



# Psychophysiology Today

The mind body magazine



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## PRESIDENTIAL NOTE



Enjoy this issue of *Psychophysiology Today*. It includes original articles, abstracts of the 18th BFE annual meeting with the authors' email addresses, participants' experiences of the meeting, a request for submissions for the next meeting and requests to submit articles for possible publication in the next issue of *Psychophysiology Today*.

This issue contains three articles that focus on how our psychophysiology is affected by the rapidly changing world and how our automatic biological defense reactions affect our behavior.

The article by Dr. Mari Swingle, *What is i-Technology Really Doing to Our Brains?*, explores the impact of digital media on brain development. Digital stimuli especially are used by computer games are highly addictive and may contribute to dysfunctional brain development. The article is a must read for any parent and clinician interested in ADHD. This is followed by the article by Dr. Erik Peper, *Evolutionary/Ecological Traps Create Illness-Be Aware of Commercialized Stimuli*, which takes an evolutionary perspective and points out numerous illnesses are caused/aggravated by commercial driven products automatic evolutionary responses which contribute to obesity, stress and addiction. The issue may not be the lack of self-control but limiting the commercial stimuli.

The third article by Drs. Stephen Porges and Erik Peper, *When Not Saying NO Does Not Mean Yes: Psychophysiological Factors Involved in Date Rape*, was reprinted with permission from the *Association for Applied Psychophysiology and Biofeedback* and describes how our hardwired physiological responses to stressors may cause a person to be immobilized during attempted date rape. A biological response that may lead to guilt, "I feel so bad that I did not fight my assailant." The authors hope that by explaining this old biological triggered response, clients will let go of the guilt, accept that it was out of their control, and evoke peace.

The Rome 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 beginners 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 the corporate sponsors who exhibited the newest bio-neurofeedback equipment and software. Specific thanks goes to Thought Technology Ltd. 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 in 2017 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). Biofeedback/applied psychophysiology continues to develop. It is so exciting to be actively involved in a field which nurtures self-awareness, self-regulation and control by which client, students and participants experience increased control and strategies to mobilize their health.

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

Warmly,  
Erik

### What is i-Technology Really Doing to Our Brains?

**Mari Swingle, Ph.D.**

*Swingle Clinic, Vancouver, BC, Canada*

Many of the social and emotional effects of excessive applications of digital media, otherwise known as i-technologies, or simply i-tech, have been duly noted in the popular press and professional peer reviewed journals alike. Associations with depression, anxiety, and the obsessive compulsive spectrum are pervasive, as is the perspective that other disorders have found a home or expression in excessive i-technology usage. The implication is that excessive usage, or i-addiction, may be a behavioral manifestation of some other disorder, rather than a discrete disorder. Accordingly there are findings of predictive personality characteristics and environments associated with the development of excessive usage patterns as well as rather unified findings that individuals who suffer from i-addiction are suffering from some other form of mental /psychological or social /interpersonal difficulty (see multiple works of Caplan & High; Pies, 2009; te Wildt et al., 2010; Young & Nabuco de Abreu, 2011).

There are also strong assertions that the medium may be responsible not only for the exacerbation or acceleration of DSM classifications of psychopathology, such as anxiety and mood disorders, but also the emergence of entirely i-technology dependent pathologies such as Cyberchondria and FOMO ('fear of missing out', a panic disorder associated with the need to constantly check in on digital media) or Phantom Vibration Syndrome, when one becomes obsessed with a vibrating or not vibrating phone (see Rossen, 2012). There are also surges in otherwise previously less prevalent pathological pursuits such as voyeurism and sociopathic narcissism. In an attempt to understand these emergent phenomena researchers are turning their attention to supportive functional or biological evidence. To date, multiple papers have found i-addiction, and in particular gaming addiction, to share common variation in neurochemistry, neurocircuitry and functional morphological / anatomical brain alterations as seen in other addictions; namely, process and substance disorders (see M. Swingle, 2015 for overview).

In my own research, looking at electroencephalographic data (EEG), I sought to explore whether i-addiction was a discrete disorder or whether it shared common biological substrates with other disorders; namely ADHD, depression, and anxiety. I also have examined quite extensively the weight of process versus content in the addictive draw. What I now refer to as the 'what' versus 'why' debate: Is what one is doing online or on i-technology (e.g., looking at erotica or gaming) more important than why they are on line (e.g., to self soothe, alleviate anxiety, or elevate mood). My research clearly indicates that why one is excessively using i-technology (e.g., seeking social connection) overshadows what they are doing or searching (e.g., gaming)

One unique factor to i-technology research, however, is speed of evolution. In this field, one must acknowledge that we are chasing a moving object. As technology advances at lightning speed so do our usages, applications, and arguably also the relative effects on brain and behavior.

When the effects of excessive application of i-technologies first appeared on my clinical radar between 10-15 years ago, they almost exclusively involved male children and excessive gaming. The first overt symptoms were behavioral and educational; specifically emotional deregulation and attention difficulties in school and homework tasks. Patterns on

the EEG reflected this; typically deregulation in the frontal lobes or excessive frontal or central Theta associated with attentional difficulties. Two things were of note here; first, on the EEG there were no systematic or cluster patterns common to those affected and second, it appeared that excessive usage involved the expression of liabilities common to those who had similar educational or behavioral symptoms but were not gamers.

Following epigenetic theory, excessive gaming could thus be viewed as an environmental trigger that allowed a liability to express. In sum, excessive gaming appeared to be a catalyst for attention and behavioral difficulties for school aged children and adolescents.

The primary issues for adults were relationship based; including marital strife, predominantly avoidant behavior (e.g., hiding in i-technology or choosing i-technology over interpersonal interaction) and anger management issues (e.g., higher agitation and overt annoyance when asked to disengage).

When looking at the EEG's of affected adults, I also did not find any specific deregulation patterns. When compared to normative data bases, EEG deregulations were broadly distributed, implying any significant EEG deviation could be a liability to the disorder. Thus my findings directly supported findings of studies that found i-addiction was a co-morbid or co-occurring as opposed to a discrete disorder (see M. Swingle, 2013).

A very important differentiation, and historically of note here, is age of discovery, or the age of introduction of systematic usage, of i-technologies: In the early 2000's parents were seeking clinical assistance associated with excessive gaming for children that were discovering routine gaming between the ages of 9-15. Personal or transportable i-devices for children were not yet common, nor implicated. The population of adults affected with excessive usage patterns in this same time frame was also different. Adults seeking clinical assistance were also latent users (predominantly digital immigrants, not digital natives). Meaning, i-technologies were discovered, and became problematic, later in life. Digital immigrants as the term implies, did not grow up with i-technology, they discovered it as adults.

Today the issues are distinctly different. Children are not only discovering console gaming, but systematically using or playing with all i-technologies (i-pads, cell phones, computers, in essence all screens) at markedly younger ages. For many, i-technology is now introduced in the cradle. Pun intended, such early introduction has dramatically changed the game. Accordingly what I am starting to see on the EEG is also different. There are distinct cluster patterns in all adults and a specific Alpha deregulation associated with excessive usage in children and adults under 30. I now suspect we are no longer seeing an expression of liability, but a complete rewiring. The implication is that the medium i-technology, is more than temporarily altering systems that regulate attention, behavior and mood it may be rewiring them. For the very young, it appears to be affecting brain development itself.

There is mounting evidence from multiple disciplines that indeed early introduction of i-technologies is affecting socio-emotional and cognitive development at its core. The primary concern for young children and infants involves i-technology's direct effects on attachment and all of the neurological systems attachment is biologically designed to foster. Quite simply, children are now being introduced to i-technologies when it is developmentally imperative that they be interacting with human caregivers. In difference to other activities, objects, or toys traditionally given to children such as stuffed animals and building blocks, it appears that when infants and young children interact with i-technology it is exclusive rather than additive. When children engage with i-technologies they do not engage with their environment nor with their caregivers to the same degree, they, like older children and adults, can become mesmerized. In terms of learning, this eclipsing of the larger environment has many implications on the thwarting of the development of observation,

curiosity and exploration; the platform from which all learning, cognitive as well as social (e.g., observing and mimicking) occurs (see multiple works of A. Gopnik) Further numerous papers, and explicitly those on language learning, have demonstrated that engagement with screen based technologies reduce not expand learning (see multiple works of Khul; Zimmerman, Christakis, & Meltzoff, 2007 ).

The reorientation of attachment of older children from parents to peers, largely due to higher exposure to messages from media (TV) and reduced parental availability, have already been shown to have serious consequences (see Lamb & Brown, 2006; Newfeld & Mate, 2004). Equally concerning is mounting evidence that i-tech exposure in older children is connected to a reduced ability to read social cues and facial expressions (Uhls et. al., 2014). There also may be future implications here regarding the latent development of autistic-like characteristics. But very little is known of the broader effects of screens on infants. In this dearth of information, studies are being launched to understand not the brain effects per se but rather what aspects of i-technology infants are drawn to, what aspects they naturally have talent for and the alliance of developmental stages and gestures used in / for i-tech (see Crista & Seidl, 2015). This to me reeks of marketing/product research not social, psychological or developmental research. Prior to the massive expansion of the digital age, non-human primates and the severely communicatively disabled were those for whom tablet technology was developed, and I might add very successfully. When we introduce and propagate the use of technologies that previously were reserved for non-verbal primate species or the functionally or cognitively compromised of our own, what message are we sending? And perhaps more importantly what is our purpose?

What we do know from years of developmental study and theory, is that parent-baby face to face or heart-to-heart engagement forms the core of the social engagement system from which the child and later adult will function in all subsequent relationships. Insufficient face-to-face interaction and touch can change or halt development as neuronal pathways that would normally be activated by caregiver interaction do not form. In an alternate process coined 'neuronal Darwinism' development halts as neuronal pathways that would normally be activated by caregiver interaction do not form. It is highly likely that early introduction of i-technology is now affecting this most fundamental of biologically programmed adaptive systems that drives development itself. (See multiple early works of Ainsworth and Shore as well as more recent works of Siegel, and Porges, 2011).

*Dr. Mari Swingle is the author of i-Minds (2015), Winner of a 2015 Federation of Associations in Behavioral & Brain Sciences Early Career Impact Award, clinical practitioner at the Swingle Clinic, and a regular presenter on the topic of the effects of i-technology on the brain and behavior.*

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### Evolutionary/Ecological Traps Create Illness - Be Aware of Commercialized Stimuli

Erik Peper, Ph.D.

*How come birds on Midway Island are dying?*

*How come your son keeps playing computer games even after he said he would stop?*

*How come you ate all the French fries and the dessert even though you promised yourself to reduce your calorie intake?*

*How come you procrastinated and did not get up from the couch to exercise?*

*How come you watched pornography?*



*Dead birds on Midway Island in the North Pacific, 2000 miles from any other islands. The bird mistake attractive coloring of plastics as food feed from the ocean.*

<https://www.youtube.com/watch?v=dtJFiXp5Bo>



*Being captured by a digital device. From:*

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

The usual answer is absence of will, self-control or self-discipline. The person is automatically blamed for making poor life choices. If you had more self-worth than you would not let yourself get obese, addicted to computer games, or watch pornography. Blaming the victim is easy, however, there are other factors that underlie the person's

covert/unconscious choices. Many of these illness producing behaviors (e.g., overeating, playing the computer games, sitting and sitting) are responses to external cues that in prehistoric times promoted survival, reproduction and health. To respond rapidly and appropriately to those cues offered a reproductive advantages while not reacting would reduce your survival. In many cases there are no upper limits to turn off our responses to these cues because the more the person responded to those cues the more was there a reproductive advantage. Now, however, our adaptive preferences have become maladaptive because the cues that trigger the same behaviors lead to lower fitness and illness (Schlaepfer et al, 2002; Robertson et al, 2013). The cues have become evolutionary/ ecological traps!

## **Some of the recent evolutionary/ecological traps include:**

### **Vigilance for survival:**

While playing a computer games, the person rapidly responds and continuously experiences immediate rewards (e.g., successful shooting the target, points, next game level). This process activates the same survival mechanisms that the hunter used for thousands of generations. A visual or auditory stimuli represents sources of food or danger (a game animal to hunt for food, an attack by a predator or an enemy). The visual/auditory cue captures the person's attention and if the person reacts to that cue he would probably survive. On the other hand, if he did not react, he may not survive and reproduce. In our modern world, similar stimuli now hijack the neurological pathways that in earlier times supported survival. Over activation of these pathways is a cofactor in the development of ADHD and other disorders (Peper, 2014). For a superb discussion of how cellphones, computers, gaming and social media are changing our brains, read Dr. Mari Swingle's new book, *i-Minds* (Swingle, 2015).

### **Energy for survival:**

Eating carbohydrate/sugary and fat foods were necessary for survival as humans constantly searched for energy sources to support life. Breast milk and almost any fruit that is sweet contains calories and supports growth. If the food was bitter it was usually harmful. For most of our evolutionary past, we would eat as much as possible because food was scarce. There was no evolutionary advantage to limit food intake as the stored calories would supply enough calories to survive during periods of famine. In our modern world, our survival mechanisms have been hijacked by advertising and the oversupply of foods which contribute to the epidemic of obesity and diabetes.

Being a couch potato and not moving again is again survival mechanism. In a prehistoric world with limited food supply, the less movement (the fewer calories you burned), the longer you could survive. You would move when you needed to build shelter or search for food. Again in a world where shelter and food are often abundant, there is no intrinsic mechanism to initiate movement.

### **Sexual arousal for reproduction:**

Men are often captured by pornography. They can watch for hours and feel aroused. The whole porn industry is based upon hijacking our sexual drive for reproduction.

