We studied 20 patients (9 male and 11 female). Before coming to our center, almost half of the subjects were on or had taken an anti-dementia drug and some of the subjects were on more than one psychotropic medication the most common being the concurrent use of an antipsychotic and an antidepressant. Evaluation measures included drug free QEEG analysis with the F.D.A approved Nx-LINK data base, the Mini Mental State Exam (MMSE), Clinical Global Impressions scale (CGI), Neuropsychological tests, and interviews with the patient's family. Our hypothesis was that neurofeedback treatment targeted towards normalizing the deviations from norms seen in the QEEG would be the most beneficial treatment for this group. All the subjects showed improvement based on the CGI, Mini Mental State Exam, and in interviews with the patients' families. This is a study provides the first clinical evidence that NF treatment can produce improvements in patients



with Alzheimer's Disease and Vascular Dementia. It is recommended that further controlled studies with additional outcome measures to be conducted.

### **A Large Clinical Study on Medication Failure in Refractory Cases: EEG/qEEG Findings Provide Evidence and Direction**

**Ron J. Swatzyna, USA**

*Email: [dr.ronswatzyna@yahoo.com](mailto:dr.ronswatzyna@yahoo.com)*

**Abstract:** In psychiatry, the reliability of diagnosis (a symptom-based approach) is key to selection and management of medications and treatments. The National Institute of Mental Health (NIMH) is now searching neurobiological measures that account for observed and reported symptoms. The results of our study of 386 refractory clinical cases suggest there are four neurobiological measures that account for medication failure: encephalopathy, focal slowing, beta spindles and transient discharges. One or more of these neurobiological measures which we call neurologic biomarkers explained medication failure in each of these refractory cases. The Fischer's Exact Test and logical regression statistical techniques were used to analyze the data. There was very little association (6%) was found between psychiatric diagnoses and neurologic biomarkers; however, for children and adolescents there was a positive correlation between total neurologic biomarkers identified and numbers of medications prescribed. In adults, there was a positive correlation between comorbidity and number of medications. This study represents a model that could improve the efficacy of the psychotropic intervention and treatment selection in refractory psychiatric cases.

### **Addiction in the 21st Century: EEG Profiling of Internet/Digital Addiction**

**Mari K. Swingle, Canada**

*Email: [mswingle@swingleclinic.com](mailto:mswingle@swingleclinic.com)*

**Abstract:** In private practice, excessive use of Internet/(digital media) is rarely reported at intake. For many clients however, excessive usage is central in the development and maintenance of the primary disorder or symptom for which the individual is seeking neurotherapeutic services (e.g., ADHD, anxiety, depression, CD, ODD, insomnia, memory, marital conflict, etc.). Debate is currently centered on whether Internet Addiction (IA) is a discrete disorder, a co-morbid disorder, or a behavioral manifestation of a clinical or a subclinical disorder. This study, examined 19 site QEEG and 5 point Clinical Q's of 30 adults with Internet Addiction. Findings of the 19 site QEEG's indicate that IA follows a deregulation pattern rather than a cluster pattern implying that any neurometric variation is a liability to the disorder. Further magnification of the data revealed a pattern of central deregulation in slow frequency wave lengths. Data from the Clinical Q revealed distinct patterns associated with emotional deregulation (40%), high frontal Alpha ADHD (89%), anxiety (100%) and compulsive perseveration (66%). Data collected on qualitative differences in Internet usage indicate that the severity of neurological deregulation is associated with the perceived degree of immersion with the technology. Findings on patterns of sexual and social interaction, creative process, gender, age and sexual orientation will also be presented.

### **From Coronary Stenting to Psychophysiological Rehabilitation - Model of Psychophysiological Interventions for Cardiac Patients**

**Ralph Sztembis, Poland**

*Email: [rsztembis@gmail.com](mailto:rsztembis@gmail.com)*

**Abstract:** Thousands of people a year undergo myocardial infarction. In most developed regions of the world it is treated with primary coronary intervention. Though intervention itself and pharmacological treatment are well established and recognized by medical associations and developed within the model of evidence based medicine, still little place is left for psychological support and psychological interventions among those patients. Meanwhile anxiety, depression, stress or post-traumatic stress disorders are common among those patients and largely influence their lives, quality of lives, drug and treatment compliance. The presentation discusses the author's experience and original solutions in the field of psychological support for patients after myocardial infarction. The model is mainly developed for patients aged 40 - 65 who still want and can come back to work after cardiac event. The model is based on concepts of: health psychology, mind-body medicine, self-regulation and biofeedback. The model comprises original concepts of:

1. in-hospital computer based early education-intervention program,
2. concept of "awaking motivation for health",
3. concept of "chest-shift-attention model" as clue for minimizing risk of anxiety disorders and myocardial infarction related stress problems,
4. website-based on-going support of positive changes in life.

The model has been practiced now for over 2 years and proved to be effective in reducing number of anxiety problems by 50 to 60%, reducing number of unnecessary visits to emergency room by 80%, improving quality of life and therapeutic compliance. Within years of practice many simple biofeedback-based techniques have been tested among cardiac patients.

### **Concussion Hits Hard: Recovery from the Multiple Effects of Concussion - Requires Interventions be Based on an Appropriate Multimodal Assessment**

**Lynda Thompson & Michael Thompson**

Email: [addcentre@gmail.com](mailto:addcentre@gmail.com)

**Abstract:** Assessment of the patient who has suffered a concussion should be first carried out by a knowledgeable medical specialist. Unfortunately this is too often done with testing that is unlikely to detect damage that underlies the symptoms that the patient is experiencing. MRI, PET, and CAT scans often show no abnormality. In addition, traditional rehabilitation often meets the criteria of conservative do no harm but may do little to remedy the deficiencies caused by minimal to moderate injury. This presentation will suggest a methodology for efficient and accurate assessment that can lead to effective intervention. The EEG and evoked potentials (ERP) can reveal the effects of damage elicited by stretching and twisting of axons, called diffuse axonal injury (DAI). The evoked potentials are particularly important for reflecting brain speed. Traumatic brain injury (TBI) will often have a negative impact on the right and/or left insula which, in turn, relates to changes in heart rate variability. Thus concussion assessment should measure QEEG, ERPs, HRV, and, using continuous performance tests, measure attention, impulsivity and variability of response time. This should be combined with neuropsych testing, in particular for short and long term memory, attention span, impulsivity and questionnaires regarding medical health, depression, and anxiety. When available, balance assessment of vestibular function with a 'force-plate' can be helpful. All this can be accomplished in a half-day assessment, which will be described. Extended biochemical assessment can be added and this can lead to appropriate dietary and supplement interventions. This presentation will review some of the literature on TBI and the connection to cardiac problems. It will then outline the neuroanatomical underpinnings regarding why, how, and with what effect, LORETA z-score

35

NFB can be used in conjunction with some combination of HRV training, transcranial direct current stimulation (tDCS), passive infra-red feedback (pIR), and metacognitive strategies, in addition to dietary interventions, to bring a client back to high level functioning. The theoretical aspects of this presentation will be supported by case examples: a Ph.D candidate in artificial intelligence, an author, a graduate student in finance, and an athlete.

## **Comparison of Eurythmy Therapy and Heart Rate Variability Biofeedback to Reduce Stress in Nurses - A Randomized Controlled Trial**

**J. Vagedes, A. Ranger, E. Helmert, A. Meule, & A. Kübler, Germany**

*Email: Vagedes@arcim-institute.de*

**Abstract:** A high tonic heart rate variability (HRV) is associated with physical and mental well-being. However, a low HRV is associated with autonomic dysregulation and physical and mental illness. By heart rate variability biofeedback (HRV BF), HRV can be increased and thus improve the state of health. Other methods can also help improve HRV, e.g. Eurythmy therapy (EYT), an anthroposophic movement therapy. In the present study a group of female hospital nurses, health professionals who are particularly prone to stress, participated in a six-week training course. Half the participants (n = 12) completed a 15-minute daily HRV BF session (HRV BF group), the other half (n = 12) did the EYT exercises (EYT group). Before and after the intervention period, the subjective well-being of the subjects was measured by means of a battery of questionnaires (Maslach Burnout Inventory, MBI; Short Form 12 Health Survey, SF-12; Trier Inventory for chronic stress, TICS; Center for Epidemiological Studies Depression Scale, CES-D; Pittsburgh Sleep Quality Index, PSQI). Physiological parameters (HRV) were calculated from a resting heart rate measurement. The TICS showed a decrease of perceived stress. In the PSQI subjects reported improved sleep quality. These improvements were reported in both intervention groups, but the TICS gains were clearer with the EYT group. The MBI demonstrated a decrease in burnout symptoms in the HRV BF group. The CES-D showed a decrease in depressive symptoms in the HRV BF group. The SF-12 showed no change. An increase in HRV was lacking. Both HRV BF and EYT can be considered as promising approaches in terms of workplace health promotion. To clarify the underlying mechanisms, further research is needed.

