

## PROFESSIONAL ISSUES

# "The Mind Room" in Italian Soccer Training: The Use of Biofeedback and Neurofeedback for Optimum Performance

Vietta E. Wilson, PhD,<sup>1</sup> Erik Peper, PhD,<sup>2</sup> and Donald Moss, PhD<sup>3</sup>

<sup>1</sup>York University, Toronto, Canada; <sup>2</sup>San Francisco State University, San Francisco, CA; <sup>3</sup>Saybrook Graduate School, San Francisco, CA

Keywords: optimum performance, biofeedback, neurofeedback, preperformance states, desensitization

*Members of the Italian soccer team that recently won the World Cup utilized a number of biofeedback and neurofeedback techniques labeled the "Mind Room." The integration of biofeedback and neurofeedback into the common practices of sport psychology can be used to assess and teach the athletes to maintain appropriate breathing, relaxed muscles, coherent heart rhythms and dominant alpha brain states. Details on the Mind Room protocol are closely guarded, but the present authors detail four components well documented in sports psychophysiology. In order to score game winning penalty kicks, the athletes need to remain calm, alert, and focused on the goal while pandemonium is occurring all around them.*

### Introduction

Sport psychology has evolved to the point that common practices are found across sports and countries. The objectives of the common practices in sport psychology include maintaining or enhancing motivation (goal setting, reinforcement, etc), controlling body responses (relaxation, energization, repetition for automatic skill), controlling mind responses (arousal, attention, non-thinking), and preparing for performance under stress (prematch preparation, preshot or critical moments performance, mental recovery, etc.). The techniques used include relaxation, psychophysiological assessment, biofeedback, neurofeedback, cognitive restructuring, imagery, and simulation (Wilson, Peper, & Schmid, 2006). The major focus is to make the performance automatic and to have recovery and back-up systems in place that allow athletes or any professional to perform in a stressful situation when performance is not automatic. By developing ritualized routines, these performances are more likely to become automatic (Singer, 2002).

The mastery of these optimum performance skills may have contributed to the Italian team's success in winning the 2006 world cup soccer championship, since Aaron Derfel reported that some of the players had trained in a so-called "Mind Room" using meditation,

physiological relaxation, and visualization techniques to enhance their relaxation, alertness, and focused responsiveness on the playing field (2006a, 2006b). Derfel also reported that the Mind Room staff used a multi-modal biofeedback system (ProComp-Infinity™; Thought Technology, Ltd., West Chazy, NY) for physiological recording and training.

Specific information on the techniques used in the Mind Room are proprietary and not available for publication. However, the present authors will introduce four widely used and well documented behavioral and psychophysiological components useful in sport. The components to be described include preperformance state training, physiological assessment to master the zone of optimal functioning, desensitization, and inhibition of self-talk. One case example used will be taken from the sports physiology practice of Dr. Wilson, and does not include any information on the Italian athletes participating in the World Cup. However, likely applications will be discussed for a high intensity sport such as World Cup soccer.

### Pre-performance State Training

The training of optimal preperformance states would prepare soccer players for the enormous pressure (playing in a world championship for a country in which fans and even politicians identify themselves as "the" soccer country in the world) with numerous distractions (media, scandal, rabid noisy fans) using meditation, imagery, and desensitization while monitoring and training psychophysiological responses (Kamata, Tenenbaum, & Hanin, 2002; Martin, Moritz, & Hall, 1999).

### Physiological Assessment to Master the Zone of Optimal Functioning

The assessment and training of body and mind responses is routinely done in the Mind Room by monitoring EEG (electroencephalograph), EMG (electromyograph), temperature, heart rate variability,

blood volume pulse, EDA (electrodermal activity), and respiration, using the Thought Technology Infiniti™ system, while the trainer guides the athletes through a series of relaxation and meditation exercises until they learn to master a quiet meditative state. This state is similar to what is labeled the “zone of optimal functioning” in the research literature (Kamata, Tenenbaum, & Hanin, 2002).

### Desensitization—Transforming Failure into Success

After learning how to maintain the quiet readiness state, the athlete then visualizes himself playing in an actual game. The athletes also watch videos of past performance. When there is an inappropriate body response, such as muscle tension, as they watch an error in their performance, they are guided back to the relaxed and focused state with their attention drawn to creating positive responses to the past errors. The desensitization procedure is continued until the athletes can view the videos with minimal arousal or alarm during the performance errors. They also are trained to imagine upcoming situations, such as penalty kicks, while being monitored to assure the same quiet, calm, and focused state. This simulation helps condition the athlete to unfamiliar or stressful situations.

### Inhibition of Self-Talk

For optimum performance, athletes perform automatically. Ideally it is a state of “non-thinking” and this is an important part of the training. This non-thinking state can be identified from specific EEG frequencies and locations when monitoring athletes from self-paced sports such as golf or shooting for good and poor performances (Hatfield, Haufler, & Spaulding, 2006). The major research in this area shows a need to increase left-hemisphere alpha activity (at F7, T4, and T3 in right dominant subjects) and to inhibit 12 Hz activity recorded at T3 (as an indicator of disruptive inner self-talk) (Hatfield, Haufler, & Spaulding, 2006). Training thus aims to increase most alpha range activity, but decreases the specific 12 Hz activity. (Table 1 shows the training bands for EEG biofeedback).