### **Our brain does not discriminate between actual visual and auditory stimuli, imagined or film/video images.**

Until the late 19th century everything we saw and heard was real. Only in the 20th century could we produce images and sounds that appeared real. These film, TV, and the ever present digital displays activate the same neurophysiological pathways as when the stimuli were actually real. A scene on a digital screen triggers the same biological pathways and responses that for thousands of generations supported survival. If we did not respond we would not have survived. If you have any doubt, watch a scary horror movie and check how you feel afterwards. You may feel more scared, your sleep may be disturbed, your heart rate increased, and you probably interpreted any noise around you as possible danger. Thus, cues in the environment may become evolutionary/ecological traps in the same way that birds on Midway Island in the North Pacific, 2000 miles from any other islands, mistook the attractive coloring of plastics as food. See: <https://www.youtube.com/watch?v=dtJFiXp5Bo>. Should the birds be blamed because they have no self-control?

## **What can you do!**

Recognize that modern industries, for the sake of profits, have hijacked our cues that had evolved to aid survival (Kemp, 2014).

Recognize that not reacting to product cues means inhibiting the intrinsic biological triggered survival responses. Yes, it is possible not react to the stimuli and demonstrate self-control; however, it is not only a problem of will. It is a problem that our cues have been hijacked and tricked for commercial profit.

Society may need to protect its own populations from commercial exploitation of evolutionary/ecological traps. A young child is automatically drawn to the visual stimuli on a smartphone and tablet which parents use to quiet the child during dinner. In this process they are activating the pre-wired biological pathways that captured attention for survival. By over activating these pathways, the brain is changing in response to this activation which increases the risk of developing ADHD, autism, and mood deregulation including anxiety, depression, anger management, and other forms of addictive behavior (Swingle, 2015). In addition, school performance and memory retention are reduced when students take notes using their keyboard or read text from digital screens (O'Callaghan, 2014). It will take the family and society to limit the availability of these cues until self-control has been developed. Similarly, the availability of cheap calories in large food portions, sugars in soft drinks and sugar and fats in snacks, need to be limited if the epidemic of obesity and diabetes is to be reversed.

It may be unreasonable to think that people can easily interrupt their biological responses to cues that have been created to increase profits. We need to take collective responsibility and limit the availability of commercially augmented evolutionary traps and cues in the same way we need to limit the plastic in the ocean so that the birds at Midway Island may be able survive. Without respecting our evolutionary past, our future may not be different from those Midway Island birds.

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### When Not Saying NO Does Not Mean Yes: Psychophysiological Factors Involved in Date Rape

Stephen W. Porges, PhD,<sup>1</sup> and Erik Peper, PhD<sup>2</sup>

<sup>1</sup>University of North Carolina, Chapel Hill, NC <sup>2</sup>San Francisco State University, San Francisco, CA

Keywords: date rape, verbal consent, evolutionary physiology, polyvagal theory

*To understand how a woman who does not want to be a willing sexual partner can at times acquiesce and not fight the date rape predator, the neurobiology of our responses to threat needs to be understood. Under situations of extreme threat, instead of responding just to danger signals with only the options to fight or flee, we also retain in our nervous system a primitive immobilization response that may reflexively be expressed when our body detects life threat. This primitive defense system is shared not only with other mammals, but also with reptiles, such as the turtle, that immobilize as a primary defensive strategy. The brain makes the decision without awareness, and the relative risks of stimuli are interpreted to be safe, dangerous, or life threatening. The polyvagal theory proposed by Stephen Porges may explain why many rape victims do not actively resist. According to the theory, the act of not responding is an immobilization fear response to life threat, which may be wrongly interpreted by the aggressor as a passive acquiescence. The woman's thoughts, intentions, and feelings are irrelevant—her body shuts down in preparation for severe injury and death. This misunderstanding may be exacerbated if judgment is clouded by alcohol. This discussion of the polyvagal theory supports the recently passed California law (Senate Bill 967) that requires the governing boards of California postsecondary institutions (colleges and universities) to adopt procedures and protocols requiring students to obtain “affirmative, unambiguous, and conscious decision by each participant to engage in mutually agreed-upon sexual activity.”*

*I read about the body immobilizing instead of fighting or fleeing. I am now 69 and when I was 18 I was nearly strangled and then sexually assaulted. Years later I was speaking with my daughter about this incident and she was disbelieving that I did what I did and that I froze. I felt so ashamed and judged. After reading your theory I cannot tell you how excited and vindicated I feel. I am crying right now. (personal communication, September 6, 2013)*

#### Not Saying No in Date Rape

What does it take to say “No”? And, what does it take to understand “Yes”? Misinterpreting intentions clearly contributes to date rape. The public discussion emphasizing the role of a verbal confirmation of intent may be based on a misunderstanding of our neurobiology and our physiological reactions to threat. Many women report that they were unable to say No to sexual advances when the partner appeared threatening or was physically restraining their ability to move. At that moment of restraint, they were unable to recruit the resources necessary to unambiguously communicate that they did not want to be intimate. In many

cases, as in the quote from the above email, the victim was ashamed of her own paralysis; ashamed that she did not react aggressively to defend herself. This shame plagued her for her entire adult life.

The current focus on consensual agreement, especially on college campuses, is forcing an operational definition of rape with an emphasis on the potential victim expressing a verbal *No* or at least making an aggressive defense. This focus assumes that the potential victim has the neurobiological resources to articulate her feelings or to defend her body.

It neglects the high probability that the intrusive and aggressive behaviors of the perpetrator will trigger a bodily reaction in which the victim will not be able to express herself either verbally or behaviorally. Thus, this paper provides a neurobiological explanation of why not saying *No* is far from the equivalent of saying *Yes*.

This paper supports the recently passed law in California (Senate Bill 967, 2014) that requires governing boards of postsecondary institutions (colleges and universities) to adopt “a policy concerning sexual assault, domestic violence, dating violence, and stalking.” It requires from each partner “affirmative consent,” which means

*“affirmative, conscious, and voluntary agreement to engage in sexual activity. It is the responsibility of each person involved in the sexual activity to ensure that he or she has the affirmative consent of the other or others to engage in the sexual activity. Lack of protest or resistance does not mean consent, nor does silence mean consent. Affirmative consent must be ongoing throughout a sexual activity and can be revoked at any time. The existence of a dating relationship between the persons involved, or the fact of past sexual relations between them, should never by itself be assumed to be an indicator of consent” (Senate Bill 967, 2014).*

Many men assume that if the woman does not verbally say *No*, then the sexual activity is consensual and not rape. In these cases, men interpret the absence of response as a passive acceptance and they continue sexual advances. This absence of response may appear to men to be consistent with earlier experiences during which the woman passively accepted or perhaps tolerated a kiss and some physical contact. In cases of fear of injury, the woman may acquiesce to these initial stages of foreplay.

However, our biological responses to threat contradict the assumption that a lack of protest is equivalent to consent. If the context puts the woman in a state of life threat, she may reflexively immobilize and lose an ability to protest and defend. The male may interpret this fear-induced immobilization by the woman as a signal that she is sexually available. Thus, in the date rape scenario, after the initial power struggle, if the woman stops struggling, it may not be a signal to the male that she passively acquiesces to his advances. Obviously, many factors contribute to the interpersonal negotiation to achieve sexual intimacy. In some cases it occurs with malevolent intent—have sex at any cost without any regard for the partner, such as being raped by a total stranger or the use of date rape drugs to make the person unconscious. In other cases the initial negotiations are covert, in which case one partner aggressively advances and continues the advance until resistance occurs. In contrast, positive paths to sexual intimacy involve a shared and reciprocal agenda.

This subtle interactive process is prone to misinterpretation and may trigger adaptive reactions wired into our DNA. These evolutionary responses to threat (embedded in our nervous system) occur without awareness. In addition, the ability to detect threat and to read the signals of others, both signs of predation and protest, are blunted by alcohol and other drugs.

To understand how a woman who does not want to be a willing sexual partner can at times acquiesce and not fight the date rape predator, the biology of our responses to threat needs to be understood. In this article, we will apply the evolutionary polyvagal theory of Stephen Porges to the situation in which a male initiates sexual activity with a female. The same responses could take place in date situations involving same-sex partners, or involving a female aggressor, but we are describing the more common date rape situation today, involving a male aggressor.

### **The Psychophysiology of Stress**

For most of the 20th century, our understandings of human reactions to threat were guided by a useful, but limited, theoretical perspective of how stress impacted behavior and physiology. Researcher Hans Selye introduced the term “stress” in the 1930s. Selye emphasized the role the adrenal glands played in dealing with challenges. At about the same time, Walter Cannon proposed a complimentary theory that emphasized the role of the sympathetic nervous system as well as the adrenals. Both theories are used to explain the detrimental health effects of stress or fight or flight reactions as disruptions in the autonomic nervous system, the neural system that regulates the organs in our body. These stress theories have migrated into our popular culture and are taught in universities and medical schools.

The model suggests that, when a stressor occurs, our body triggers a stress response commonly conceptualized as either a fight or flight response. This active response requires support from our nervous system through the activation of our sympathetic nervous system and our adrenal glands. This activation increases heart rate, pumps blood to our muscles, and provides the metabolic resources for individuals to perform heroic tasks. This response can sometimes enable people to be unbelievably strong (e.g., a mother lifts a 2,000 pound car to free her child caught underneath). This model is, however, incomplete. It represents only one part of a repertoire of responses that may occur to threat.

Unfortunately, this simplistic one-dimensional stress response model has failed to adequately explain the experiences of many individuals who, rather than mobilize to threat, freeze. Many individuals who freeze subsequently are diagnosed with post-traumatic stress disorder and don't have symptoms associated with activation of the sympathetic nervous system and adrenal glands.

### **Polyvagal Theory**

A more inclusive model describing our responses to threat has been proposed by Stephen Porges, a coauthor of this article and Professor of Psychiatry at the University of North Carolina. About 20 years ago, Porges (1995, 2001, 2009) introduced the polyvagal theory. According to Porges, instead of responding just to danger signals with only the options to fight or flee, we also retain in our nervous system a primitive immobilization response that may reflexively be expressed when our body detects life threat. This primitive defense system is shared with reptiles, such as the turtle, that use immobilization as a primary defense system. According to Porges, through a process that he has called *neuroception*, our brain continuously interprets risk in the environment and automatically reacts without conscious awareness to optimize survival through three different pathways. The brain makes the decision without awareness, and the relative risks of stimuli are interpreted to be safe, dangerous, or life threatening. This process is different than perception, which involves a cognitive awareness of the stimuli. Neuroception occurs in areas of the brain that are not participating in our active cognitive evaluation of the environment. Our neuroception of risk triggers bodily reactions that we “feel,” although we may not be aware of the signals that trigger these feelings. Each category of risk triggers a physiological state that promotes and facilitates the behaviors that are usually the most adaptive for our survival. Consistent with

evolutionary principles, since our survival is so important, the decision is being made outside the realm of the higher conscious processes that are vulnerable to persuasion.

When the external stimuli signal safety, the brain engages neural processes that support social communication and the establishment and maintenance of social bonds. These neural processes overlap with the neural processes supporting health, growth, and restoration.

When the stimuli signal danger, the brain triggers the classic fight or flight response. The blood flow shifts from the digestive organs to the deep muscles, and heart rate and blood pressure increase. These biological processes mobilize one to yell, scream, fight, or run away.

However, when the stimuli signal life threat, the brain triggers a totally different defense reaction, that of death feigning and physiological shutdown. At the moment of signal we immobilize and our heart rate and blood pressure decrease. This is the embedded reptilian survival response. More specifically, this immobilization response was characteristic of the ancient reptiles from which mammals evolved. When these ancient reptiles were under life threat, they would immobilize, slow their heart rate, and hold their breath. Given their small brains and limited need for oxygen, they could hold their breath for a couple of hours, thus enabling them to submerge underwater to seek safety. If threat occurred while on land, the immobilization strategy made them more difficult for a predator to detect, since body movements provide the primary cues for predators.

The immobilization defense system evolved in mammals with only slight modifications from the reptilian ancestor. The earliest mammals were very small. Similar to the ancient reptile, immobilization had several adaptive features, including hiding and appearing to be dead (death feigning). Although humans are modern mammals, we retain some of the response patterns of our evolutionary ancestors. Namely, when life is threatened in ways in which resisting would only trigger the predator to attack more, we may automatically immobilize. Thus, immobilization has survival value.

### **Polyvagal Theory and Date Rape**

The polyvagal theory is derived from our current knowledge of neurophysiology and neuroanatomy, and explains why some women in the situation of a threat of date rape do not resist. The signals reaching the woman's brain through a process of neuroception automatically trigger immobilization, the life threat response. This response is not conscious; the biology shuts her down and she cannot act or fight, which is the reptilian defense mechanism of survival. Many women experience shame over their failure to resist or fight, yet their immobilization has nothing to do with choices, intentions, or wishes—it is reflexive.

Similarly, the immobilization response may occur across mammalian species when the nervous system evaluates the context as life threatening. In general, the probability of this shutdown immobilization response occurring increases when the individual is either physically restrained or in a confined physical environment. In these contexts, neuroception will frequently automatically trigger immobilization. Often the immobilization will be accompanied with an increase in pain threshold and psychological dissociation. From an evolutionary perspective, if you survive you can thank your body for its intrinsic wisdom.

On the other hand, when judgment is clouded by alcohol, the male may misinterpret the female's immobility as a passive Yes. Had her neuroception triggered the danger response, which would mobilize action, she most likely would have yelled, punched, or kneed the date rape predator. Although the predator may respond with anger, he probably would have stopped even in the throes of sexual excitement with his judgment clouded by his alcoholic state. This scenario assumes that the potential date rape predator did not truly want to rape or injure the woman.

When a woman appears to acquiesce because of the triggering of the life-threatening physiological pathways, the potential predator may misinterpret the absence of resistance through his neuroception as if it were safe and he should proceed. The woman's thoughts, intentions, and feelings are irrelevant—her body shut down in preparation for severe injury and death.