## ABSTRACTS FROM BFE VENICE MEETING - POSTERS

### Neurogaming: Take Control of the Mind, and Have Fun Doing It

Simona Carniato, Italy & Mervyn Etienne, United Kingdom

*Email: [simonacarniato@gmail.com](mailto:simonacarniato@gmail.com)*

**Abstract** Neurofeedback or EEG Biofeedback is the real-time feedback process of aspects of electrical activity generated in the brain that is facilitated by a brain computer interface (BCI). It is long and well established that it is possible for humans to self-regulate aspects of their EEG through biofeedback and operant conditioning and to positively affect, state and behaviour.

The poster gives a brief description of the history of neurofeedback and key studies that have been the foundations for the field. We develop some of the background behind the key studies, and the neurobiology behind the neurofeedback training process. It explores how neurogaming is an opportunity to take control of the mind, and have fun doing it. We look at a wide variety of brain-computer-interface devices, and applications for clinic and performance, considering opportunities and challenges.

### The Relationship Between Anger Rumination and Autonomic Nervous Reaction in Older Adults

Y. J. Chen, , C. F. Chen, S. Y. Fan, , J. S. Tsai, , & I.M. Lin, Taiwan

*Email: [psyiml@kmu.edu.tw](mailto:psyiml@kmu.edu.tw)*

**Abstract** Previous studies had found that anger rumination increased heart rate, blood pressure and peripheral vasoconstriction. Sympathetic hyperactivity or parasympathetic withdrawal are taken as the psychopathological mechanism in anger and illnesses. This study was to examine the relationship between anger rumination and autonomic nervous reaction. Thirty-three healthy adults were enrolled in this study, average age of 65.39 years (SD = 9.89). The anger rumination scale was completed and electrocardiogram was monitored under the following sequences: baseline, neutral recall, neutral recovery, anger recall and anger recovery. The results showed that people with low anger rumination (low AR group) have higher LF and higher HF trend than people with high anger rumination (high AR group) at baseline ( $t = 2.06$ ,  $p = .05$ ; and  $t = 1.92$ ,  $p = .07$ ); as well as the low AR group had higher HF in anger recall stage ( $t = 2.41$ ,  $p = .02$ ) and higher LF trend in anger recovery stage and higher LF trend in anger recovery stage ( $t = 1.77$ ,  $p = .09$ ) than the high AR group. The study confirmed that anger rumination was related to autonomic nervous reaction. People with low anger rumination have higher parasympathetic reaction and cardiac autonomic regulation than people with high anger rumination.

### Effects of Heart Rate Variability Biofeedback Training on Emotion Dynamics in Healthy Participants: A Pilot Study

Cristina Campillo Costoya, André Schulz & Claus Vögele, Luxembourg

*Email: [Cristina.Campillo@uni.lu](mailto:Cristina.Campillo@uni.lu)*

**Abstract:** This pilot study investigated the effects of Heart Rate Variability Biofeedback (HRV BF) on affective state and emotion dynamics in healthy individuals. Several studies suggest higher HRV to result in a greater potential for regulation of affective states. Eight healthy volunteers participated in 7 weekly sessions of HRV BF training. ECG electrodes were placed on the participant's chest and respiration was recorded by two strain gauges placed around the thorax and the abdomen. Subjective reports and HRV measures were assessed pre- and post-intervention. The purpose of the first training session was to assess each participant's resonant frequency, according to the protocol described by Lehrer et al. (2000). The procedure consisted first of the participant breathing for 2 minutes at each of 7 specific frequencies (7.5, 7.0, 6.5, 6.0, 5.5, 5.0, and 4.5 breaths per minute) in order to determine personal resonant frequency. In the following 7 sessions, participants were then given biofeedback for 20 min divided into four five-minute training periods. Participants were instructed to breathe in phase with heart rate changes, with the goal of increasing the amplitude of HRV. Participants showed an overall reduction in negative mood after the intervention compared to pre-intervention levels, and both lower negative and positive affect after each training session. Resting HRV (total HRV, Low-Frequency HRV) increased significantly in response to the intervention. The present pilot study showed improvement in emotion dynamics over 7 training sessions with HRV biofeedback in healthy participants, suggesting that this intervention protocol is suitable for a larger controlled trial.

### **Psychophysiology of Job Risk Sensitivity**

**Crocetti, Italy, B. Corsale, Italy, A. Iacuzzi, Italy, L. Moroni, Italy,  
D. Pierini, Canada & G. Bertolotti, Italy**

Email: [a\\_crocetti@tiscali.it](mailto:a_crocetti@tiscali.it)

**Abstract:** Risk sensitivity and reaction to possible job environment dangers depends on many factors. One of them could be an optimal level of arousal related to the incoming stimulus. In this study we assessed subjective general risk sensitivity and subjective job risk sensitivity in two groups (n. 20 subjects per group) attending a school in the field of construction industry: a) students engaged in three months education training on risk prevention in working setting; b) workers also attending to a similar training (duration: one month and a half). Assessment has been done using a specific questionnaire and psychophysiological stress profile. These measures were administered before and after a term of three months, when subjects attended to the cited training.

Results, obtained through a statistical analysis of questionnaire's answers before and after training, pointed out that workers have developed during the experience a good risk sensitivity (pre post difference  $p < 0.01$ ). Students increased their attention to general risk behaviors ( $p = 0.01$ ), but not about risks in job environment. The inter group comparison showed differences in general risk perception.

Psychophysiological stress profile revealed during the rest period a lower arousal condition in the workers-group, more useful to cope with the environmental stimulus, since students group was more activated; this difference was maintained during stress and recovery period. Stress reactivity was improved in students by the training experienced in those three months: compared to pre training values, post psychophysiological measure was more suitable (lower), especially sEMG measure ( $p < 0.01$ ).

We can conclude that workers have good risk sensitivity, related to an arousal fit for cope with stimuli. Even if after the training workers were again in a better psychophysiological condition, students developed an enhancement thanks to the training.



## Design of Direct Audio Feedback for Heart Beat and Heart Beat Variability

Loe Feijs, Mathias Funk, & Bin Yu, Netherlands

Email: [l.m.g.feijs@tue.nl](mailto:l.m.g.feijs@tue.nl)

**Abstract:** We previously presented alternative presentations of HRV feedback based on real-time Poincaré plots, which offer a faster and more direct feedback of heart rate variability than other approaches. We take a design perspective in creating biofeedback systems, which empower their users in matters of health and wellbeing, for instance, in coping with stress. In 2011 we discussed the relative advantages (more direct and faster feedback, more precise patterns visible) and disadvantages (lower outlier robustness and narrative adaptability) of real-time Poincaré plots. Now we ask ourselves whether a similar effect could be reached using the auditory modality rather than the visual. The main envisioned advantage is that feedback sessions can be done with the eyes closed and leaning back, which we assume is an excellent condition for relaxation. Our way of working is to develop experiential prototypes and explore the functional, aesthetic, and perceptive qualities of the feedback – with an emphasis on the form giving. Using a PPG sensor and the Processing programming environment we created a prototype, in which four variations of direct auditory feedback are implemented (besides visual forms such as traditional tachograms and real-time Poincaré plots). In each of these forms the aim is to map timing variations of the heart-beats to timing or dynamic variations of the sound. The motivation for this is the design principle "natural mapping", which would be violated when mapping timing information to more qualitative aspects of sound (texture, frequency spectrum, filtering) rather than frequency or amplitude, for example. Results on the effectiveness of the design propositions are not available yet. However, we shall demonstrate and discuss them, and in doing so we look forward to share our work with members of the BFE community and hear their opinion.