#### Case example

The following example is a fifteen year old tennis player, of international caliber, who had a problem maintaining emotional control on the court, which cost him points as well as good will. We follow a training strategy of lowering arousal (by increasing Sensorimotor

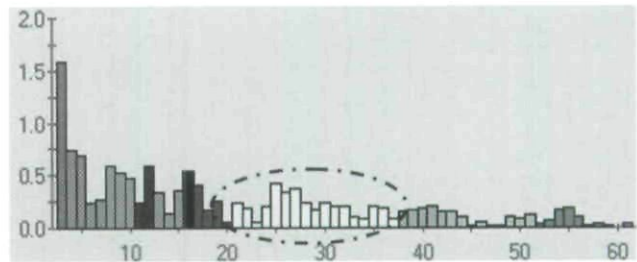


Figure 1. EEG recorded from Cz while the athlete was resting after a reaction time task. The increased amplitude from 20 to 36 Hz indicates increased rumination.

Table 1. Training bands for EEG feedback.

Alpha	8–13 Hz
Sensorimotor Rythym	12–15 Hz
Low Beta	15–18 Hz
High Beta busy brain	23–38 Hz
Inner Self Talk T3 T5	12 Hz

Rhythm activity) and focusing attention (by inhibiting Theta activity) at Cz (Wilson, Peper, & Thompson, in press). Similarly, individual differences are found such as increases in high Beta at Cz, which we interpret as “busy brain,” wherein the athlete mentally replays events or ruminates, and practices inhibiting. His training screen is also non-functional until he decreases 12 Hz at T3 (self-talk). This busy brain pattern is illustrated in Figure 1. In this specific example, an athlete in Vietta Wilson’s laboratory indicated that he was frustrated, and replayed again and again in his mind how he had “screwed up.”

His training consisted of initially guiding him to become more aware and better able to identify cognitive rumination, and then introducing systematic neurofeedback training to inhibit this activity. This, in conjunction with selecting a new coach who reinforces an inhibition of all critical self evaluation, has now put this athlete in the top three in the world in his age division.

This case example illustrates the complexity of determining what to train and how to train. Even when an athlete reaches the top, it is usually impossible to know what exactly leads to the success. Training protocols are not mechanical formula; they are specifically developed and adapted for each performer. This is a process that is dialectically opposed to systematic controlled studies. Nevertheless, most athletes and coaches agree that mental training and mental control is critical for optimal performance.

## Conclusion

Optimum performance training protocols have been integrated with applied psychophysiology to monitor the covert and overt physiological response patterns and states. A number of these approaches have been used to train Italian soccer players. The success of the Italian team in winning the World Cup rests on many factors including superior physical conditioning, skill training, team tactics, mental preparation, and even luck. However, the use of the Mind Room in professional soccer reflects the broadening acceptance and application of biofeedback and neurofeedback as an integral part of the training for those whose performance must be optimal during times of extreme stress.

## References

- Derfel, A. (2006a, July 8). Italy's weapon is all in their heads [Electronic version]. *Montreal Gazette*. Retrieved July 12, 2006 from <http://www.canada.com/montrealgazette/news/story.html?id=f0289b54-acc1-4710-899d-e6227b80e88a&k=98253&p=1>
- Derfel, A. (2006b, July 8). Will Canada's secret weapon give Italy an edge? [Electronic version] *Vancouver Sun*. Retrieved July 12, 2006 from <http://www.canada.com/vancouvernews/news/story.html?id=3b65ab53-fe15-41d0-a3f0-47a9570b184b&k=94051&p=2>
- Hatfield, B. D., Haufler, A. J., & Spalding, T. W. (2006). A cognitive neuroscience perspective on sport performance. In E. Ekkekakis & E. Acevedo (Eds.), *Psychobiology of Physical Activity* (pp. 221-240). Champaign, IL: Human Kinetics.
- Kamata, A., Tenenbaum, G., & Hanin, Y. L. (2002). Individual zone of optimal functioning: A probabilistic estimation. *Journal of Sport and Exercise Psychology, 24*, 189-208.
- Lidor, R., & Singer, R. N. (2002). Preperformance state, routines, and automaticity: What does it take to realize expertise in self-paced events. *Journal of Sport and Exercise Psychology, 24*, 359-375.
- Martin, K. A., Moritz, S. E., & Hall, C. R., (1999). Imagery use in sport: A literature review and applied model. *Sport Psychologist, 13*, 245-268.
- Wilson, V. E., Peper, E., & Schmid, A. (2006). Strategies for training concentration. In J. Williams (Ed.), *Applied Sports Psychology* (pp. 404-422). New York: McGraw-Hill.
- Wilson, V. E., Peper, E., & Thompson, M. (in press). Attention! Attention in sport. In M. Linden, B. Strack, & V. Wilson (Eds.), *Biofeedback and neurofeedback in sport*. New York: Springer.



Vietta Wilson



Erik Peper



Donald Moss

Correspondence: Vietta E. Wilson, PhD, 359 Strong College, York University, 4700 Keele Street, Toronto, Ontario, Canada, M3J 1P3, email: [vwilson@yorku.ca](mailto:vwilson@yorku.ca).

Copyright of Biofeedback is the property of Alliance Communications Group and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.