## Conclusions

Lessons to learn from the polyvagal theory as applied to possible date rape:

1. If the victim of date rape responded by becoming paralyzed during a rape, she is not at fault. Shame and self-blame are inappropriate. Her immobility was the mammalian species' last resort to survive by shutting down and becoming immobilized in face of overwhelming life-threatening danger.
2. The potential perpetrator should not assume that immobility or the absence of resistance means a passive *Yes*. It can mean the person is saying *No* because his threatening behavior has triggered a life-threatening immobilization response. Thus, we recommend that potential perpetrators should only proceed on the ongoing pathway of intimacy when the person being approached gives an affirmative *Yes*, under a condition without threat.
3. As the California law passed on September 28, 2014 states, "It is the responsibility of each person involved in the sexual activity to ensure that he or she has the affirmative consent of the other or others to engage in the sexual activity. Lack of protest or resistance does not mean consent, nor does silence mean consent. Affirmative consent must be ongoing throughout a sexual activity and can be revoked at any time" (Senate Bill
4. 967, 2014).

## Acknowledgment

The authors thank Dr. Donald Moss for superb feedback, editorial changes, and support.

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## HIGHLIGHTS FROM BFE ROME MEETING

### Biofeedback Federation of Europe 2015 Awards Ceremony

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



The 2015 Biofeedback Federation of Europe Service Award to  
**Prof Giuseppe Sacco**  
for his dedication in furthering the field of Biofeedback and Psychophysiology



The 2015 Biofeedback Federation of Europe Research Award to  
**Dr. Steven Baskin**  
for his contribution to the Science of Psychophysiology



The 2015 Biofeedback Federation of Europe Education Award to  
**Dr. Penny Werthner**  
for her contribution to Education in Sport Psychophysiology

#### 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)

**2014 - Venice, Italy**  
Stephen Porges - Research Award  
Jay Gunkelman - Educator Award

## HIGHLIGHTS FROM BFE ROME MEETING

### Attendees Share Their Experiences

*At the BFE Annual Meeting in Rome we once again welcomed participants from all over the globe specializing in many different fields. The five day meeting included workshops and a Scientific Day where the latest research in biofeedback, neurofeedback and sport was presented. We would like to thank all the participants, presenters and exhibitors for joining us once again at our meeting in Italy and helping to create a warm, nurturing atmosphere for all.*

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For the second time within a few years, the BFE meeting was held in Rome. Quite a different part of the city compared to the former meeting, five years ago. This year, it was held in the Università Pontificia Salesiana, situated in a real local neighbourhood, with its own Italian flavour.

The five days congress had a lot of topics on the list, ranging from neurofeedback to biofeedback and combining both with all kinds of therapies. The scientific program started with invited speakers for the whole biofeedback community. The next day, the program was divided into an Italian language track and tracks for neurofeedback and biofeedback.

Coffee breaks and lunchtime were the most ideal times to connect with other people and share experiences and ideas. All these people from different cultures and professions makes a nice blend. And it is always a surprise to see some well known faces from earlier meetings. So, looking for nice companionship for dinnertime in the magical town of Rome, is not too difficult. Looking back, the meeting gave new insights, new ideas and renewed old friendships.



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

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*Dr. Erik Peper, Dr. Giuseppe Sacco, Dr. Lindsay Thornton*

## HIGHLIGHTS FROM BFE ROME MEETING

The BFE conference is always such a hurricane of events, with rarely a moment to sit down. There are so many interesting workshops and scientific presentations to check out, as well as people for me to engage to learn about the exciting work they are doing in the field. Aside from the little hiccups that accompany all live, multi-day events, I'm extremely proud of everyone that helped coordinate the event and grateful to all of those who attended. It has always been a goal of ours to provide clinicians of all skill levels and students the opportunity to learn directly from the expert in their fields, and I definitely believe that standard was maintained this year.

My conversation with attendees left me with several positive, stand-out impressions of the meeting. Amongst these highlights are:

Linda Walker, MHR, LPC presented two workshops, one on "Practical Tips for Getting the Most out of Biofeedback" and the other on "Z-Score Neurofeedback: Tips and Methods for Effective Integration in Practice". Her name has long been cemented as the BFE's most popular online instructor, and it was confirmed by participants that her hands-on approach to learning, with calm and clear explanations, made her a winner here as well.



*Participants in Linda Walker's workshop*



*Dr. Paul G. Swingle,  
Dr. Mari Swingle*

Mari K. Swingle, Ph.D., daughter of well-known psychologist and author Dr. Paul Swingle, presented three times during scientific day on the neurofeedback assessment and training of digital technology and internet addictions. Due to the fascinating (and even frightening) nature of this topic of internet addiction, i-technology and youth, the BFE has invited her to present a webinar on this timely topic. Keep your eyes open for that. (You might say to yourself: "Yes, but Dr. Swingle already has spoken on that...". Well, from whom did you think he learned this?)

Biofeedback and sports fans received quite the treat: 2-days from Dr. Lindsay Thornton, 2-days from Dr. Penny Werthner, and a scientific day presentation where heavy hitters of the field Dr. Bruno Demichelis and Tim Harkness of Chelsea F.C. converged for a talk on the "Unique Peak Performance Database". Attendees of the scientific day got to witness quite the passionate discussion.

Those that are interested in sleep issues will be happy to hear that the BFE has asked Lothar Niepoth, head of the German Biofeedback Society, to present his 1-day workshop on "Biofeedback in the Treatment of Insomnia" as full online class.

Dr. Steven Baskin received quite glowing reviews for his 2-day workshop on "Biobehavioral Considerations in the Diagnosis and Treatment of Primary Headache Disorders". Participants enjoyed his hands-on approach and ease of interaction. If the BFE is lucky, we may also be able to share some video of his workshop.



*Dr. Lindsay Thornton*

## HIGHLIGHTS FROM BFE ROME MEETING

Who doesn't love a conference room that's reminiscent of some type of United Nations round-table discussion? Attendees of Drs. Lynda and Michael Thompson's workshop certainly enjoyed it.

Although I was left a bit exhausted by the end of the conference I thoroughly enjoyed the opportunity to meet with and learn from, I look forward to the next meeting and I hope to reencounter the many new colleagues and friends made this year. From my all my online work during the year, I very much enjoy finally putting faces to the voices with whom I teach and speak to.



*Drs. Lynda and Michael Thompson*

The BFE would like to thank everyone who attended our Rome meeting. We hope that the conference provided you with the opportunity to make new friends, connect with colleagues and share knowledge and expertise with participants from around the world. We were fortunate to welcome workshop presenters who are leaders in their respective fields, along with a diverse group of speakers and poster presenters who addressed a wide variety of biofeedback topics as part of the scientific program.

We would also like to thank our host, the Salesian Pontifical University in Rome, for providing a location for our meeting. Special thanks go out to our sponsors – without their support the conference would not be possible.

It is indeed a pleasure when so many members of the biofeedback community come together to share ideas. Thank you again for being a part of BFE 2015.

**Jon Bale**  
**BFE Research Manager**  
**Canada**



*Walking Tour of Rome*

## HIGHLIGHTS FROM BFE ROME MEETING

The 18th BFE Meeting was really practical with a huge number of different workshops. Every day we could choose the most interesting and helpful for us. I participated in “Practical Tips for Getting the Most Out of Biofeedback” conducted by Linda Walker, “Effective intervention in patients with autism and ADHD” by Piotr Sobaniec and also took a part in Neurofeedback fundamentals by Lynda and Michael Thompson. I am glad about my choice, because each workshop gave me other benefits.

During the Scientific Day I listened to lectures by many authorities in the bio and neurofeedback field. Also coffee and lunch breaks allowed us to meet participants from other countries. It was a great opportunity to develop our knowledge, share experiences and learn new approaches to working with patients. Moreover, the 18th BFE Meeting took place in one of the most beautiful Italian cities – Rome. We visited all the famous places and discovered wonderful unknown places. I look forward to the next BFE meeting and I hope it will be just as inspiring and in an interesting location.

*Barbara Turko is a speech therapist and the PhD candidate at the Medical University of Bialystok, Poland. Her main work is concerned with therapy of autistic or mentally disabled children. At the Department of Pediatrics Neurology and Rehabilitation she conducts a few studies in neurophysiology and neurofeedback in a cooperation with Piotr Sobaniec, BCN. She is also a volunteer consultant in "Hope and Chance foundation" in Bialystok for children in need.*

**Barbara Turko**  
**PhD Candidate at the Medical University of Bialystok**  
**Poland**



*Piotr Sobaniec, Barbara Turko, Dr. Richard Gevirtz, Dr. Lynda Thompson, Paulina Ejsmont, Dr. Michael Thompson (seated)*

*Piotr Sobaniec, Paulina Ejsmont, Barbara Turko*



## HIGHLIGHTS FROM THE BFE ROME MEETING

### Student Scholarship Program

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



*The BFE would like to thank all students who submitted an application for the Student Scholarship Program. This years winners were:*

#### BFE 2015 Scholarship Recipients

Sebastian Charuvila - Italy  
Paulina Ejsmont- Poland  
Barbara Turko- Poland



*Piotr Sobaniec, Paulina Ejsmont, Dr. Erik Peper, Barbara Turko*

## ABSTRACTS FROM BFE ROME MEETING

The 18<sup>th</sup> Annual Meeting of the Biofeedback Federation of Europe was held March 24-28, 2015, in Rome, Italy. The meeting consisted of a number of intensive 1- and 2-day invited workshops that teach in-depth knowledge and skills along with a scientific program. The journal is pleased to publish the abstracts of oral and poster presentations from the scientific portion of the meeting.

### **The Improvement of the Parasympathetic Response Through a Personalized 9-week Biofeedback Training vs Individual Biofeedback Training Without Specific Instructions in Stress Exposed Patients**

**Punito Michael Aisenpreis**

Aisenpreis Coaching & Therapy GmbH, Murnau

*Email: aisenpreis@somatic.de*

**Abstract:** People in stressful situations are looking for ways to control their bodily reactions to stressful stimuli on their own, e. g. with HRV biofeedback training. Within a period of about 3 years, patients of a somatic practice were selected, to conduct a 9 week, specially personalized HRV biofeedback training. It was explored in which areas this training was successful regarding the improvement of the parasympathetic response of the ANS. It consisted of an initial and final HRV measurement, a questionnaire at beginning and end, a special questionnaire to individual stressors & resources, and 3 one-hour coaching sessions (in practice or via Skype) at beginning, middle and end of the training. The subjects practiced at least 20 minutes daily and received instructions to HRV Biofeedback every week for the following week plus a feedback form. The subjects used different HRV BF equipment (HRV Scanner, Qiu, Nexus) and sent their exercises by e-mail. At the beginning and end, they were measured with a HRV short-term analysis. Average HR, SD1, SD2, SDNN were determined. A control group (n = 19, 11 m / 8f) occasionally conducted HRV biofeedback training on their own without special accompaniment. Data were imported into HRV Scanner, artifact-adjusted and analyzed. The used statistics was ANOVA with replication. The Verum group has improved significantly in all investigated HRV parameters after the training compared with the control group. The Verum group showed a significant difference between input & final measurement for all examined parameters. The control group showed no significant change of above HRV parameters. (Wilcoxon test). A personalized HRV biofeedback training significantly improves the parasympathetic response of ANS. It develops a high level of client motivation and compliance and lets a therapist steer the process on a daily base as the clients send their measurements by email. With easy-to-use client equipment and multiple import channels into HRV analysis software it shows to be a valuable extension to the biofeedback practice. Murnau, November 2013

**Keywords:** HRV biofeedback, heart coherency training, stress reduction, HRV Coaching concept

### **Clinical Process Based on The Applied Neuropsychophysiological Paradigm**

**Psic. Npf. David Arroyo**

Mexican Society of Bio and Neurofeedback/Hospital StarMedica Centro, Mexico City, Mexico

*Email: vidargui@outlook.com*

**Abstract:** The clinical process in health sciences aims to gather, organize and interpret sufficient data that makes possible for us to: a) arrive to an accurate diagnosis of the situation, b) to develop a treatment plan or intervention for the identified problem, c) to implement such plan, d) to evaluate its effectiveness transversely to determine if it's adequate to continue the original plan or to modify it according to the specific situation, and finally, e) to track the results.

Nowadays, the paradigm in which clinical process is currently based has proved to be insufficient to achieve those goals successfully as it may, on one hand, underutilize the full capacity of the resources that modern scientific and technological advances can provide, or otherwise, to rely too much on these developments and dismiss the human dimension of the patient or client and most of the factors and variables that play a key role in attaining a real state of wellbeing, when that's possible.

Because of its multi and interdisciplinary nature, the Clinical Process based on the Applied Neuropsychophysiology Paradigm requires the consideration of the human being in all of his physical, mental, social - and even spiritual - dimensions in a holistic manner, taking into account a great number of intrinsic and extrinsic variables that can alter its health status and relying on the latest technology to thus be able to accomplish a much more effective clinical process, from the potential to obtain more accurate multifactorial diagnoses - that even allows us to assess objectively what is traditionally considered subjective-; to help us implement treatment programs that could complement other conventional treatments increasing their effectiveness or to replace them with new options which can be less intrusive with fewer undesirable side effects with a higher rate of success improving the quality of life and functional capacity.

**Keywords:** clinical process, neuropsychophysiology, applied neuroscience

### **Bio/Neuro Evaluation and Neuro Psychotherapy**

**Hasan Asif, MD, Aza Mantashashvilli, MD**

Brain Wellness Center, New York, USA

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

**Abstract:** Combining QEEG and BIO parameters in psychiatric evaluation improves our understanding of underlying neurophysiological factors involved in disturbance of larger mind body homeostasis. Beside the clinical evaluation in psychiatric practice, addition of QEEG and bio parameters (respiration, HRV, skin conductance) not only greatly enhances our diagnostic formulation but also helps us formulate a much more effective Bio-Neurofeedback protocol especially for PTSD, anxiety disorder and attention deficit disorder. Furthermore, exploring the role of combining bio neuro feedback with psychotherapy for enhanced efficacy of treatment as compared to when these treatment modalities are practiced separately. Case studies are presented along with QEEG surface and S Loreta maps, dynamics display of S Loreta changing values in relationship to respiration and skin conductance.