## Stress Reactivity and Psychotherapy Outcome

Louise Fidalgo & Patrick Steffen, USA

Email: [louise.fidalgo@hotmail.fr](mailto:louise.fidalgo@hotmail.fr)

**Abstract:** Physiological stress reactivity is related to psychotherapy outcomes. PTSD patients who respond positively to cognitive behavior therapy show decreased heart rate reactivity in response to trauma cues. Psychiatric patients who showed less physiological stress reactivity before therapy had significantly better treatment outcomes at the end of therapy, suggesting that psychotherapy outcomes are negatively impacted by high stress reactivity. It is not known, however, how physiological stress reactivity is related to outcome in general psychotherapy patients. The purpose of the present study was to examine if physiological stress reactivity at the beginning of therapy will predict psychotherapy outcome at the end of therapy. We hypothesized that patients reporting higher levels of distress would have higher levels of physiological stress reactivity compared to less distressed psychotherapy patients, which would contribute to their lack of success in therapy. To test this hypothesis, we measured the physiological stress reactivity (respiration, heart rate variability, blood pressure and cortisol levels) of patients beginning psychotherapy using the Trier Social Stress Test (TSST). Our results show that on the Outcome Questionnaire OQ-45, red responders (patients whose distress score significantly go up after baseline) showed slower systolic blood pressure (SBP) recovery on the TSST ( $F=3.101$ ,  $p=.018$ ). Our results also show that patients scoring high on the OQ-45 (above 63) have higher levels of heart rate and SBP ( $F=3.804$ ,  $p=.006$ ) and take more time to reduce their stress levels during the recovery period compared to less distressed psychotherapy patients. In conclusion, we propose that stress-reducing techniques such as biofeedback will provide a useful adjunct to

39

psychotherapy and will help improve the psychotherapeutic experience and the outcome of these patients.

## **Hemoencephalography: A Practical Approach to Neurofeedback Training**

Ralph Warnke & Christel Kannegießer-Leitner, Germany

Email: [kannegiesser-leitner@web.de](mailto:kannegiesser-leitner@web.de)

**Abstract:** For many years, Neurofeedback has been facilitated primarily as a long-term weekly training. The reasoning for this treatment structure was that the brain needed time to allow for a transition of the learning process into the daily routines; on the other hand the healthcare systems stipulate weekly trainings by professionals with their given structure.

While previous studies with ADD/ADHD patients suggest a good overall result after 30 to 40 training session, client motivation often suffers more on more with long lasting training. In order to provide an alternative, more appealing and likewise effective variant of training, a compact crash HEG-based neurofeedback training was designed. For one week, the client undergoes intensified training, practicing HEG-neurofeedback three times per day. This routine is repeated 2 to 3 times, depending on the individual client's needs and level of improvement, leading to about the same amount of training time packed into three intensive training weeks.

This compact training has the advantage that children apparently are capable of better performance from one session to the next with greater ease. Presented based on several sample cases (including children with ADD/ADHD, dyslexia, dyscalculia and lack of concentration), the effects of such a compact and intensive training is presented.

**Client progress is being displayed based on changes in endurance, corresponding GAIN in the nIR-based ratio in % and the SPR (Second-Point-Ratio):** The SPR indicates just how well a client is capable of keeping his level of concentration up over an extended period of time. Dividing the training session duration by the number of points accomplished, this score is compared to the optimal score of 10, showing client improvement with ongoing training sessions in a matter of days. Both analysis and training conduct offer promising and strong additional options for effective and motivating training in patients with ADD/ADHD and related issues.

## **Self-Regulation of Slow Cortical Potentials: Insights from a Neurofeedback Study in Externalizing Patients**

L. Konicar, R. Veit, N. Birbaumer, & U. Strehl, Germany

Email: [lilian.konicar@uni-tuebingen.de](mailto:lilian.konicar@uni-tuebingen.de)

**Abstract:** Several studies on brain self-regulation demonstrated that healthy participants can learn to modify cortical activity volitionally via neurofeedback. In clinical disorders, neurofeedback can be used to allow communication in severely paralyzed patients, control hand prosthesis or to normalize the neuro-physiological mechanism that underlie the specific disorder, e.g. based on oscillatory or metabolic brain responses. Recent research used event related Slow Cortical Potential (SCP) neurofeedback in disorders with deficient regulation of brain activation. After SCP self-regulation training, symptom specific improvements were demonstrated for disorders associated with hyperactivation such as epilepsy or frontal hypoactivation such as Attention Deficit- / Hyperactivity Disorder (ADHD).

For ADHD related symptoms, like disinhibited, impulsive and aggressive behavior, Neurofeedback was as well frequently considered as a potential treatment, but it was only occasionally addressed without convincing results.

Based on successful neurofeedback studies in children with ADHD, a special SCP-training protocol for adults with externalizing symptoms was developed. Fourteen male psychiatric patients took part in two SCP-training phases (25 sessions in sum). During SCP-training, patients learned to increase and to decrease (inhibit) cortical excitability in a feedback (a graphical object was fed back to the patients' monitor) and a transfer (no feedback) condition.

The differentiation of SCP changes against baseline between trials requiring cortical negativity (increase of activation) versus positivity (decrease of activation) increased in both conditions across the whole training. Detailed analysis of differences in the learning progress, separately for the two training phases, as well as separately for the two conditions, reveal new insights in the process of self regulation and may facilitate future studies, tracking an optimization in neurofeedback training designs.

### **The Autonomic Regulation and Cardiac Vagal Control in Patients with Major Depressive Disorder**

**I. M. Lin, , S. Y. Fan, E. Peper, E., Z.C. Tang, , Y.C. Yeh, & C.F. Yeh, Taiwan**

*E-Mail: psyiml@kmu.edu.tw*

**Abstract:** Heart rate variability and respiratory sinus arrhythmia are the indices of autonomic nervous system (ANS) and cardiac vagal control (CVC) that are taken as markers of emotional regulation and physiological activity. This study examined the differences between patients with major depressive disorder (MDD) and non-MDD controls in ANS and CVC. In addition, this study also examined the associations between severity and subtypes of depression and the indices of ANS and CVC. A total of 77 patients with MDD and 69 non-MDD controls were recruited, there were no significant differences in age and gender. The electrocardiograph was collected under the depressive-induction task and positive-induction task and then transformed to the indices of ANS and CVC for 51 MDD patients and 57 non-MDD controls. The results showed that patients with MDD had higher dysregulation in the indices of ANS (higher heart rate and lower SDNN, LF, lnLF, lnHF) and CVC (lower lnRSA power and percentage of RSA) than non-MDD controls under all experimental stages. The severity and subtypes of depression were negatively related to the indices of ANS and CVC. This study verified the ANS and CVC dysregulations in patients with MDD; the associations between the severity and subtypes of depression and ANS and CVC. These results can be the theoretical basis for the clinical intervention program using the HRV or RSA biofeedback in the future.

### **The Relationships Between Four Frequency Bands of Respiration Rate and Heart Rate Variability**

**P. Y. Lin, I. M. Lin, L. Y. Tai, & H. C. Lu, Taiwan**

*E-Mail: psyiml@kmu.edu.tw*

**Abstract:** The previous study confirmed that the respiration rate is related to heart rate variability (HRV). This study investigated the relationships between four frequency bands of respiration rate in indices of HRV. A total of 166 participants were enrolled (mean age was  $59.17 \pm 12.12$  years), and respiration rate and HRV at resting were measured. Four

frequency bands of respiration rate were examined in HRV indices: Group1: lower than 9 breaths per min (bpm); Group 2: 9-16 bpm; Group 3: 16-24 bpm; and Group 4: higher than 24 bpm.

**The results showed that** there were negative correlations between respiration rate and indices of HRV in SDNN ( $r = -.29, p = .01$ ), LF ( $r = -.33, p < .001$ ), lnLF ( $r = -.34, p < .001$ ), and LF/HF ratio ( $r = -.32, p = .004$ ). There were higher LF in Group 1 than Group 3 ( $F = 4.04, p = .01$ ); as well as higher lnLF in Group 1 than Group 3 and 4, higher lnLF in Group 2 than Group 4 ( $F = 6.08, p < .001$ ). In conclusion, this study confirmed that people with slow breathing had higher cardiac autonomic regulation.

## **Heart Rate Variability Increases Respiratory Sinus Arrhythmia and Heart Rate Amplitude in Patients with Major Depressive Disorder**

**H. C. Lu, S.T. Huang, I. M. Lin, Z. C. Tang, & Y. C. Yeh, Taiwan**

[psyiml@kmu.edu.tw](mailto:psyiml@kmu.edu.tw)

**Abstract:** Previous studies confirmed the heart rate variability biofeedback (HRV-BF) can increase HRV and decrease depressive symptoms in patients with major depression disorder (MDD). The purpose of this study was to examine whether the HRV-BF increase cardiac vagal function and decreases depressive symptoms in patients with MDD. A total of 32 patients with MDD were assigned to the HRV-BF group ( $N = 19$ ) and the control group ( $N = 13$ ). Participants completed the Beck Depression Inventory II (BDI-II) and Beck Anxiety Inventory (BAI). The HRV-BF consisted of 60-min sessions weekly for six weeks, and the treatment effectiveness of respiratory sinus arrhythmia (RSA) and heart rate amplitude (as the indices of cardiac vagal function) were examined. The results showed that the heart rate amplitude (HRmax-min) increased significantly at post-test than at pre-test in HRV-BF group than that in control group ( $F = 4.98, p = 0.03$ ). However, The lnRSA increased slightly at post-test than at pre-test in HRV-BF group than that in control group ( $F = 3.57, p = 0.07$ ). In addition, the scores of BDI-II, and BAI were reduced significantly from pre-test to post-test in HRV-BF group than in control group ( $F = 6.12, p = 0.02, F = 6.44, p = 0.02$ ). In conclusion, this study confirmed that HRV-BF is a useful psychosocial intervention for improving cardiac vagal function, and decreasing depression and anxiety in patients with MDD.

## **Near-infrared Spectroscopy (NIRS) Neurofeedback as a Treatment for Children with Attention Deficit Hyperactivity Disorder (ADHD) - Preliminary Results**

**Anna-Maria Marx, Ann-Christine Ehlis, & Ute Strehl, Germany**

[anna-maria.marx@uni-tuebingen.de](mailto:anna-maria.marx@uni-tuebingen.de)

Attention deficit hyperactivity disorder (ADHD) is characterized by the main symptoms of inattention, hyperactivity and impulsivity. EEG feedback is a well-established treatment for children with ADHD, enabling the children to perceive and self-regulate their attention level as well as to gain control over hyperactive compulsive behavior. With the near-infrared spectroscopy (NIRS) feedback, a new method of neurofeedback was investigated. The study was designed to assess if NIRS feedback leads to changes in the ADHD symptomatology measured by parents ratings and a computer based attention task. NIRS is a method that measures the hemodynamic brain activity. Light in the near-infrared spectrum is absorbed to different amounts by oxygenated and deoxygenated hemoglobin allowing to determine

relative concentration changes. In the conducted NIRS feedback, oxygenated hemoglobin in the prefrontal cortex is measured and fed back. In a pilot study 9 children with ADHD, aged 7 to 10 years, took part in the NIRS feedback training. The training consisted of twelve sessions each with three blocks of NIRS feedback. The task was to increase or decrease the hemodynamic activity in the prefrontal cortex. Before and after the training main symptoms, comorbid symptoms and performance in a computer based attention task were measured. First results on main symptoms and attentions performance will be presented. These results will be a first step to evaluate NIRS feedback as a further treatment method for ADHD.

## **Autonomic Nervous System Activity In Response to Different Mental Stressors**

**Michal Mestanik, Zuzana Visnovcova, Andrea Calkovska, Michal Javorka, & Ingrid Tonhajzerova, Slovakia**

*Email: mestanik@gmail.com*

**Abstract:** Mental stress is considered as a common factor in etiology of the autonomic nervous system (ANS) dysregulation leading to various stress related diseases. Detailed study of the physiological stress reactivity is necessary for further understanding of the pathophysiological processes acting in the development of such diseases. The aim of this study was to study the reactivity of autonomic nervous system to various mental stressors in healthy young people.

**Methods:** The ECG and electrodermal activity (EDA) were continuously monitored in 40 students (20 women; age:  $22.9 \pm 0.1$  yr., BMI:  $21.7 \pm 0.4$ ) during rest (baseline), Stroop test (S1), rest, arithmetic test (S2), rest, negative emotion (S3) and rest. The EDA and heart rate variability (HRV) parameters: RR interval, spectral power in high frequency band (HF; cardiac vagal control); symbolic dynamics – 0V% (potential index of sympathetic regulation), 2LV% (parasympathetic activity) were evaluated for each 5-minute phase. The results showed a significantly shortened RR-interval (S1, S2:  $p < 0.001$ ; S3:  $p < 0.01$ ) and significantly lower logHF and 2LV% (both S2:  $p < 0.001$ ; S1, S3:  $p < 0.01$ ) in response to all stress tests compared to rest. The 0V% and EDA were significantly higher ( $p < 0.001$ ) in response to both cognitive stressors compared to rest. EDA significantly decreased after the negative emotional stimulus compared to stress period ( $p < 0.001$ ), and it remained significantly higher during all recovery phases compared to baseline ( $p < 0.001$ ). No significant changes were found in other parameters. In conclusion, this study confirmed a vagal withdrawal (lower logHF, 2LV%) to all stressors; however, a greater sympathetic excitation (increased 0V%, EDA) was found only in response to cognitive stressors. In contrast to HRV parameters, the electrodermal activity remained higher without return to initial values reflecting a potential sympathetic overactivity during complete stress profile.

**Acknowledgement:** Supported by Centre of Excellence for Perinatology Research (CEPV II 26220120036), VEGA No. 1/0087/14, VEGA No. 1/0416/12, grant UK/299/2013.

## **Is Neurobiological Model of Personality Associated with Heart Rate Variability?**

**Michal Mestanik, Zuzana Visnovcova, Milos Slepecky, Antonia Kotianova, Michal Javorka, & Ingrid Tonhajzerova, Slovakia**

*Email: mestanik@gmail.com*



**Abstract:** Cardiovascular system is extremely sensitive to regulation by autonomic nervous system. Malfunction of this regulation is often discussed in the association with mental stress. There is an empirical evidence about the interindividual differences (potentially influenced by personality type) in coping responses, stress impact and cardiovascular morbidity risk. Despite the evidence based medicine approach and individualized therapeutic trends, experimental findings about the interaction between personality traits and cardiovascular system regulation are still lacking. The aim of this research was to study a potential effect of subjective characteristics (temperament and character dimensions) on cardiac autonomic regulation assessed by heart rate variability (HRV) analysis.

**Methods:** We have examined 40 students (20 women, age:  $22.9 \pm 0.1$  yr., BMI:  $22.0 \pm 0.4$ ). The continuous ECG signal was recorded during 7-step mental stress protocol (Stroop test, mental arithmetic and negative emotional stimulus situated between four rest phases). Subjective characteristics (temperament dimensions: Novelty Seeking, Harm Avoidance, Reward Dependence, Persistence; character dimensions: Self-Directedness, Cooperativeness, Self-Transcendence) were assessed using Temperament and Character Inventory. Spectral power in high frequency band of HRV (reflecting cardiac vagal control) and normalized index of complexity (NCI; symbolic dynamics parameter indicating HRV complexity) were evaluated. The result demonstrated significant positive correlation between resting NCI and Cooperativeness ( $r=0.391$ ,  $p=0.015$ ). Spectral power in high frequency band of HRV showed no significant association with investigated personality traits. In conclusion, this study revealed significant effect of character dimension Cooperativeness on the complexity of heart rate regulation, that has not been observed so far. This finding can be potentially helpful in nonpharmacological therapy of stress related diseases.