**Keywords:** biofeedback, neurofeedback, QEEG, psychotherapy

### **Is the Athlete's Brain Efficient or Proficient? Cortical Patterns of Athletic Performance Within the Multi-Action Plan Model**

**Maurizio Bertollo, Selenia di Fronso, Edson Filho, Laura Bortoli, Claudio Robazza, Silvia Comani**

BIND - Behavioral Imaging and Neural Dynamics Center, University "G. d'Annunzio" of Chieti-Pescara, Chieti, Italy

*Email: [m.bertollo@unich.it](mailto:m.bertollo@unich.it)*



Electroencephalographic (EEG) measurements have been essential in shaping our understanding of the mechanisms underlying “economy of effort” in skilled performance in sports, such as precision sports and self-paced tasks (Hatfield & Kerick, 2007; Babiloni et al. 2008). Although various studies have supported the neural efficiency hypothesis in sports (which explains the occurrence of decreased cortical activation during skilled performance), there is also evidence that this hypothesis does not fully account for elite athletes’ brain activity in some conditions and/or tasks (Hatfield et al 2013; Babiloni et al. 2009).

Thus, we introduce the neural proficiency hypothesis of superior performance, in which cortical activity is not only related to automaticity and economy of effort, but also to notions of degree of control, maximum certainty and minimum movement time (Bertollo et al., submitted).

To test this hypothesis, we have subscribed to the Multi Action Plan (MAP) model (Bortoli et al. 2012), which uses performance (optimal and sub-optimal) and action control (automatized and controlled) levels to define four distinct performance profiles.

Our purpose herein is to discuss neural activation changes (i.e. ERD/ERS patterns in the theta, alpha and beta bands) associated with these four performance profiles in athletes from different sports/specialties, such as shooting, cycling, driving and juggling. On one hand we found that lower cortical activation is associated with optimal-automatic performance, in agreement with the “neural efficiency hypothesis”, but we observed higher cortical activation in optimal-controlled performance, achieved by exerting control of idiosyncratic core components of action. The latter result is in agreement with the neural proficiency hypothesis, which states a high level of neural adaptability. From an applied point of view, our research suggests that the MAP model can help to (1) develop performance enhancement strategies based on bio- and neurofeedback techniques, and (2) improve self-regulation skills to prevent choking under competitive pressure.

**Keywords:** MAP model, performance, sport, neural efficiency

## **Heart Rate Variability Biofeedback and Psychotherapy in Polycystic Ovary Syndrome: A Case Report**

**Carlo A. Pruneti, Chiara Cosentino**

University of Parma, Parma, Italy

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

Polycystic ovary syndrome (PCOS) is a common disorder affecting 4%–8% of women of reproductive age (Azziz et al., 2004). PCOS is characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovaries. Infertility affects 40% of women with PCOS. Women with PCOS are also at increased risk of a number of mental health disorders including depression, bipolar disorder, anxiety, and eating disorders (Sirmans & Pate, 2014). Also autonomic innervation of the heart can be affected in PCOS with increased sympathetic and decreased parasympathetic components of HRV (Yildirim et al., 2006). Typically, oral contraceptive pills (OCPs) are first-line for pharmacologic management PCOS (Badawy & Elnashar, 2011).

We present a PCOS patient who followed a psychotherapeutic and biofeedback treatment integrated with a specific endocrinology treatment. The patient, aged 32, was sent to visit from her endocrinologist for evaluation and counselling intervention aimed at stress management. The psychological assessment included the compilation of the CBA 2.0, MMPI - 2 , SQ , Psychophysiological Base Assessment and after stress induction (MAT). The equipment used was the Psycholab V35 of the company SATEM, Rome and emWave for HRV biofeedback. Rigidity and repressive attitude towards emotions emerges both at the behavioral level and in thought processes in a general absence of psychopathology with coping strategies "emotions centered " and "avoidance" and anxious symptomatology.

The assessment phase was followed by sessions of cognitive behavioral psychotherapy. The HRV biofeedback was suggested because the patient showed a clear chest breathing with diaphragmatic stiffening in correspondence to emotionally significant stimuli. There have been 24 sessions of psychotherapy and 18 sessions of HRV BFB , with home exercises for a total duration of 11 months. The p ., who underwent a medical treatment to promote endogenous production of estrogen and progesterin and psychological treatment based on HRV BFB, has recently been pregnant.

**Keywords:** PCOS, HRV biofeedback, multidimensional assessment, integrated treatment

## **Unique Peak Performance Database: 25 Years Inside the Brain of Top Athletes**

**Bruno Demichelis (1); Harkness, Tim (1); Demichelis, Hiroko (1,2); Resta, Valeria (1)**

(1)Demichelis Mindroom , Milano, Italy; (2)Precision Neurometrics, Vancouver, Canada

Email: [valeriaresta@demichelismindroom.com](mailto:valeriaresta@demichelismindroom.com); [hirokodem@hotmail.com](mailto:hirokodem@hotmail.com)

This presentation aims to cover issues related with measurability and trainability in peak performance with top level sports teams. Based on proprietary database, collected during 25 years of intervention in human performance enhancement, we will present results about pre-post neuro-biofeedback training, markers of peak performance, correlation with performance.

Presented for the first time by its owner, this unique database will demonstrate the difference in special characteristics between first team athletes, reserves and management of elite soccer teams. This data informs sport psychologists and performance experts in structuring training protocols and set parameters for devising custom interventions.

**Keywords:** optimal performance, psychophysiological correlates to peak performance, stress management, sport and corporations

## **Use of Neurofeedback in Different Psychopathologies**

**Juan Ricardo Díaz (1), Sandra Milena Camelo(2), Bertha Lucía Avendaño (2)**

(1)Training for Life,(2)Facultad de Psicología - Universidad Católica do Colombia

(1) Florida, USA, (2) Bogotá, Columbia

Email: [juan@trainingfl.com](mailto:juan@trainingfl.com); [smcamelo@ucatolica.edu.co](mailto:smcamelo@ucatolica.edu.co); [blavendano@ucatolica.edu.co](mailto:blavendano@ucatolica.edu.co)

In the last few years, the use of electroencephalographic Neurofeedback has increased exponentially; the practice of which is based on the registration and automatic analysis of the brain's electric activity. Using the signals directly emitted from the Central Nervous System, which is characterized for its wider range of actions, Neurofeedback allows for the recording of a considerable amount of the correlations between the superior cognitive functions. The parameters put in place for this technique represent some of the principle processes that, generally speaking, remain at an unconscious level and therefore escape rational control. The general idea is that the individual, having been presented with the registered information, is then able to exercise a control over these processes, therefore optimizing cerebral as well as entire bodily functions of the subject. Empirical literature has shown a substantial amount of studies that have applied Neurofeedback to the treatment of different psychopathologies with results pointing towards a beneficial use of this technique. For this reason, the following study proposed to examine the applicability of Neurofeedback in 50 patients: 26 of which were diagnosed with ADD, 16 diagnosed with ADHD, and 8 with a diagnosis of an autistic disorder. The ages ranged between 5 and 38 years with a median age of 12.65 and a deviation of 7.73 years. The number of sessions ranged between 10 and

75 with a median of 27 sessions and a deviation of 14 sessions. The final results, based on an evaluation on the effectiveness of the treatment, expressed that 4.1% of the patients received an A+ (outstanding), 57.1% received an A (excellent), 24.5% received a B (satisfactory), and 14.3% received a C (average).

**Keywords:** neurofeedback, psychopathology, effectiveness

## **Continuity of Hospital Care to Trauma Patient in CBT Approach: BFB/EMDR Outpatient Clinic**

**Eterno, Roberta; Mastronardi, Luciana; Manzone, Maria Grazia; Massè, Alessandro;  
Massazza, Giuseppe**

A.O.U. Città della Salute e della Scienza - C.T.O./M. Adelaide Hospital, Torino, Italy  
*Email: eterno.roberta@gmail.com*

**Introduction:** A traumatic event, such as a crash, a sport or working accident, or other events that threaten life, put involved people through a huge distress, and also their families. This experience may produce important psychological diseases as responses to a peritraumatic stress, Acute Stress Disorder or Post-Traumatic Stress Disorder (PTSD), with consequences on an emotional, cognitive, physical and social level, significantly affecting the psychophysical well-being and at-large the quality of life.

**Objective:** The psychological care activity at the Trauma Center offers a psychological treatment continuity to patients dismissed from the same hospital and their families, already taken on responsibility during admission, as well as patients with previous and serious traumas coming from other hospitals. Therefore a dedicated Psychotraumatology Outpatient Clinic has been activated.

**Method:** Assessment, essential for a personalized psychological treatment, includes a patient's global evaluation: a personological profile, emotional and interpersonal conditions, risks factors, cognitive/behavioral disorders, personal resources, life story and social context; through interviews and specific questionnaires about stressful and traumatic events, peritraumatic experiences/event impact, psychophysiological profile. The specific CBT intervention uses EMDR and BFB in addition.

**Results/Conclusions:** The overall reactive symptoms shown by the patients guide to an accurate and focused therapeutic choice as response to specific problems: CBT and/or EMDR and/or Biofeedback in addiction. Specifically, Biofeedback is used for psychophysiological screenings and also for therapeutic purposes. Patients thus treated bring back effective results regarding the symptom management, in particular decrease or remission of the traumatic event reactive symptoms, personal resources activation, compliance to the medical-surgical treatment considered the serious physical outcomes, preventing the onset or the establishment of important psychological disorders. Clinical results will be presented. *Thanks to Compagnia di San Paolo di Torino Foundation for contribution.*

**Keywords:** trauma, outpatient clinic, CBT-EMDR-BFB

## **Shared-Regulation Training: An Applied Framework for Using Biofeedback in Team Sports**

**Edson Filho, Davide Pierini, Maurizio Bertollo**

BIND - Behavioral Imaging and Neural Dynamics Center, University "G. d'Annunzio" of  
Chieti-Pescara, Chieti, Italy

*Email: soares\_medeiros@yahoo.com.br*

Research and practice on bio-neurofeedback has been based on individual-centered methods, namely idiosyncratic approaches (Bertollo, Bortoli, Gramaccioni, Hanin, Comani, &

Robazza, 2013). To date, there is extant research on biofeedback methods tailored to individual-centered approaches. However, there remains a need for additional studies advancing reliable group-level biofeedback interventions in team sports (Filho, Tenenbaum, & Yanyun, 2014). Stemming from recent research in socio-biology and socio-neuroscience (see Schilbach et al., 2013), we propose a conceptual framework to orient research and practice based on a group-level approach. To this extent, there is growing empirical evidence suggesting that sport and performance psychologists should focus on the notion of “shared regulation” training to facilitate coordination in team sports (see Filho, Pierini, Comani, Robazza, Tenenbaum, & Bertollo, 2014). From a research standpoint, we propose specific guidelines on nested data measurement and socio-cognitive task analysis for group bio-neurofeedback approaches. From an applied standpoint, we explain how contemporary bio-feedback techniques (e.g., breathing relaxation, heart rate variability, open focus) can be used to advance “shared regulation” training in team sports, particularly in cooperative sport dyads and triads. In conclusion, we forecast how neuroimaging methods can be used in future research and applied work in naturalistic environments in general, and sport settings in particular.

**Keywords:** shared mental model, team sport, shared regulation, juggling

## **Providing Biofeedback Services from a Distance: Lessons Learned from Telehealth**

**Raymond A. Folen, Ph.D., ABPP (1), Sarah D. Miyahira, Ph.D. (2)**

(1)Tripler Army Medical Center, (2)Pacific Regional Medical Command, Hawaii, USA

*Email: [raymond.a.folen.civ@mail.mil](mailto:raymond.a.folen.civ@mail.mil)*

For patients in rural and underserved areas, specialized health care services like biofeedback are often difficult to access. The limited availability of qualified biofeedback practitioners further exacerbates this problem. The tremendous expansion of technology infrastructure at both provider and patient locations has created the opportunity for an individual to receive treatment services, such as biofeedback, from distant providers who may be physically located thousands of miles away from the patient. Studies from behavioral telehealth suggest that treatments provided via distance modalities are equivalent to services provided face-to-face with regard to patient-provider rapport, the ability to accurately assess and diagnose, treatment outcome, and the frequency of adverse events. There is also evidence that behavioral telehealth increases access to care, reduces stigma, allows for closer patient follow-up, reduces cost, and results in increased patient and provider satisfaction. Providing biofeedback telehealth services via this modality requires a special skill set, however, as it presents many unique challenges not present in face-to-face care. This presentation addresses important considerations related to equipment, provider competence, patient selection, informed consent, safety, ethics and licensure. The results of a survey of the technologies currently available to provide biofeedback via telehealth will also be presented.

**Keywords:** biofeedback, telehealth, distance healthcare

## **CoKeTT – Application and Usability Centre for Healthcare and Assistance in Old Age**

**Petra Friedrich, Kai Hinderer, Michael Häcker, Bernhard Wolf**

University of Applied Sciences Kempten, Kempten, Germany

*Email: [petra.friedrich@hs-kempten.de](mailto:petra.friedrich@hs-kempten.de)*

CoKeTT (COMES Kempten Test and Training Centre) enables the testing of practically oriented therapy management systems for conditions such as diabetes, obesity,

cardiovascular diseases, psychosomatic disorders, as well as for patients who require rehabilitative care. For this purpose, the test and training centre is equipped with various telematic measuring systems, providing different configuration options and allowing for different settings according to the different ICT infrastructures of medical institutions. Landline and mobile communications-enabled analysis and therapy platforms can be used, all of which are able to access an already existing server (COMES<sup>®1</sup>) by means of which problems such as telemonitoring and the development of personalised telematic therapy structures may be addressed. Together with CoKeTT, potential users may develop suitable test scenarios, enhance existing equipment and also perform on-site tests of new diagnostic and therapeutic systems. The presentation will give an overview of current research projects related to teletherapy, virtual coaching, motivation based on feedback and gaming.