**Acknowledgement:** Supported by Centre of Excellence for Perinatology Research (CEPV II 26220120036), VEGA No. 1/0087/14, VEGA No. 1/0416/12, grant UK/299/2013.

## **Patterns of Bioelectrical Resting Activity in Chronic Bilateral Tinnitus**

**R. Milner, M. Lewandowska, M. Ganc, I. Niedziałek, W. W. Jędrzejczak, & H. Skarżyński, Poland**

**E-Mail: rafal.milner@gmail.com**

Tinnitus is a phantom auditory perception occurring in the absence of external acoustic stimulation. The prevalence of tinnitus in world population is estimated at 10%, but neurootological mechanisms underlying this condition remain still unexplained. There is also a lack of objective method of tinnitus diagnosis and therapy. Quantitative electroencephalography (QEEG) is a technique that allows one to define specific resting-state bioelectrical brain activity patterns which may be useful in better understanding different dysfunctions related to abnormal functioning of central nervous system. It can also be used as an objective diagnosis tool and in planning Neurofeedback therapy of brain disorders. The aim of the study was to assess abnormal QEEG patterns in chronic bilateral tinnitus patients.

Twenty patients with bilateral tinnitus and fifteen healthy individuals with no tinnitus participated in the study. The study paradigm involved recording bioelectrical spontaneous brain activity in two 3min runs, one with eyes closed and one with eyes open. The EEG signal was registered at 19 electrodes and analysed using QEEG. Absolute power spectra of different frequency bands were calculated in each subject separately for each run.

Different bioelectrical resting state activity pattern was found in tinnitus patients, as compared to normal subjects. Quantitative analysis revealed greater power of 2-8 Hz waves

in temporal, fronto-temporal and occipital regions and reduced power of 4-8Hz waves in medial frontal areas in tinnitus patients. These effects were enhanced in eyes closed condition. In addition, in both conditions, patients had greater power of 8-12Hz waves in temporal-occipital and occipital brain regions. Interestingly, in patients, power of 12-25 Hz waves was found greater in the right temporal cortex with eyes closed and bilaterally reduced with eyes open.

The results indicated that the frontal and temporal brain areas may be potential generators of tinnitus. Defined QEEG patterns may be applied in objective diagnosis and planning Neurofeedback therapy for patients with bilateral chronic tinnitus.

## **A Combination of Cognitive Behavior Therapy and HRV Biofeedback on Patients with Anxiety Disorders: A Pilot Study**

**L. Moroni, B. Corsale, D. Pierini, A. Crocetti, A. Iacuzzi, G. Bertolotti, Italy**

*Email: [giorgio.bertolotti@fsm.it](mailto:giorgio.bertolotti@fsm.it)*

**Abstract:** Vagally mediated heart rate variability (HRV) has been proposed to be an index of cognitive and affective self-regulation. Negative emotions such as anxiety are related to reduced HRV and incoherent heart rhythm patterns whereas cardiac coherence refers to a high amplitude sinus-like heart rhythm characterized by increased vagal activity, and it is associated with a psychological state of a positive emotion. HRV biofeedback (BFB) devices display the heart rhythms in real time and are useful to teach patients to self-generate coherent oscillations in the heart rate. A combination of Cognitive Behaviour Therapy (CBT) and HRV biofeedback training could be effective in reducing symptoms of anxiety while increasing HRV and the ability to sustain cardiac coherence.

Three patients suffering from different severity degrees of anxiety disorders undertaken sessions of CBT integrated with HRV BFB training. Psychotherapist then provided patients with a portable biofeedback unit for home practice, to be used at least for two sessions of 5 minutes per day. At the beginning and the end of the training a registration without HRV BFB was done, together with diagnostic questionnaires assessing also level of anxiety. The results showed that at the end the treatment all patients showed an increase in the ability to sustain cardiac coherence over time, along with a sense of better control of their breathing. Moreover, questionnaires showed that patients' symptoms of anxiety have been reduced and that their wellbeing has been increased. The use of HRV biofeedback allows subjects suffering from anxiety to improve emotional and physiological self-regulation and could increase adherence to CBT treatment and final results.

## **The Added Value of Using Multiple Methods for the Evaluation of Mental Fatigue**

**D. Noreika, M. Baranauskas, I. Griškova-Bulanova, & R. Grikšienė, Lithuania**

*Email: [donatas.noreika@gmail.com](mailto:donatas.noreika@gmail.com)*

**Abstract:** Objective and reliable assessment of mental fatigue is a hard task due to the multidimensional nature of the phenomenon. The usefulness of different subjective, performance-based and physiological measures for evaluation of mental fatigue is being investigated. In the present study we incorporated different measures for fatigue evaluation during a mental rotation task. 49 subjects performed 4 blocks of mental rotation task (1600 pairs of figures and ~1.5 h of duration in total). Accuracy (percent of correct responses) and mean response times (RT) were the main performance-based measures. Subjective measures of fatigue, task aversion, motivation and boredom were rated on a visual analogue

scale 7 times during the experiment. Electrocardiogram (ECG) was recorded during the whole experiment. The results showed that with increasing time-on-task, mean RT tended to decrease and accuracy to increase, demonstrating a vivid practice effect, especially at the beginning of the task. At the end of the task, RT measures seemed to approach a plateau and accuracy measures began to decrease, showing a possible growing effect of fatigue. Subjective measures demonstrated a fairly stable increase of subjective fatigue, task aversion and boredom and decrease of motivation during the task. The increase in subjective fatigue was the largest among the four subjective measures. Heart rate (HR) decreased and heart rate variability (HRV) increased with time-on-task, possibly indicating a practice or adaptation effect. However, low frequency (LF) component of HRV, usually associated with involvement of sympathetic branch of ANS, tended to increase with time-on-task, suggesting an influence of fatigue. The study demonstrates the usefulness of incorporating many methods for the evaluation of mental fatigue, as these methods complement each other at grasping different aspects of the multifaceted fatigue phenomenon.

### **Drug Addiction Intervention for Adolescents with Religious Spirituality and Biofeedback**

**Muhammad Nubli Abdul Wahab & Urme Binte Salam, Malaysia**

*E-mail: [urmechy@gmail.com](mailto:urmechy@gmail.com)*

Religious spirituality (taubah, zikir and holy Quran recitation) and biofeedback devices (GSR & HRV) play a vital role in drug addiction treatment among teenagers. This study explored the effect of religious faith, spirituality and biofeedback in 36 drug addicted school students (aged 13-19) of Kuantan, Pahang in Malaysia. Participants were randomly assigned either to a training group ( $n = 18$ ) or control group ( $n = 18$ ). Religious spirituality significantly help to reduce the drug addiction in the active training group ( $\chi^2 (4) = 47.739, p < 0.001$ ), but not in the control group ( $\chi^2 (4) = 1.633, p > 0.05$ ). It was observed that high levels of religious faith and spirituality significantly effects to intervene the adolescents from addiction. Survey data indicate that high levels of religious faith and spirituality were closely related with positive life orientation, better perceived social assistance and lower levels of depression, anxiety and stress. The findings of this study confirmed that the effect of religious treatment was related to physiological change. Therefore this study represents the greatest self-report research to assess the relationship between religious faith and spirituality to recover the drug addiction through GSR and HRV biofeedback devices.

### **The Possibility of Improvement in Blood Glucose Levels Following Six Month Biofeedback-Assisted Respiratory Training in Japanese Adult Diabetic Patients**

**Setsuro Okada, Noriko Tsutaya, Toyohiko Hayashi, Japan**

*E-Mail: [okada\\_s@niigata-min.or.jp](mailto:okada_s@niigata-min.or.jp)*

**Abstract:** The purpose of this study was to determine the effects of stress management training on glycemic control in patients with diabetes. Japanese adult diabetic patients (age,  $60 \pm 15$  y; means  $\pm$  SD) were randomly selected to undergo a 5-day group diabetes education program. The patients were divided into two groups, one group ( $n=13$ ) undertook 8 sessions of biofeedback-assisted respiratory training, the second ( $n=15$ ) without. All sessions were held on an individual basis and all participants completed the 3-month training protocol. To evaluate the effect of the training, post prandial blood glucose, HbA1c and

subjective well-being inventory (SUBI) scores (which related to one's feelings and attitude about various areas of life) were measured before and after 3 month and 6 month periods. Results were analyzed using paired "t" test and two-way repeated measure ANOVA. There was no significant difference between both groups in post prandial blood glucose levels before the training protocol ( $p=0.678$ ). The training and control groups were associated with significant decreases in post prandial blood glucose levels after 3 months ( $p<0.001$ ,  $p<0.01$ , respectively). At the 6-month follow-up mark, the training group continued to demonstrate lower blood glucose levels (vs pre,  $p<0.001$ , vs 3-month,  $p=0.963$ ) whereas those values in the control group tended to increase compared with their 3 month mark, and there was no significant differences between their 6 month mark and prior to training ( $p=0.191$ ). Both groups were associated with significant decreases in HbA1c after 3 months and 6 months compared with levels prior to training. No significant improvement in SUBI scores occurred. The results show the possibility of improvement in post prandial blood glucose levels following six month stress management training in Japanese diabetics. It is recommended to consider this training as an addition to the diabetes education program.

### **Real-time Electro-Acupuncture with Cardiac Autonomic Response in Chronic Tension-Type Headache**

**Kyungmo Park, Korea, Changjin Jung, Korea, Joungchan Lee, Korea, Sokcheon Pak, Australia, Jun Yang, China, & Sanghoon Lee, Korea**

*Email: [saenim@khu.ac.kr](mailto:saenim@khu.ac.kr)*

**Abstract:** Acupuncture modulates autonomic nervous system which is tightly coupled with many disorders including pain related diseases. We devised an real-time feedback electroacupuncture (EA) system with the intensity varying according to the cardiac parasympathetic activity measure, the high frequency component (HF) of heart rate variability HRV). Thirty patients with chronic tension-type headache (CTTH) in accordance with the criteria of the International Headache Society were recruited. The subjects were randomly assigned into three groups: a varied-intensity EA group (Varied-EA) which employs a real time feedback stimulation upon parasympathetic shift, a fixed-intensity EA group (Fixed- EA) which is conventional EA, and another control group with manual acupuncture (MA). Twenty-one patients completed the study by undergoing six treatment sessions for two weeks. For the Fixed-EA, 2 Hz EA was applied to the left ST36 and ST37 acupoints with a fixed intensity between sensory detection threshold and pain threshold. In the Varied-EA, stimulus intensity was adjusted every 5 min by change of a parasympathetic measure, HF power in HRV; If the HF increased, the stimulation intensity was reduced. Galvanic skin response, thermal quantitative sensory testing, Pain score of Headache (VAS), and the Brief pain inventory (BPI) were measured. Even though Varied-EA induced the increase of HF power in stimulation session significantly, no stronger change of HF power than Fixed-EA and MA was found. Consequently, the Varied-EA didn't show the pain releasing effect, while only Fixed-EA decreased both of headache VAS score and BPI over the six visits. And GSR change indicates all the three groups induced significant sympathetic activation. While the conventional form of EA showed pain relieving effect, our approach failed to show the therapeutic effect as well as stronger autonomic modulation effect than others. Also the opposite stimulation strategy, decreasing intensity when the parasympathetic drops, is worth trying for the next study. And frequency change of EA should be considered.

**Acknowledgement:** This study was supported by a grant from the National Research Foundation funded by the Ministry of Science, ICT and Future Planning (NRF-2011-0028968) and Project for the National Key Basic Research and Development Program (973)

under Grant no. 2010CB530500, Anhui Provincial Natural Science Foundation under Grant No. 1208085MH147, and Major Scientific Projects of Anhui Provincial Education Commission under Grant No. KJ2011ZD05.

## **Smart Phone/Tablet Apps for Biofeedback Clinical and Personal Use**

**Erik Peper, Jasmine Mitose, Rick Harvey, Emily Rogers, Sandy Liu, USA**

*Email: [epeper@sfsu.edu](mailto:epeper@sfsu.edu)*

**Abstract:** For more than a decade, researchers have been working on designing hardware and software biofeedback applications ('apps') for use on smartphones and other portable computing devices. The purpose of the study is to compile and evaluate useful health care and biofeedback applications currently available for the Apple and Android platforms that can be used for clinical and personal use on smartphones and tablets and encourage clinicians to share useful apps as they come to the market place. Available apps were searched through the buying marketplaces for each platform using keywords including "biofeedback," "self-regulation," "observational data," and "behavioral change" and interviewed biofeedback vendors. The results identified 80 apps which were organized into 3 groups, "logging/reminders/pacing," "physiological monitoring (via the phone/tablet)," and apps requiring "adjunctive biofeedback sensors." 24 apps gave feedback without the use of adjunctive sensors and utilized the camera or movement detector, 46 apps were used for behavioral and monitoring that required input from the user, and 10 apps used adjunctive biofeedback sensors. The top 15 apps are listed and assessed in utility for clinicians to use in their practice and clients for personal use. In conclusion, Apps requiring adjunctive sensors were more focused on clinical biofeedback methods, while behavioral monitoring apps were general "wellness" types that included themes like weight loss and stress reduction. Using readily available technology enables both clinical and non-clinical biofeedback users to access equipment and forms of feedback previously only available in biofeedback labs or by other types of specialized equipment. This systematic review of biofeedback apps for the Android and Apple platform smartphones and tablets serves as a baseline measure for what will surely emerge as a growing field of biofeedback technology. We invite clinicians and educators to contribute by submitting descriptions and links of apps so that the database will be more complete.

## **Integrating Biofeedback in the Treatment of Migraine and Tension Type Headaches: Preliminary Observations**

**Giacinta D'Otolo, Biagio Ciccone, & Davide Pierini, Canada**

*Email: [dpierini@neuromtl.com](mailto:dpierini@neuromtl.com)*

**Abstract:** Chronic pain has been associated with the interplay between physiological, psychological, physical, and social factors. In Europe, the 1-year prevalence of chronic headaches seem to be 4.0%. Prevalence of Migraines are approximately 14%, while prevalence of Tension Type Headaches (TTH) are 62%. Biofeedback is a technique that addresses health issues in a biopsychosocial perspective. An extensive body of literature indicates that it can be considered efficacious in treating migraines and TTHs. The purpose of the study was to present preliminary observations resulting from a series of 6 cases diagnosed with Tension Type Headache (TTH) or Migraine treated integrating pharmacological, psychophysiological (biofeedback), and psychological interventions.

**Method.** Pre and post treatment, we measured pain duration, intensity, and frequency, as well as emotional symptoms and quality of life. After a neurological, psychological, and



psychophysiological assessment, patients received an average of 15 biofeedback sessions integrated with cognitive intervention and, in some cases, with medications. The results showed that after treatment, patients reported a 50% reduction in pain duration and a 62% reduction in pain frequency. In most cases, symptoms of anxiety and depression appeared improved. Finally, the negative impact of headaches on daily life was also reduced. Our experience suggests that integrated treatments for headaches could be feasible and efficacious. Consistent with scientific literature, biofeedback training seems to decrease pain, to reduce emotional symptoms, and improve quality of life.

### **Quantification of Co-contraction Index During Walking Using a Low-tech Ambulatory System - A Preliminary Reliability Study**

**Marlene Rosa, Portugal, Alda Marques, Portugal, Sara Demain, United Kingdom, & João Rodrigues, Portugal**  
*Email: [marlenerosa@ua.pt](mailto:marlenerosa@ua.pt)*

**Abstract:** Muscle co-contraction index (Col) has been shown to be important for walking stability. It can be reliably quantified using two different methods. However, this has been mainly explored in laboratory settings using high-tech equipment (H-Tech). The aim of the study was to explore the reliability of existing methods to quantify muscle Col using a low-tech ambulatory equipment (L-Tech) in a clinical setting.