Development of novel therapy concepts for diabetes and obesity:

By using the mobile diagnosis and therapy platform COMES<sup>®</sup>, patients are enabled to view their physiological data such as blood pressure, blood glucose or their weight as well as their trends over time everywhere, at all times. Thanks to the already existing option of sending individualised feedback from the system to the user, he or she can rely on a telemedical companion and coach as a support during therapy or when changing habits and lifestyle.

- Biophysical feedback therapies
- Telemedical exercise therapies

With motivation, feedback and the telemedical companion it should be easier for the patients to transfer their findings into daily life. Thus achieving a better compliance and an increasing sustainability.

**Keywords:** biofeedback, virtual therapy, ambient assisted living, ambient medicine

## Mindfulness Attention as a Predictor of Psychopathology Among University Students

**Morayo Jimoh**

University of South Africa, South Africa

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

**Introduction:** Mindfulness is regarded as the ability to pay attention on purpose, in the present moment, in a nonjudgmental manner (Kabat- Zinn, 1990). This new construct has gained prominence in the field of counseling psychology and psychotherapy. Several therapeutic approaches have incorporated mindfulness as a technique in intervening in various psychopathological conditions. Prior studies have also examined mindfulness as a construct in relation to other variables. Garra & Barajas (2014) examined the relationship between mindfulness and psychopathology in a clinical sample of patients with anxiety disorders, depressive disorders and borderline personality disorder, general population and a sample of university undergraduates. However, little is known about this construct in the Nigerian context.

**Objective:** The general aim of this study is to ascertain psychology student's knowledge about the concept of mindfulness, their level of mindfulness attention and its relationship with the experience of anxiety and depression.

**Method:** A total of 100 undergraduate and postgraduate psychology students were used in the study. The Mindfulness Awareness Attention Scale (Brown & Ryan, 2003) as well as Beck's depression Inventory (Beck et al, 1961) and State Trait Anxiety Inventory-Form Y

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<sup>1</sup> COMES is a registered trademark of the Heinz Nixdorf-Lehrstuhl für Medizinische Elektronik, Technische Universität München

(Speilberger et al, 1983) was used. A questionnaire was also developed to collate demographic data as well as information on their knowledge about mindfulness. Descriptive results were analyzed using T-Independent test, Correlation and Regression Analysis.

**Conclusion:** Thus the research gives occasion for the recommendation of mindfulness based intervention strategies for individuals with clinical and nonclinical cases of anxiety and depression.

**Keywords:** mindfulness, predictor, anxiety, depression, psychopathology

## **Hemoencephalography: HEG Based Neurofeedback Practically Introduced as a Smart and Easy-to-use Training Method in ADD/ADHD, Dyslexia and Other Learning Disorders**

**Dr. Christel Kannegiesser-Leitner and Ralph Warnke**

Praxis für Psychomotorische Ganzheitstherapie, Rastatt, Germany

*Email: [kannegiesser-leitner@web.de](mailto:kannegiesser-leitner@web.de), [ralph.warnke@meditech.de](mailto:ralph.warnke@meditech.de)*

Often enough, biofeedback treatment will lead to immediate positive effects for the clients in one or just a handful of training sessions. On the other hand, particularly neurofeedback training can be intense and time consuming. Previous studies show that for example in treatment of ADD/ADHD, 30-40 training sessions (typically once per week) are necessary for corresponding and lasting training effects requiring a year of treatment for the client.

This work describes a different approach to neurofeedback treatment. It is based on the concept of nIR-based HEG therapy as proposed by Toomin and others and primarily addresses ADD/ADHD clients as well as clients with dyslexia and other forms of learning disorders. Recent findings indicate that a compact HEG based neurofeedback treatment which offers several sessions per day offers comparable or even better effects in clients than the common lengthy form of therapy. The overall aim of this approach is to provide such clients who show limited concentration and endurance with an easier and faster treatment program.

In this presentation the authors will share the progress showing in a group of n>20 and provide a thorough understanding of the approach and its benefits for both clients and trainers. More details and practical experience on the method can be obtained in the corresponding workshop which is part of this year's BFE conference in Rome. The workshop includes extensive hands-on self-experience for all workshop participants.

**Keywords:** HEG, hemoencephalography, neurofeedback compact training, ADD, ADHD, learning disorders

## **QEEG/Electrical Imaging and Z-score LORETA Neurofeedback in Neuropsychiatric Practice**

**J. Lucas Koberda, MD, PhD.**

Tallahassee NeuroBalance Center, Tallahassee, FL, USA

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

Introduction of QEEG/LORETA imaging has improved our diagnostic ability in neuropsychiatric practice by identification of dysregulated cortical areas implicated in patient's symptoms. Additional use of LORETA Z-score neurofeedback (NFB) enables us to directly target this area of dysregulation in order to improve associated symptoms. Based on approximately 300 patients treated in our clinic with Z-score LORETA NFB a detailed analysis of selected cases will be presented. Cases will include depression/anxiety, chronic pain, epilepsy, stroke and cognitive dysfunction. Specific areas of dysregulation attributed to particular condition identified by LORETA will be presented including Anterior Cingulate and Insular cortex in pain syndromes as well as specific Brodmann's Areas in other cases.

Follow up findings of QEEG/LORETA electrical imaging after NFB and computerized cognitive testing will be discussed. In addition, cases of Z-score LORETA NFB mediated cognitive enhancement will be shown.

**Keywords:** Loreta neurofeedback, neuropsychiatry

## **Biofeedback Outpatient Clinic Dedicated for the Treatment of High Complexity Amputees and Reimplanted Patients at CTO Hospital**

**Mastronardi, Luciana; Manzone, Maria Grazia ; Pontini, Italo ; Massazza, Giuseppe**

A.O.U. Città della Salute e della Scienza - C.T.O./M.Adelaide Hospital, Torino, Italy

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

**Introduction:** A Biofeedback/Psychotraumatology Outpatient Clinic is operative at Psychology Service, AOU Città della Salute e della Scienza, C.T.O./M.Adelaide Hospital, for traumatized patients in a multidisciplinary approach and in medical and psychological care continuity, thanks to contribution of Compagnia di San Paolo di Torino Foundation.

**Objective:** Offering a care continuity to patient and his family, in collaboration with GIM (Interdisciplinary Group Microsurgery), Hand Surgery and Plastic Surgery Wards, making sure there is a global take on responsibility. Intervention, focused on rising psychological disorders, aims to stress containment and management, paying specific attention to symptoms reactive to traumatic event, pain control, personal resources activation, in order to support a compliance in medical, surgical and rehabilitative care in the treatment pathway, improving patient and his family's quality of life. Therefore a dedicated Biofeedback Outpatient Clinic is operative for high complexity patients' treatment.

**Methods/Instruments:** At the Outpatient Clinic, after psychological and psychophysiological assessment and diagnostic return, CBT intervention includes Biofeedback Training. Biofeedback Training consists in a first psychophysiological assessment phase on five channels (EMG, BVP, Temp, SC, Resp) and later Biofeedback Training along with Relaxation Training, in order to develop more awareness and voluntary control of physiological processes and to reach a significant symptom decrease. Biofeedback psychological intervention is also used in pre and post surgery preparation, focusing specifically on the management of painful symptoms in collaboration with medical teams.

**Results/Conclusions:** Although data are preliminary whereas the outpatient clinic is operative since about six months, results highlight in treated patients a decrease/remission of the reactive symptoms, allowing to develop a better stress management, improving interpersonal and medical relationship, promoting compliance to the medical-surgical treatment. Preliminary data will be reported and discussed. Moreover, dedicated psychological intervention towards very high emotional level patients has been effective within a multidisciplinary approach, allowing a continuity of psychological care making sure of an outpatient global take on responsibility in team. *Thanks to Compagnia di San Paolo di Torino Foundation for contribution.*

**Keywords:** hand surgery, amputation, reimplant, hospital psychological care

## **Biofeedback as a Tool for Pain Management - A Case Based Approach**

**Eugénie Pabst, Psy.D.**

Private Practice, Chicago, IL, USA

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

This case based approach provides an example of how biofeedback can be used as an effective pain management tool for chronic pain. Broken down into a three step process, this case example explains how a chronic pain patient was able to see, learn and change his response to pain using biofeedback. Pre/post treatment examples of surface

electromyograph and respiratory biofeedback demonstrate significant changes the patient was able to implement through mastery of self-regulation skills.

**Keywords:** pain management, biofeedback, case example

## **Biofeedback, Posture Awareness Embedded Within an Evolutionary Perspective**

**Dr. Erik Peper**

San Francisco State University, San Francisco, CA, USA

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

Implementing strategies to mobilize health after traditional treatments have been unsuccessful may be possible when the problems are reframed. The reframing is based upon perceiving the dysfunctions from a holistic health evolutionary perspective. Discussed is the process by which integrating a holistic framework, somatic awareness and posture with biofeedback reduce illness. The process is illustrated with four cases—six year chronic migraine, psychogenic nonepileptic seizures, vulvodynia, and CIN III carcinoma in situ cervical dysplasia—which were treated in less than 5 sessions over a three month period. The common themes that contributed to the etiology and maintenance of the illnesses were dysregulation of breathing patterns, lack of hope, unhealthy life style, and absence of self-regulation skills to nurture the self-healing potential. Discussed are strategies by which these students/clients mobilized health and eliminated migraines from three per week to zero, epileptic seizures from 11 per week to zero, reduced pelvic floor pain from an average of 7 to 1, and reversed cervical dysplasia so that the next Pap test was normal.

**Keywords:** evolution, posture, respiration, migraine, epilepsy, vulvodynia, cervical dysplasia, biofeedback

## **Heart Rate Variability Biofeedback Reduces Symptoms of Depression and Anxiety in Depressed People**

**Davide Pierini (1), Petros Tzavaris(2), Domenico Sgromo(3), Carlo Pruneti(3), Chiara Cosentino(3)**

(1) Keiron, Montreal (2) Montreal Neurofeedback Center, Canada; (3) University of Parma, Italy.

*Email: [domenico.sgromo@unipr.it](mailto:domenico.sgromo@unipr.it)*

**Background:** Reduced Heart Rate Variability (HRV) has been associated with symptom severity in Major Depressive Disorder (MDD), indicating that at least part of the depressive symptoms could be caused by impairment in the autonomic nervous system. HRV biofeedback (HRVB) seems able to improve autonomic function and recently it has been applied with positive results in the treatment of MDD.

**Objective:** The present study aims to measure the effect of solely HRVB training on symptoms of depression, anxiety, and on the quality of life in subjects suffering from MDD.

**Procedure:** 15 subjects, satisfying the DSM-5 criteria for MDD and a rating of moderate-to-severe depression scored by the BDI-II, participated in 10-session HRVB training. We administered measures of anxiety (BAI), depression (BDI-II) and quality of life (WHO-QOL) at session 1, 6, and 10, as well as in a 1-month follow up. We also recorded two psychophysiological baselines before and after the training.

**Results:** Participants reported lower levels of Depression both at the post training assessment and at follow-up. Such modifications became evident at the intermediate recording after five HRVB sessions [ $F(1,3)= 9.866$ ;  $P=.002$ ;  $\alpha= .97$ ], and both for somatic [ $F(1,3)=17.538$ ;  $P= .000$ ;  $\alpha=1$ ] and cognitive symptoms [ $F(1,3)=13.74$ ;  $P= .000$ ;  $\alpha=.999$ ]. Also for Anxiety and satisfaction for Quality of life, there were significant differences along the



time. We didn't find significant differences in physiological measures related to HRV neither in time nor in frequency domain.

**Conclusion:** HRVB training probably had a positive effect on symptom perception; however data suggested once again the need of understanding the asynchrony in pattern of responses, between cognitive and physiological components. We argue that the use of HRVB can be more effective and better evaluable if used in a wider cognitive behavioral therapy context.

**Keywords:** HRV biofeedback, positive psychology, major depressive disorder, MDD

## **Complementary Therapy for Brucker-Biofeedback - Implementation of Gamification and eHealth to Increase Motivation and Compliance**

**Hasan Simsek (1), Kubi Mensah(1), Prof. Heiko Krumm(1), Stefanie Weber(2), Ralf Nickel(2)**

(1) TU Dortmund University, Dortmund; (2) Schön Klinik München, Harlaching, München, Germany

*Email: [hasan.simsek@tu-dortmund.de](mailto:hasan.simsek@tu-dortmund.de)*

At the final check-up of the Brucker-Biofeedback-Therapy (BBFT), the therapist evaluates patients' innervation improvements and infers a physical activity program to strengthen and increase functionality of the, by now better controllable, muscles. Because the program is recommended as a self-workout to the patient, personal assistance is needed over this period. At the Dortmund-University and in cooperation with the Schön-Klinik (Munich, Germany) we are developing a Cyber-Physical-System to cover the specified need. A (low cost) 3D-sensor with a complementary intelligent software can detect, measure, track and analyse users' body and movement to return a correspondent visual or auditive feedback. This enables the therapist to quantify the results of the BBFT and capture an individual movement of the patient, which represents the goal-movement in further exercises. Thus, the therapist sets up training parameters individually and under system instructions the patient tries to match the movement in a given time, until 100% is achieved. System-parameters, resulting vital- and training-data and additional information is administrated on an application server, so the patient or therapist can view and adjust the values regardless of their location. Elements of Gamification are implemented as well. Gamification describes the introduction of game elements into hitherto non-game environments like physical exercises with the intention of raising user engagement and motivation. The system is evaluated in cooperation with the Schön-Klinik, SportsCenter (Dortmund, Germany) and Medical Rehabilitation Department (Wetter, Germany). Test persons who underwent physical exercise with our system have shown high user acceptance, increased motivation and better overall compliance based on a questionnaire. Therefore, the work strongly indicates positive effects of gamification and eHealth on a complementary therapy for Brucker-Biofeedback.