Thirty-five gait cycles were recorded whilst 5 healthy participants walked along 5 meter corridor at their comfortable speed. Complete gait cycles (first double support-DS1; single stance-SS; second double support-DS2; swing phase-SW) were identified using a L-Tech (USB-webcam; 15fps, sagittal plane) and a H-Tech (12-camera, Vicon system; 200fps.), both synchronized with electromyography (Procomp Infiniti Encoder, 2000 fps.). Electromyographic muscle activity of rectus femoris (RF) and biceps femoris (BF) was recorded for one randomly assigned lower limb. Col was quantified for each walking phase, using two formulas: (i) Unithan - the common area of linear envelopes between two muscles/the number of data points ( $_{U}Col$ ); (ii) Falconer - the common area of the linear envelopes of antagonist muscles/the sum of the areas of those muscles ( $_{F}Col$ ). Paired t-test, intraclass correlation coefficient ( $ICC_{3,1}$ ) and limits of agreement (Bland-Altman analysis) were calculated between  $_{U}Col$  obtained in L-Tech and in H-Tech and repeated for  $_{F}Col$ .

**The results demonstrated that both  $_{U}Col$  and  $_{F}Col$  for all walking phases, fair to good reliability ( $_{U}Col$  ICC: 0.4-0.75;  $_{F}Col$  ICC= 0.52-0.79). No systematic bias was found in  $_{U}Col$  vs  $_{F}Col$ : DS1: 0.25 (-0.56-1.25) vs 0.008 (-0.33-0.36); SS: -0.18 (-0.78-0.41) vs -0.07 (-0.27-0.13); DS2: 0.34 (-0.60-1.29) vs 0.08 (-0.26-0.42); SW: -0.10 (-0.80-0.60) vs 0.028 (-0.23-0.17). Contrary to  $_{F}Col$  ( $p < 0.05$ ), the  $_{U}Col$  demonstrated significant differences between L-Tech and H-Tech in DS1 and SW ( $p > 0.05$ ). In conclusion, measurement of muscle co-contraction can be undertaken with acceptable reliability using L-tech equipment and the  $_{F}Col$ , allowing for low-cost data collection in clinical environments.**

### **Relaxation Effects of a Biofeedback Assisted Respiratory Training on Japanese Adult Diabetic Patients**

**Noriko Tsutaya, Setsuro Okada, & Toyohiko Hayashi, Japan**  
*Email: [healing-yu-wa@chorus.ocn.ne.jp](mailto:healing-yu-wa@chorus.ocn.ne.jp)*

**Abstract:** Mental stress is known to be a risk factor of deteriorating glycemic control of diabetic patients. This study aimed at clarifying how a biofeedback-based respiratory training

for relaxation affects such patients. Subjects were 15 diabetic patients with the average age of 63.4 yo (SD=10.8). They underwent a biofeedback-based respiratory training using such biosignals as surface EMG, skin conductance, respiration and heart rate (BioGraph Infiniti, Thought Technology Ltd., Canada). The training session lasted for 5 minutes and was done 8 times individually in a period 3 months. Before and after the 5-minute training, the biosignals and salivary amylase were recorded at rest. In the first and last sessions, a sensory test on the training and relaxation was done. Additionally hemoglobin A1c (HbA1c) was measured once a month. Results were analyzed using paired t-test, repeated measures analysis of variance (rANOVA) and two-way rANOVA. The results showed a significant **33** decrease was observed in HbA1c levels after 3 months, compared with those prior to training ( $p<0.05$ ). The average level of every biosignal and the level of salivary amylase were assessed at rest before and after the 5-minute training. Consequently a rate of decrease in skin conductance before and after the training increased significantly after 3 months ( $p<0.05$ ), while no significant change was observed in other parameters. Initially most of the patients complained about the difficulty of consciously practicing abdominal breathing, while finally 10 out of 15 patients gave favorable answers on mental and/or physical effects of the training. In conclusion, analysis of HbA1c verified that all patients remained under a good glycemic control. Biosignal analysis revealed that skin conductance sensitive to emotional change could be usable as an index of relaxation. Results of sensory tests suggested that the biofeedback-assisted respiratory training would be effective for prompting patient's awareness and behavior modification required to acquire relaxation.

## From Learning Disabilities to Learning Differences Over to Learning Abilities and Learning Gifts

**Edna Tune & Dan Tune, Israel**

*Email: [tuneedna@bezeqint.net](mailto:tuneedna@bezeqint.net)*

At our respective learning centers in Israel we have worked with thousands of adults and children who present with the whole range of learning difficulties. Our programs are in most cases intensive, ranging from 9 to 30 hours a week, followed by many months of support work and continued follow up.

Depending upon the person, the problem, the need, we rely on a "mix" of peripheral biofeedback, neurofeedback, and other innovative brain technologies to regulate and balance the LD brain. As educators and performance coaches, we weave these throughout the day into the framework of our content-oriented tutoring or coaching programs. The poster defines the following topics:

- What is a learning disability (LD ) and what isn't one?
- A brief history of treatment methods for learning disabilities (LD) – both comic and tragic
- A new and promising key to unlocking the mystery of LD – Sensory Processing Disorder (SPD)
- Stress as a major factor in dealing with LDers (theirs, their families, their teacher's/employer's)
- The Intake Interview Tools for LD – psychophysiological instruments and more
- The Confusion Cycle, how you can identify it and what you can do about it.
- Perceptual distortions and how they affect learning, their triggers, their effects throughout the school day and at home.
- A micro look at Thinking Styles – what teachers and parents may not know.

- Lateral Training: a breakthrough approach to balancing the processing speeds of the brain to visual and auditory stimuli at the basal level of the central nervous system for more consistent attentional skills.
- "THE MIX": some variations on how we combine the various systems (sequentially and parallel) peripheral multimodal biofeedback, neurofeedback, Brain Boy /Lateral Trainer, HEG (nIR HEG and pIR HEG), HRV (Heart Math), pROSHI

### **Biofeedback Impact on Children's Migraine Attacks**

**E., Valevicha, D. Voita, K. Utane, B. Norite-Lapsina, M. Tihomirova, & M. Krauce, Latvia**

Email: [evalevica@gmail.com](mailto:evalevica@gmail.com)

There is still no consensus finding the best biofeedback (BFB) application methods in children and adults to reduce psychosomatic symptoms and modulate autonomic nervous system activity. Our aim of the study was to detect temperature and breathing BFB efficacy in children with migraine. Children ( $n=13$ , 6 girls, 7 boys,  $11,2 \pm 0,5$  years old), who had been diagnosed migraine according to ICH guidelines participated in the study. Study was conducted in collaboration with children neurologists. Before the biofeedback trainings children were tested to detect autonomic nervous system properties. After test children underwent biofeedback trainings twice a week for 6 weeks consecutively. Children were asked to practice at least once a week at home. Before and after BFB training phase migraine properties were recorded with migraine diaries. It was found that children with migraine had sympathetic nervous system hyperfunction. After the BFB trainings migraine attack frequency statistically significantly decreased ( $p=0,043$ ). Medication intake and migraine intensity had tendency to decrease. Results show that temperature and breathing BFB has positive effect on childrens' migraine headaches. It is also important to detect autonomic nervous system changes after BFB trainings as it could be BFB longterm efficacy predictor.