**Keywords:** eRehabilitation, Assistive-System, Posture-Movement-Analysis, Compliance

## **Alpha Deregulation Patterns in Children and Youth Associated with Excessive Usage of i-technologies (gaming, texting, social media etc.).**

**Mari K. Swingle, Ph.D.**

Swingle Clinic, Vancouver, Canada

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

**Abstract:** In adults diagnosed with Internet or Digital Addiction, neurological liability is central to the development of excessive or detrimental usage of i-technologies: Any non-normative neurometric variation in the EEG is a liability (EEG readings 2 standard deviations out from normative). In the clinical Q, cluster patterns are also apparent: deregulated Theta

occipitally, deregulated gamma frontally, deregulation in the balance of the frontal lobes, and deregulated Alpha frontally (M. Swingle, 2013).

In my current clinical research with children and youth, a distinct and exclusive pattern of Alpha deregulation is now apparent; one that appears to be implicated in attention difficulties and disorders, emotional/behavioral deregulation (including anxiety), overall intelligence, innovation and creative process, as well as socio-emotional development.

**Keywords:** internet addiction, alpha deregulation, sub-clinical disorders, i-technologies

## **EEG Deregulation Patterns in Adults Diagnosed with an Internet Addiction**

***Mari K. Swingle, Ph.D.***

Swingle Clinic, Vancouver, Canada

*Email: 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-site 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.

**Keywords:** internet addiction, deregulation patterns, sub-clinical disorders

## **Doctor Stent - Model of Early In-hospital, HRV-based Rehabilitation for Cardiac Patients**

**Rafal Sztembis, PhD, MD; Tomasz Kaczmarek, IT; Marcin Chlebuś MD; Janusz Romanek MD, PhD**

Invasive Cardiology Unit, State Hospital No 2, Rzeszów, Poland

*Email: rsztembis@gmail.com*

As hospitalization becomes shorter, medical personnel have less time for patient education which is on the other hand perceived in practical guidelines of European Cardiac Society as a crucial element of treatment. However, there is no single model of such education and very few experimental programs targeted psychophysiological issues. Heart rate variability is one of psychophysiological modalities which is well known not only as a inner physiological imbalance and marker of increased risk of cardiac events but also as convenient tool of self-regulation techniques which potentially may bring about positive changes. Such context was a background for developing by author independent non-governmental experimental educational project for cardiac patients, mainly those after percutaneous coronary interventions. The program is based upon concept of self-education, promoting skills of self-regulation techniques and encompasses several areas covering both in-hospital and early post-discharge periods. The bonding icon of the program is virtual Doctor Stent.

The program was gradually expanded since 2010 and in 2014 a new element was added - application for tele-monitoring of heart rate. Application is loaded on a tablet that contains other elements of educational program including e-book, audiobook, comics, film and website. The app is divided into two basic groups of exercises: relaxation exercises based upon concept of slow breathing and physical exercises customized to medical condition of patient. The app allows for detection of significant arrhythmias what is signal for termination of exercises. It allows also for constant tele-monitoring of patients in real time and allows for retrospective data analysis. Tests of application were done in summer and autumn 2014 in clinical ward of cardiology and this presentation discusses results in context of practical, medical and psychological aspects.

**Keywords:** heart rate variability, myocardial infarction, cardiology, percutaneous coronary intervention, self-regulation

## **Heart Rate Variability Biofeedback to Improve Health and Well-Being of Senior Citizens in Singapore: A Pilot Study**

**Gabriel Tan, PhD, ABPP, BCB, BCN, qQEEG; Angelique Chan, PhD; Ivan Thong Shin Kai, BSc; Ido Amihai, PhD**  
*Email: [psygt@nus.edu.sg](mailto:psygt@nus.edu.sg)*

In this study we assessed the feasibility, acceptability, and efficacy of an 8 week biofeedback intervention program to increase the heart rate variability (HRV) and overall wellbeing of senior citizens (aged 65 and over) in Singapore. Twenty-five senior citizens who were recruited from a local community center volunteered to participate in the study. After recruitment, participants were taught to use a portable biofeedback device (i.e. a “stress eraser”), which aids the participant to breath in resonant frequency via visual and auditory signals. The participants were required to use the biofeedback device for at least 30 minutes a day, during the 8 week intervention. The participants underwent a 10 minute ECG recording before and following the intervention in order to assess potential changes in HRV that may occur as a consequence of the intervention. In addition, in order to assess changes in emotional wellbeing, participants were administered several questionnaires before and after the intervention (e.g. PANAS, EQ-5D). Our results showed that the intervention led to an increase in emotional wellbeing, evidenced by an increase in the PANAS positive emotions scale, as well as the PANAS positive-emotions/negative-emotions ratio. On the other hand, we did not observe significant HRV changes before and after the intervention. These results suggest that the 8 week biofeedback intervention was effective in increasing emotional wellbeing, albeit it is unclear whether this increase is related to HRV changes. Multiple issues relating to feasibility, acceptability and logistics of implementing research in the Singapore context will also be discussed.

**Keywords:** HRV, well-being, senior citizens

## **The Effect of EEG-Biofeedback Method on Memory Performance of Gifted and Talented Children**

**Mehmet Fatih Varli, PhD (1)(presenter); Tony Steffert, PhD (2)**  
Istanbul Aydin University (1); London Open University (2)  
Istanbul, Turkey (1); London, England(2)  
*Email: [varli.net@gmail.com](mailto:varli.net@gmail.com)*

The main aim of this study is to investigate the effects of EEG-Biofeedback method on memory performances of gifted and talented individuals. The subsidiary aim of the study is to investigate and compare the effects of EEG-Biofeedback method and Memory Exercise Program on memory performances of gifted and talented individuals. Thirty-four gifted and

talented 5th and 6th grade students enrolled in Istanbul Science and Art Center constitute the sample of the study. Öktem Verbal Memory Process Test – T1 (ÖKTEM-VMPT), Visual Aural Digit Span Test – T2 (VADS) and Visual Memory Test - T3 (VMT) were applied as preliminary tests. These 34 students were grouped into three groups according to their average scores of their memory preliminary test scores. The standard deviations do not show any significant differences which confirms that the groups were homogeneous. The numbers of students are as follows: Experimental Group 1 (EG1): 6; Experimental Group 2 (EG2): 14; and the Control Group (CG): 14. EEG-Biofeedback training was applied in EG1 and Memory Exercise Program was applied in EG2. At the end of the application, T1, T2 and T3 were administered to each of the three groups as a final test. Non-parametric Kruskal Wallis Test, Wilcoxon Signed Rank Test and Mann Whitney U Test were used in the analysis of the data.

According to the findings of the study, it was observed that the total average scores of the final test of both EG1 and EG2 are significantly higher than their preliminary test total average scores. Regarding the comparison of experimental groups, which is the main aim of this study, the findings indicate that the final test total average scores of EG1 are significantly higher than the final test total average scores of EG2. As a result, these findings provide evidence that EEG- Biofeedback Training and Memory Exercise Program improve the memory performances of gifted and talented individuals, yet EEG-Biofeedback Training is found to be more effective.

**Keywords:** memory performance, gifted and talented students, EEG Biofeedback

## ABSTRACTS FROM BFE ROME MEETING - POSTERS

All posters are listed in alphabetical order by the name of the lead presenter.

### **Electrodermal Activity in Children with Autism Spectrum Disorder**

**Bujnakova I (1), Ondrejka I (2), Mestanik M (1), Snircova E (2), Hrtanek I (2),  
Tonhajzerova I (1)**

(1) Department of Physiology and (2) Psychiatric Clinic, Jessenius Faculty of Medicine in Martin, Comenius University in Bratislava, University Hospital in Martin, Martin, Slovak Republic

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

**Introduction:** Autism spectrum disorder (ASD) is a neurodevelopmental disorder of unknown etiology, defined by impaired social communication and interaction, and by the presence of restrictive and repetitive behavior. The autonomic dysregulation, that is associated with higher risk of cardiovascular morbidity, has recently become the object of scientific interest in recent research as a feature of ASD. However, this question is still discussed. Electrodermal activity (EDA) is one of possible parameters of sympathetic arousal, which has not been studied adequately in children with ASD. Thus, the aim of our study was to assess activity of autonomic nervous system (ANS) using EDA as a sensitive marker of sympathetic activity.

**Methods:** The group of children with ASD (n=8), aged 7-15 years (mean age 10.1±0.9 yr.) was compared with normally developed children as a control group aged 7-15 years (n=8, mean age 10.0±0.5 yr.). Electrodermal activity was monitored, and consecutively EDA amplitude (µS) was analyzed using device the ProComp Infiniti (Thought Technology Ltd., Canada) in supine position (10 min.).

**Results:** The amplitude of electrodermal activity was significantly higher in children suffering from ASD compared to controls during the resting phase (p=0.036).

**Conclusions:** Our pilot results revealed increased electrodermal activity indicating higher sympathetic arousal in ASD children at rest. We suggest that it could represent an important pathomechanism leading to higher risk of cardiovascular complications associated with ASD. Detailed complex analysis of physiological parameters may illuminate the pathway linking ASD and autonomic nervous system activity.

**Support:** VEGA No. 1/0087/14 and BioMed Martin (ITMS 26220220187).

**Keywords:** autism spectrum disorder, autonomic nervous system, electrodermal activity, sympathetic arousal

### **Analysis of Event-related Potentials in Patients with ADHD**

**Paulina Ejsmont (Piotr Sobaniec, Basia Turko, Milena Tomczyk, Hubert Pesel, Ewelina Batruch, Renata Mróz, Milena Źochowska-Sobaniec)**

Students' Scientific Group at the Department of Pediatrics Neurology and Rehabilitation, Medical University of Bialystok, Poland

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

**Background:** Modern neuro-diagnostic methods are noninvasive and they complement cognitive and behavioral development assessment in children with suspected or known ADHD. Presented research is a part of the authors master's thesis.

**Objective:** The aim of the study was to analyze the differences in visual event-related potentials between patients with ADHD and healthy.

**Methods:** This study included a group of 40 patients, 20 diagnosed with ADHD, 20 healthy at age 7 - 18 years, hospitalized in the Department of Pediatrics Neurology and

Rehabilitation at the Medical University of Bialystok, Poland. Patients were administered visual event-related potentials testing in order to analyze parameters: amplitude and latency of P300, reaction time, sensitivity, specificity, errors of commission and omission. In addition, each parent has taken the questionnaire structured diagnostic interview hyperactivity syndrome.

**Results:** Compared with controls, ADHD patients show slower reaction time. Latency time level is not considerably varied in 2 groups. Moreover, the number of commission and omission errors is significantly increased in ADHD patients, although also in part of healthy patients.

**Keywords:** ADHD, Event-related potentials, P300

## **5 Sessions of Biofeedback to Manage Time Pressure and Urinary Urgency in a Young Man with Loss of Sphincter Control Bladder as a Symptom of Agoraphobia**

**Denise Farlati Pinton, Marika Giollo, Carla Mogentale**

Centro Phoenix srl, Centro di Psicologia, Neuropsicologia, Riabilitazione e Psicoterapia  
Romano d'Ezzelino (VI), Italy

*Email: [direzione@centrophoenix.it](mailto:direzione@centrophoenix.it)*

**Introduction:** The case of a 21-years-old young man with Agoraphobia Without History of Panic Disorder (DSM-IV) will be discussed. Albeit the collection of symptoms would never result in a real Panic Attack, there was a loss of control of the bladder sphincter causing severe relapses in his social and academic life with the risk to develop even worse psychopathologies. This young man, before coming to our clinical attention, had already addressed himself to a great number of clinics in order to find a medical solution.

**Methodology and Objectives:** Diaphragmatic breathing training supported by the use of a progressively slower pacer was proposed, in order to obtain a better relaxation and a correct respiration pattern. During this training, the lower abdominal muscles were monitored with the aim of making the client aware of the real muscle contraction that he associated to the loss of control. No threshold was applied to EMG registration; graphs and patterns of muscles activation and relaxation were showed only to allow him to develop a sense of control on them.

**Results:** During the training the patient increased his awareness and control of his physiological parameters. Such learning has allowed him to become aware of his misperception of muscle abdominal tension and implemented functional adjustments in particular in the breathing pattern.

**Discussion:** The clinically meaningful improvements, not only allowed the client to manage the anxiety driven symptoms but also gave him the chance to gain access to even heartfelt aspects so that the symptoms would not be replaced by other ones and as a prerequisite for access to psychotherapy.

**Keywords:** integrated approach, loss of sphincter control bladder, agoraphobia, self-awareness

## **A Neuropsychological and Psychophysiological Integrated Treatment in a Case of Childhood Epilepsy: A Pilot Study and Methodological Implications**

**Giollo Marika, Mogentale Carla**

Centro Phoenix srl, Centro di Psicologia, Neuropsicologia, Riabilitazione e Psicoterapia  
Romano d'Ezzelino (VI), Italy

*Email: [direzione@centrophoenix.it](mailto:direzione@centrophoenix.it)*

**Introduction:** The case of a 9-years-old boy with astatic myoclonic epilepsy will be discussed. In particular, we will present the impact of a neuropsychological and psychophysiological integrated treatment on executive functions, self-regulation, behaviour and school performances in the light of the clinical complexity of the case.

**Objectives:** 1. To accurately measure the relation among every neuropsychological and neurophysiological component and their contribution in determining the cognitive disability profile and the every-day reality adaptation. 2. To assess and to discuss the combined treatment outcomes in terms of efficacy and efficiency and the methodological implications in the frame of a neuroconstructivist model of progressive modularization.

**Methodology:** NFB Training (single channel at Cz): Theta and Alpha inhibition; by the time we were submitting this study 20 more sessions had already been scheduled for this boy to enhance SMR and 15-18 Hz Beta. Neuropsychological rehabilitation: computer-based executive functions and working memory training 40 twice-a-week sessions: 20 sessions each treatment.

**Results:** Significant statistical and clinical results were obtained in both treatments with positive impact on cognitive, behavioural and educational variables. The outcomes were assessed after only 4 months of treatment by different raters and occurrence of important improvements were reported also in untreated cognitive functions.

**Discussion:** Results support clinical literature which reports, at empirical evidence level, maximum efficacy of combined therapy. Results achieved will be interpreted in the frame of Karmiloff-Smith's and Moscovich-Umiltà's modularization models: treatments could rely on mutual reinforcement deriving from neuroanatomical and neurofunctional common ground. A critical point of discussion, a starting point for further studies and for the creation of a decision flow chart is the possibility to assess the impact of every treatment and the priorities in the application of each intervention in relation to the subject global profile changing. There will also be the attempt to define a quasi-experimental design clinical research study.

**Keywords:** integrated approach, childhood epilepsy, intellectual development disability, neurofeedback

## Paced Breathing with Biofeedback for Postural Control Improvement in Athletes

**Kovaleva, Anastasia; Kvitchasty, Anton; Bochaver, Konstantin; Grushko, Alyona; Kasatkin, Vladimir**

Moscow State University of Psychology and Education, Moscow, Russia

*Email: anastasia\_kovaleva@hotmail.com*

**Background:** At the beginning of the 21st century Lehrer, Vaschillo&Vaschillo (2001) showed, that when a person breathes at so-called resonant frequency (about 6 breathes per minute) a high amplitude peak appears in heart rate variability (HRV) power spectrum at the 0.1 Hz. These oscillations causes resonance in cardiovascular system, and it is supposed to be useful for the treatment of depression, anxiety, panic disorder and other diseases (Hofman et al, 2005; Gevirtz, 2013; Lehrer&Gevirtz, 2014).

We supposed that the biofeedback training with paced 6 per minute breathing will be useful for athletes, and will help them to improve their ability to control posture, emotions and finally to enhance their sport performance. Based on Lehrer, Vaschillo&Vaschillo protocol (2000, 2007) and Beauchamp et al (2012) application for sport psychology we organized a pilot practically oriented study.

**Methods:** Sixteen biathlon athletes (15-17 years old) took part in this study. For biofeedback (BFB) training the Thought Technology equipment was used. An athlete should breathe abdominally according to the pacer on the screen. Photoplethysmogram (for HRV analysis) and breathing frequency and amplitude were recorded before, during and after BFB session. Shooting performance was tested on the special shooting simulator. For postural control assessment stabilometric equipment was used (Stabilan2.0). For further analysis pre- and

post-training data (HRV, stabilometric, shooting) were processed by statistical software (SPSS).

**Results:** After one session of 5 minutes abdominal breathing BFB training only six athletes had significant improvement of shooting performance. Despite the fact that it is not significant for the whole sample, there is a tendency for sports performance improvement after BFB training. Breathing at one's resonant frequency significantly improved postural control according to the stabilometric parameters in a simple stabilographic test, but not in Romberg test. HRV parameters were changing only during training, but not in post-training test comparing to pre-training test.

**Keywords:** heart rate variability, respiratory sinus arrhythmia, postural control, athletes

## Changes in Biofeedback Stress Profile in Healthy Students After long-Term Mental Workload

**Mestanik M (1), Mestanikova A (1), Jurko A (2), Tonhajzerova I (1)**

(1) Department of Physiology and (2) Pediatric Cardiology, Jessenius Faculty of Medicine in Martin, Comenius University in Bratislava, Martin, Slovak Republic

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

**Introduction:** Sympathetic nervous system plays a key role in connection between mental stress and negative health outcomes. Electrodermal activity (EDA) represents relatively direct marker of sympathetic activity, as the sweat glands are regulated solely by sympathetic innervation in contrast to most autonomic functions regulated by both branches of autonomic nervous system. Therefore, we aimed to evaluate the long-term effect of increased mental workload on EDA-linked stress profile in healthy students.

**Methods:** The EDA ( $\mu\text{S}$ ) was recorded in 20 male university students (age  $22.5 \pm 0.3$  years, BMI  $23.5 \pm 0.6$ ) using ProComp Infiniti (Thought Technology Ltd, Canada) during stress profile: baseline (T1), Stroop test (T2), rest (T3), mental arithmetic (T4), rest (T5), negative emotion (T6), rest (T7). Duration of each period was 5 minutes. Examination was performed twice – at the beginning of term (P1) and a day before the last exam (P2).

**Results:** Significantly increased EDA was found in response to all the tasks (T2, T4, T6) as well as during recovery periods (T3, T5, T7) compared to baseline (T1) within both P1 and P2 ( $p < 0.001$  for all except T7 in P2, where  $p = 0.011$ ). Significantly decreased values of EDA were found in P2 compared to P1 ( $p < 0.001$  for T2,  $p < 0.01$  for T1, T3-T7).

**Conclusions:** The EDA was a sensitive psychophysiological marker of sympathetic arousal in response to acute stress. Increased EDA during complete stress profile could indicate persisting sympathetic activation even after cessation of stressor. Surprisingly, lower sympathetic activity was found after long-term mental workload. This finding could represent the effect of psychological coping mechanisms activation as well as an subtle alteration of complex allostatic reaction to stress. Detailed study may bring important information about the long-term effects of stress and pathophysiology of related health outcomes.

**Support:** VEGA No. 1/0087/14 and BioMed Martin (ITMS 26220220187).

**Keywords:** mental workload, autonomic nervous system, stress profile, sympathetic arousal

## Sympathetic Arousal During Continuous Performance Task in Mental Disorders

**Mestanikova A (1), Ondrejka I (2), Mestanik M (1), Hrtanek I (2), Snircova E (2), Tonhajzerova I (1)**

(1) Department of Physiology and (2) Clinic of Psychiatry, Jessenius Faculty of Medicine in Martin, Comenius University in Bratislava, University Hospital in Martin, Martin, Slovak Republic

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



**Introduction:** Electrodermal activity (EDA) is a well-applied marker of autonomic arousal during mental stressors, and its altered reactivity was found in several mental disorders. Therefore, we aimed to evaluate EDA response in different mental disorders in response to Continuous Performance Task (CPT), which is used for sustained attention and impulsivity evaluation.

**Method:** CPT was applied in attention-deficit hyperactivity disorder (ADHD), depressive disorder, and control subject using Biofeedback Reaction Time Suite (Thought Technology Ltd, Canada). Variable protocol sent two stimuli - a target (green circle) and non-target (red coloured letter X) on the screen, and the subject pressed a push button switch in response only to the target. Evaluated CPT parameters: mean reaction time (RT-mean), standard deviation (RT-STD), commission (EC) and omission errors (EO). EDA amplitude ( $\mu$ S) was evaluated in a percentage value from resting phase (5 min.) and the CPT response (5 min.).

**Results:** ADHD patient had the worst results in CPT (RT-mean 354 ms, RT-STD 89.220 ms, EC=5, EO=2) compared to depressive patient (RT-mean 289.1 ms, RT-STD 69.890, EC=1, EO=2), and control subject (RT-mean 266 ms, RT-STD 39.43 ms, EC=1, EO=0). In contrast, increase of EDA reactivity during CPT was the highest in control subject (68%) compared to depression (41%) and ADHD (24%).

**Conclusion:** Continuous Performance Task discovering impaired executive control in ADHD patient could represent an important psychological diagnostic tool in mental disorders. Further, the EDA reactivity was the lowest in ADHD patient compared to depressive and healthy subject indicating a potential sympathetic underarousal typical for externalizing psychopathology. We suggest that diminished electrodermal response to stress could indicate abnormal cholinergic sympathetically-mediated regulation associated with higher risk of adverse health outcomes. It seems that complex psychophysiological approach may be useful in clinical application for differential diagnosis of mental disorders.

**Support:** VEGA No. 1/0087/14 and BioMed Martin (ITMS 26220220187).

**Keywords:** sympathetic arousal, electrodermal response, mental disorders, continuous performance task

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

Setsuro Okada, Noriko Tsutaya, Toyohiko Hayashi

Kaetsu Clinic, Niigata City, Japan

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

**Objective:** The purpose of this study was to determine the effects of stress management training on glycemic control in patients with diabetes.

**Materials and Method:** Japanese adult diabetic patients (age,  $60 \pm 14$  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=15) 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 three month training protocol. To evaluate the effect of training, post prandial blood glucose and HbA1c were measured before and after three, six, nine and twelve month periods. Results were analyzed using paired "t" test and two-way repeated measures ANOVA.

**Results:** Statistically there was no significant difference between both groups in post prandial blood glucose levels before the training protocol. The training and control groups were associated with significant decreases in post prandial blood glucose levels after 3 months ( $p < 0.001$ ,  $p < 0.05$ , respectively). At the six, nine and twelve month follow-up marks, the training group continued to demonstrate lower blood glucose levels ( $p < 0.001$  vs before training, respectively), whereas those values in the control group tended to increase when

compared with their three month mark. Furthermore, there was no difference in the controls group's values at the six, nine and twelve month marks when compared to those prior to the commencement of training. Finally, at twelve months, the blood glucose levels in the control group increased significantly compared with that in the training group ( $p < 0.05$ ). Both groups were associated with significant decreases in HbA1c from 3 months to 12 months compared with levels prior to training.

**Conclusion:** The results show the possibility of improvement in post prandial blood glucose levels following twelve month biofeedback-assisted respiratory training in Japanese adult diabetic patients.

**Keywords:** stress management, diabetes, glycemic control

### Posture Changes, Perceived Strength and SEMG

**Erik Peper, PhD, BCB (a), Annette Booiman, MSCT, BCB (b), I-Mei Lin, PhD, BCB (c), Richard Harvey, PhD, (a), Ashley Del Dossoa (a)**

(a) Institute for Holistic Health Studies, San Francisco State University, San Francisco, CA,  
(b) Biofeedback in Beweging, Wormer, The Netherlands, (c) Kaohsiung Medical University, Taiwan

*Email: epeper@sfsu.edu*

Nonverbal communication, including projections of how we feel, is often reflected in body posture. For example, when standing erect, chest out, we visually occupy more space which tends to project power and authority to others. This study explored how changes in standing body posture affected self-perceptions of 'strength, power and authority' on a subjective rating scale. The subjects were 33 physical therapists (average age 46.2 years) assigned in pairs of 'testers' and subjects' taking turns in holding out their arms while resisting against downward pressure. The subjects either stood in an erect posture or in a slouched posture while they again held out their arm and attempted to resist the downward pressure. The order of collapsed or erect posture was counterbalanced. Phase two examined the phenomenon of subjective strength or weakness during erect or collapsed posture, respectively, by measuring SEMG of the upper trapezius, medial and anterior deltoid muscles during the two positions in a convenience sample. Analysis of Variance (ANOVA) showed that not only was there greater muscle strength, but also that 98% of the participants subjectively felt stronger when they stood in an erect posture compared to a collapsed posture  $F(1, 58) = 85.9, p < .001$ . ANOVA also showed the 'testers' felt that the subject were much stronger in their ability to resist the downward pressure in the erect versus collapsed position  $F(1, 59) = 74.6, p < .001$ . It is possible the testers were applying greater pressure at varying time, or that subjects' arms were fatigued at various times, however the subjective rating downward arm pressure were not significantly different as measured with t-test (erect  $p = 0.46$ ; collapse  $p = 0.50$ ). ANOVA of the combined SEMG of the trapezius, medial and anterior deltoid was significantly higher during the erect than the slouched position  $F(1, 46) = 6.69, p < .01$ . The subjective experience and objective SEMG measurements can be used to demonstrate to participants that posture matters! Somatic feedback should be part of the therapeutic and teaching process of biofeedback and neurofeedback. Without teaching how to change body posture only one half of the mind-body equation that underlies health and illness is impacted. The body is affected by the mind just as the mind effects the body.

**Keywords:** posture, strength, memory recall, somatic feedback

## Analysis of the HRV Biofeedback Trainings on Stress Level in Athletes Training Sprints

Hubert Pesel (Paulina Ejsmont, Piotr Sobaniec, Basia Turko, Milena Tomczyk, Ewelina Batruch, Renata Mróz, Milena Żochowska-Sobaniec)

Students' Scientific Group at the Department of Pediatrics Neurology and Rehabilitation,  
Medical University of Bialystok, Poland

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

**Background:** Worldwide, one of the athletes challenges is a mental preparation to compete. The body's resistance to stress is one of the main determinants of athletic achievement or lack of it. Presented research is a part of the authors master's thesis.

**Objective:** The aim of the study is to verify whether the heart rate variability biofeedback training can affect the reduction in the level of stress in athletic sprinters.

**Methods:** The study group consisted of 30 persons aged 18-28 years. The study group consisted of 15 athletes training sprints at the Sports Club Podlasie Bialystok, Poland and a control group of 15 people not related to any sports. The subjects performed the 7 tasks during the 20 minutes stress assessment. The pre- post- examination included measurements of following physiological parameters: heart rate variability, respiratory rhythm, skin conductance, hand temperature and surveys. After a preliminary testing, 5 participants from the research group, who achieved the lowest scores underwent 15 sessions of the heart rate variability biofeedback training, 20 minutes each.

**Results:** The study showed a significant reduction of stress level in training group after the heart rate variability biofeedback trainings and general improvement in attitude prior to competitions.

**Keywords:** athletes, stress, HRV biofeedback

## QEEG Analyze and Biofeedback in ACC (agenesis corporis callosi) – A Case Study

Anna Rasmus (1). Maria Łuckoś. Grzegorz Mańko (2)

1. Kazimierz Wielki University, Bydgoszcz, Poland; 2. Department of Ergonomics and Exertion Physiology, Institute of Physiotherapy, Faculty of Allied Health Sciences, College of Medicine, Jagiellonian University, Cracow, Poland

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

The topic of presentation is a case study of a child, who has been born with congenital agenesis of the corpus callosum and directed to eeg-biofeedback training. Currently, the boy is 7 years old. Neuroimaging study showed inoperable cyst of arachnoid in the right hemisphere and a small area of atrophy in the temporal lobe. Intellectual development within normal limits, emotions adapted to the situations, the boy has symptoms of dyslexia.