### **The Fluctuation and Resilience of Skin Conduction and Finger Temperature in Patients with Coronary Artery Disease**

**L. C. Yu, I. M. Lin, Y. H. Lu, & C. S. Lee, Taiwan**

E-Mail: [psyiml@kmu.edu.tw](mailto:psyiml@kmu.edu.tw)

**Abstract** This study investigated the autonomic nerve reactivity and resilience by measuring skin conductance (SC) and finger temperature (TEMP) in patients with coronary artery disease (CAD) and healthy adults under anger induced and anger recovery phases. Patients with CAD ( $N = 170$ ) and healthy adults ( $N = 90$ ) were enrolled. SC and TEMP were measured in the following sequences: baseline, neutral phase, neutral recovery, anger phase, and anger recovery. The changes of SC and TEMP between baseline and anger phase reflects the ability of anger reactivity; and the changes between anger phase and anger recovery reflects the ability of anger recovery. The results showed that there was significant higher anger reactivity and anger recovery of SC in health adults than in patients with CAD ( $t = 2.74$ ,  $p = 0.07$ ,  $t = 2.85$ ,  $p = 0.05$ ). However, there were no significant differences between two groups in anger reactivity and anger recovery of TEMP ( $t = 1.23$ ,  $p = 0.22$ ;  $t = -.29$ ,  $p = 0.77$ ). In conclusion, this study confirmed that healthy adults have more fluctuation and resilience of SC while encounter anger situation.

## **Are blanketing and Stem Artifacts Real?**

**Christopher L. Zerr, Evan Fluty, Alec Cangelosi, & Fredric Shaffer USA**

*Email: clz8225@truman.edu*

This within-subjects study investigated the magnitude of blanketing and stem artifacts in temperature measurement. Blanketing artifact raises finger temperature by trapping heat in multiple layers of tape. Stem artifact lowers finger temperature when the first 8 cm of a thermistor cable is not secured against the skin. Sixty undergraduates (30 men and 30 women), ages 19 to 24 years of age, participated in this experiment. A Thought Technology ProComp™ Infiniti system monitored finger temperature using four identical SA9310M thermistors with a 0.3 cm bead in a 21.1 degree C room. A thermistor was attached to the dorsal aspect of the second phalange of the middle and first finger of each hand using a single layer of Curad 2.5 cm wide Gentle Paper tape placed around the circumference of a thermistor bead and along the next 8 cm of its cable. Subjects sat upright with their hands resting on their thighs with no feedback for 2 minutes to measure initial finger temperature to control for differences in blood perfusion. To measure the magnitude of blanketing artifact, two extra layers of tape were wrapped around the thermistor bead on the right middle finger, while the right index finger retained its single layer. To measure the magnitude of stem artifact, the 8 cm strip of tape was removed from the left middle hand so that the cable no longer touched the skin, while the cable remained attached to the skin on the left first finger. Subjects continued to sit upright without feedback for 5 minutes to measure both artifacts. After adjustment for initial differences in perfusion, data were analyzed using General Linear Model (GLM) analysis. A significant blanketing artifact that averaged 0.9 degree C was found,  $F(1,58) = 44.06$ ,  $p = .000$ ,  $\eta^2 = 0.43$ , while there was no evidence of stem artifact.

## **A 1:2 Inhalation-To-Exhalation Ratio Increases HRV Training Success**

**Christopher L. Zerr, Evan Fluty, Alec Cangelosi, & Fredric Shaffer, USA**

*Email: clz8225@truman.edu*

While there is strong empirical support in HRV biofeedback for teaching patients to slow their respiration rate to between 5 and 7 breaths-per-minute, there has been no definitive study of the best inhalation-to-exhalation ratio. In theory, a 1:2 ratio should increase time domain measures of HRV more than a 1:1 ratio, because extended exhalation should prolong parasympathetic slowing of the heart. The present crossover study addressed this question. Ten male undergraduates, ages 18–22, were randomly assigned to one of two orders of HRV training: 1:1 ratio training followed by 1:2 ratio training, or 1:2 ratio training followed by 1:1 ratio training. A Thought Technology ProComp Infiniti data acquisition system measured HRV using a photoplethysmographic (PPG) sensor placed on the thumb of the nondominant hand and a respiration sensor placed over the navel. Participants received four consecutive weekly training sessions using their initial inhalation-to-exhalation ratio. Then, they received four additional training sessions using the second inhalation-to-exhalation ratio. During each session, they were instructed to follow a pacing display to guide their inhalation and exhalation, and watch analog feedback displays for heart rate, HRV frequency amplitude, and respirometer movement. Participants were encouraged to breathe abdominally from 5 to 7 breaths per minute and increase low frequency amplitude. Each session consisted of a 5-min stabilization period, 3-min eyes-open prebaseline, six 3-min training segments, and a 3-min eyes-open postbaseline. No feedback was provided during baseline measurements. A GLM Repeated Measures analysis found that only the 1:2 ratio training increased SDNN,  $F(1, 9) = 16.91$ ,  $p = .003$ ,  $\eta^2 = 0.65$ , and pNN50,  $F(1, 9) = 5.91$ ,  $p = .038$ ,  $\eta^2 = 0.40$ . These findings should be replicated with a significantly larger, gender-balanced clinical sample to confirm their generality.

# BFE 18TH ANNUAL MEETING

## Dates and Location Coming Soon....

Mark your calendars for Spring 2015. We are currently reviewing locations and will post additional information on our website as soon as it becomes available.

### Request for Submissions

It's not too early to make your submission for a workshop, symposia, oral or poster presentation. We welcome your suggestions on workshops and invited speakers. Email: [conferences@bfe.org](mailto:conferences@bfe.org)



### Submissions Guidelines for the 18th BFE Meeting

For information for submitting proposals for workshops, symposia, paper sessions, posters and oral presentations go to: <http://bfe-meeting.blogspot.ca/p/welcome-to-bfe-annual-meeting.html>.

### Submission Deadlines

**June 1, 2014:** Workshop presentations and invited speakers

**September 1, 2014:** Symposia, paper sessions and oral presentations

**November 1, 2014:** Posters

For more information, please contact Conference Coordinator: [conferences@bfe.org](mailto:conferences@bfe.org)  
BFE meeting page at: <http://bfe-meeting.blogspot.ca/p/welcome-to-bfe-annual-meeting.html>.

### Join the Program Committee

Would you like to be actively involved in developing the content for our conference? We invite you to join our program committee. Contact us at: [conferences@bfe.org](mailto:conferences@bfe.org)

### Join the Conversation

Like us on Facebook and follow us on Twitter to stay up to date on the latest information about our next meeting. We have dedicated BFE Meeting pages for both.



<https://www.facebook.com/bfemeeting>



[https://twitter.com/BFE\\_Biofeedback](https://twitter.com/BFE_Biofeedback)



# SUBMIT AN ARTICLE TO PSYCHOPHYSIOLOGY TODAY

## Guidelines for Submission for *Psychophysiology Today*

*Psychophysiology Today* is published and distributed by the Biofeedback Federation of Europe as an e-magazine. Items for inclusion in *Psychophysiology Today* should be forwarded to [editor@bfe.org](mailto:editor@bfe.org)

Articles should be of general interest to the neuro/biofeedback community with a focus on educational, clinical and research findings as well as pragmatic clinical/educational tips. All articles are reviewed by the editors. The editors reserve the right to accept or reject any material and to make editorial and copy changes as deemed necessary.

Feature articles should not exceed 2,500 words; department articles 700 words; and letters to the editor 250 words in Microsoft Word. Graphics and photos may be embedded in Word files to indicate position only. Please include the original, high-resolution graphic files with your submission -- at least 266 dpi at final print size. GIF or TIFF preferred for graphs and JPEG for photos. PDF files and scanned documents cannot be accepted.

With each submission please include the primary author's a biographical sketch (30 words) and photo.

**Title:**

**Authors:**

**Primary Authors Biographical Sketch (30 words) and photo:**

**Affiliations:**

**One Sentence Summary:**

**Abstract:**

**Main Text:**

**References and Notes:** (followed by a numbered list)

**Acknowledgements:**

**Fig. #:** (Begin each figure caption with a label, "**Fig. 1.**")

**Table #:** (Begin each table caption with a label "**Table 1.**", etc.)

**Supplementary Materials:** include a list of the supplementary materials

Manuscripts should be submitted electronically to [editor@bfe.org](mailto:editor@bfe.org)

BFE is not responsible for the loss or return of unsolicited articles.



Previous issues of *Psychophysiology Today* can be viewed on our website at <http://bfe.org/new/news/psychophysiology-today/>

**Articles in this issue reflect the opinions of the authors, and do not reflect the policies or official guidelines of BFE unless stated otherwise.**