QEEG analysis showed : excess of Alfa and Theta waves in the sensorimotor area and the frontal lobes. Elevated ratios of Theta/Beta, Theta/SMR, Alfa/Beta.

The boy was subjected to eeg-biofeedback therapy, points Cz i Fz , protocol Theta/Beta to improve his cognitive processes. We will present a training program and neuropsychological therapy of the child together with gained results.

**Keywords:** agenesis corporis callosi, eeg-biofeedback training, QEEG

## An Analysis of EEG Spectra and ERP in Chronic Pain Patients Point Towards Central Sensitivity Syndrome

Ida Valikangas Rautio, Dieter Gøhmann, Stig Hollup

NTNU, Trondheim, Norway

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

Chronic pain syndrome (CPS) is defined by an ongoing pain, often starting with an acute injury or illness, lasting longer than 6 months. This presents a major challenge to health-care providers because of its poor response to therapy and an unclear etiology. It is a matter of debate to what extent CPS is a psychological or a somatic condition, nevertheless the experience of pain is very real for the affected patients.

The pain matrix consists of an extensive cortical network consistently activated by acute pain, which includes the somatosensory and cingulate areas, as well as prefrontal cortex, parietal and insular areas.

19 channel EEG was recorded from 46 patients diagnosed with CPS during a visual continuous performance task (VCPT). The data was artifact corrected for eye blinks and eye movements using independent components analysis (ICA). Individual data were analyzed for spectra, independent component spectra and ERP. Results from spectra analysis were exported to sLORETA to estimate which Brodmann areas were involved in the generation of excessive amplitudes compared to normdata. ERP were analyzed and compared to normdata for significant deviances.

Results indicate that the majority of patients presented deviances in theta, alpha and beta band ranges in brain areas related to the pain matrix. A large percentage of the target P3's were significantly increased, except not as a group average. The cueP3 from the active cue condition expressed a robust increase, both individually and computed as a group average. A group average spectra computation from the patients did not yield significant deviance.

The cueP3 has been implicated as an index for sensitivity in the default mode network in several studies, which renders this a relevant finding. Excessive rhythmic activity within the pain matrix in conjunction with hyperactivity in the default mode network may correspond with notions of central sensitivity syndromes.

**Keywords:** pain, CSS, EEG

## **Evaluation of the Efficacy of Neurofeedback Training Compared with Traditional Approaches for Children with Autism - Neurophysiological Results**

**Sobaniec Piotr, Milena Źochowska, Magdalena Cholewa, Barbara Turko**

Department of Pediatrics Neurology and Rehabilitation, Medical University of Bialystok, Poland

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

The efficacy of various therapeutic methods for children with ASD is not sufficiently studied. In presented work we summarize neurophysiological results of the evaluation of the efficacy of neurofeedback training, compared with traditional methods including behavioral and cognitive therapy, hippotherapy for young children with autism.

The study included a group of 27 patients, diagnosed with autism (ICD-10), at age 4 - 13 years, hospitalized in the Department of Pediatrics Neurology and Rehabilitation at the Medical University of Bialystok, 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. Patients participated in two kinds of interventions #1 including 40 sessions of traditional approaches such as: pedagogical and behavioral intensive treatment, hippotherapy and #2 40 sessions of neurofeedback.

Results included neurophysiological measurements obtained from QEEG analysis conducted before and after each intervention.

**Keywords:** neurofeedback, autism, QEEG

## HRV Training and Neurofeedback Baseline in Fibromyalgia: Two Case Reports

Porzia Talluri, Tiziana Cena, Cristiana Grazioli

Clinical Center Betelgeuse, Turin, Italy

*Email: [ptallur@tin.it](mailto:ptallur@tin.it); [crigrapsi@gmail.com](mailto:crigrapsi@gmail.com)*

Fibromyalgia syndrome (FMS) is an acquired systemic disorder of uncertain etiology characterized by widespread musculoskeletal pain.

Besides widespread pain, patients with FMS have many other symptoms like fatigue, sleep difficulties, a swollen feeling in tissues, paresthesia, cognitive dysfunctions, dizziness, increased tenderness in multiple points, morning stiffness, psychological disorders, abdominal pain, dysmenorrhoea, irritable bowel syndrome, headache. Much of the common symptoms could be attributed to a dysfunction of the autonomic nervous system due to sympathetic hyperactivation and/or to parasympathetic dysfunction. There are different ways for evaluating autonomic function. The most commonly used, fastest, and least invasive method is measuring heart rate variability (HRV), analysing the variability of time between successive R waves (R-R interval analysis).

Electroencephalographic biofeedback is an operant conditioning procedure that supports the individual's ability to modify the amplitude, that is the frequency or coherency of the neurophysiologic dynamics of the brain. In a previous study, we revealed that the SMR training alleviated the clinical symptoms (SMR facilitate the thalamic inhibitory mechanism). In literature there are no studies that revealed the use of the HRV training and the neurofeedback together in patients with fibromyalgia. In this preliminary study, 10 HRV training sessions were used to alleviate the clinical symptoms in two fibromyalgia patients. In addition, neurofeedback baselines were recorded before starting the training, after 5 sessions of it and at the end, in order to evaluate EEG changes.

Our project is to add 20 neurofeedback training sessions after HRV training.

Patients were evaluated by the following scales: Hamilton Depression Inventory, Beck Depression Inventory Scale, Short Form 36 (SF-36), Fibromyalgia Impact Questionnaire, Dissociative experience scale, temperament character inventory (TCI).

After 10 HRV sessions we had a decrease in fibromyalgia symptoms and an improvement in patient's life quality.

**Keywords:** heart rate variability, neurofeedback, fibromyalgia

### Quantitative analysis of the midline EEG in youth with ADHD

Milena Tomczyk, Paulina Ejsmont, Piotr Sobaniec, Basia Turko, Hubert Pesel, Ewelina Batruch, Renata Mróz, Milena Żochowska-Sobaniec

Students' Scientific Group at the Department of Developmental Neurology and Rehabilitation, Medical University of Białystok, Poland

*Email: [milena.tomczyk90@gmail.com](mailto:milena.tomczyk90@gmail.com)*

**Background:** ADHD is a serious disorder and has an enormous impact on the lives of affected individuals and their families. Modern therapies like NFB can influence on abnormal brain activity in those patients but precise neurophysiological examination is needed prior to the intervention. Mini QEEG acquired from the midline may be helpful in primary diagnosis for practitioners doing Neurofeedback therapy in youth with ADHD. Presented research is a part of the authors master's thesis.

**Objective:** The purpose of this study was to gain information about differences on the midline quantitative analysis of EEG in youth with ADHD.

**Material and Methods:** The study involved 40 children aged 12-18 years, including 20 diagnosed with ADHD and 20 controls. EEG recordings from Fz and Cz electrodes were

performed for five stages: eyes open, eyes closed, reading, listening, math and surveys for caregivers.

**Results:** Quantitative analysis of EEGs present differences in various frequency band ratios and dominant frequencies on the midline in youth with ADHD.

**Keywords:** ADHD, MiniQ, neurofeedback

## Autonomic Reactivity in Response to Emotional Stress

**Tonhajzerova I (1), Mestanik M (1), Mestanikova A (1), Jurko A (3), Ondrejka I (2)**

(1) Department of Physiology, (2) Psychiatric Clinic, Jessenius Faculty of Medicine in Martin, Comenius University in Bratislava, University Hospital in Martin, (3) Pediatric Cardiology Martin, Slovak Republic

*Email: [ingridtonhajzerova@gmail.com](mailto:ingridtonhajzerova@gmail.com), [tonhajzerova@jfmfmed.uniba.sk](mailto:tonhajzerova@jfmfmed.uniba.sk)*

**Introduction:** The negative emotional stress represents an important real-life stressor associated with higher risk of cardiovascular complications. However, the question related to "brain-heart-emotion" interaction is still unclear. We addressed the hypothesis that autonomic dynamic balance could be influenced by negative emotional stress, and this response might reflect a subjective emotional processing. Thus, we aimed to study autonomic parameters – electrodermal activity (EDA) and heart rate variability (HRV) during negative emotional stress in healthy students in the interaction with mood evaluation.

**Methods:** Twenty subjects (age:  $22.7 \pm 0.7$  yr.) were examined. Continuous ECG signal and EDA (ProComp Infiniti, Thought Technology Ltd., Canada) were recorded at rest and in response to negative emotional stress (NES). HRV evaluated parameters: high frequency band (HF-HRV) as an index of cardiovagal activity; symbolic dynamics index 0V% as a cardiosympathetic index. Depressive mood score was assessed using Beck Depression Inventory (BDI). The probands were divided into two groups – Group 1 with mild mood disturbance (score  $14.3 \pm 4.3$ ) and Group 2 with normal mood (score  $0.6 \pm 0.5$ ).

**Results:** In total group, EDA ( $\mu S$ ) was significantly higher and HF-HRV ( $ms^2$ ) was significantly lower in response to NES compared to rest ( $p < 0.05$ ). Group 1 was characterized by reduced vagal parameters (HF-HRV) and higher cardiac sympathetic index (0V%) in NES compared to Group 2 ( $p < 0.05$ ).

**Conclusion:** Our study revealed that NES evoked autonomic response in the manner of sympathetic arousal and vagal withdrawal. Importantly, the autonomic response was influenced by subjective emotional processing: a greater sympathetic activation and reduced cardiovagal activity in response to emotional stress was associated with mild mood disturbance in otherwise healthy subjects. We suggest that it could contribute to "brain-heart-emotion" understanding, particularly in affective disorders.

Support: VEGA 1/0087/14, APVV – 0235-12, BioMed (ITMS: 26220220187).

**Keywords:** emotional stress, electrodermal activity, heart rate variability, depressive mood

## How to Say NO During Impulsive Shopping Decisions: An Experimental Neurofeedback Study

**Lena Weichenmeier, Prof. Dr. Gerhard Raab**

Hochschule Ludwigshafen am Rhein, Ludwigshafen am Rhein, Germany

*Email: [lana.weichenmeier@hs-lu.de](mailto:lana.weichenmeier@hs-lu.de)*

The present investigation examines the potency of near infrared Hemoencephalography training (nirHEG) upon certain aspects of impulsive buying behavior (willingness to pay (WTP), amount of product purchase) and different vegetative functions (heart rate variability

in the low frequency range, HRV%LF; respiration/heart rate coherence, RSP/HR coherence).

Given that impulsivity as a character trait is associated with subcortical prefrontal connections (Miller, 1992; Spinella, 2004), we argue that low levels of self-control, hence high levels of impulsivity, may be linked to a diminished frontal activity. Amelioration of frontal oxygenation via specific neurofeedback training by means of nirHEG may therefore contribute to conventional therapeutic procedures for abnormal buying patterns. NirHEG constitutes a non-invasive neurofeedback training technique to picture brain activity in the human frontal lobe due to the concentration of hemoglobin. The intentional increase of regional cerebral blood flow oxygenation (rCBO<sub>2</sub>) in the human frontal lobe is the trainings' foundation (Toomim, 2004).

The results within a pretest already revealed a significant improved blood flow in the sample ( $n=11$ ) on Fpz after 8 weeks of nirHEG training of 6% ( $t(10)=3.91$ ;  $p<.01$ ). We were able to demonstrate significant improvements of 42% on HRV%LF ( $t(10)=-3.72$ ;  $p<.01$ ) and a significant increase within RSP/HR coherence ( $t(10)=-3.65$ ;  $p<.01$ ) from the first to the last training session in the pretest.

As shopping behavior and questionnaire data respectively did not change significantly during nirHEG training in the pretest we will present results from a running study ( $n=40$ ) that ties to the pretest procedure but involves a control group design that addresses impulsive and uncontrolled buyers (selected by questionnaire screenings).

Our research will offer valuable results on the impact of nirHEG training to enhance controlled and intentional buying behavior. And furthermore to derive scientific support for the implementation and effectiveness of a special developed neurofeedback training for impulsive and uncontrolled buying behavior.

**Keywords:** impulsive buying behaviour, neurofeedback (HEG), self-control, willingness-to-pay (WTP)

## BFE 19TH MEETING & UPCOMING CONFERENCE

In 2016, the BFE will be sponsoring the "BFE European Conference on Neurotherapies". We are pleased to collaborate with the [Asociación I+D Neuroterapias](#) to help nurture and develop the Bio/Neurofeedback field in Spain. The conference will be held primarily for Spanish professionals; thus, the language for this meeting is Spanish. Many of the presentations will be made in English (with simultaneous translations to Spanish) and we invite our English speaking colleagues to attend. More information will be available soon.



**Mark your calendars for the BFE 19th Meeting set to take place in Spring 2017.** We are currently reviewing a number of locations and we'll post additional information on our website 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. For more information, please contact Conference Coordinator: [conferences@bfe.org](mailto:conferences@bfe.org)

### 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)

### Take Part in 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/BFEConference>



# 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.**

# BFE EUROPEAN CONFERENCE ON NEUROTHERAPIES

## MADRID, SPAIN JUNE 8-12, 2016

The Biofeedback Federation of Europe  
in collaboration with the  
Asociación I+D Neuroterapias  
are pleased to announce the:

### BFE European Conference on Neurotherapies

Madrid, Spain  
June 8-12, 2016



The focus of the conference is to nurture and develop the fields of biofeedback and neurofeedback in Spain. The full program and additional details will be available soon.

**June 8, 2016  
Technology Day**

*Visit with sponsors and see the latest products being used in the industry.*



**June 9-10, 2016  
Pre-conference  
Workshops**

*One and two day workshops instructed by leaders in the field.*



**June 11-12, 2016  
Conference Program**

*Keynote speakers, short presentations, half-day workshops and research presentations.*



*(Presentations will be simultaneously translated to Spanish.)*



**For more information:  
[conferences@bfe.org](mailto:conferences@bfe.org)**