



Integration Effect: The Leveraging of Physiological Systems for Peak-Performance

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Lee A. Picariello, PsyD, MA Richard S.P. Meagher PsyD, MBA, BCB

Introduction

The Mindful Athlete Training, (MAT) mission is to provide elite athletes with a trackable method of mental strength training that connects mind and body for readiness to perform. The MAT team has developed an empirically supported and trackable mental skills training program that taps into the mind-body connection to enhance athletic performance. The purpose of this study is to explore the impact of 16 weeks of Mindful Athlete Training's Progressive Zone Training, (PZT) system on baseball performance. This research was influenced by the work behind the Yerkes-Dodson Model, Dr. Elmer Green's Psychophysiological Principle, and Dr. Herbert Benson's discovery of the Relaxation Response.

The Mindful Athlete Training method allows physiological systems to be leveraged through the training of four bio-circuits: Heart Rate Variability (HRV), Electroencephalograph (EEG), Neuromuscular Timing, and Reaction Speed. The player's development through these four stages is measured via bioQ, a patented, mind-body efficiency metric for an integrated, empirical approach to player development.

The purpose of this current study was twofold. First, the MAT team wanted to test the impact of the 16-week Progressive Zone Training system on a player's On-Base Percentage (OBP). Secondly, to test the hypothesis that the combination of training methods would outweigh the benefits of training in isolated methods as identified by previous studies.

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Participants

Participants for this study included 63 Division-1 baseball players from the Philadelphia area. The study began with 64 players from various teams. The study concluded the 16 weeks of training with 63 players remaining, as one player had dropped out of the study due to injury.

Methods

Circuit 1 is identified as “Be Calm” or Heart Rate Control via Heart Rate Variability (HRV). HRV training allows players to handle performance pressures appropriately by controlling their heart-brain connection and calming their minds. Measuring HRV patterns gives us information about a person’s level of *coherence*, or level of synchronicity among nervous, hormonal, and immune system functioning, as well as parasympathetic nervous system dominance, or a calm state of body and mind. A high level of coherence is indicative of a synchronization among these systems, whereas poor coherence is indicative of erratic bio-systems, stress, and anxiety, which typically leads to inconsistent performance. The player begins the training by learning scientifically proven techniques of controlling respiration and heart rhythms. Upon mastery, the player is then presented stressors during athletic tasks. By stacking these stressors, the player begins to develop the ability to handle elevated levels of pressure while controlling their body and maintaining that optimal level of “healthy stress,” leading to peak performance.

Circuit 2 is identified as “Get Focused” or Relaxed Attention which trains brain waves via Electroencephalograph (EEG). Mindful Athlete Training used wireless, in-helmet EEG to measure focus and translate the method to on-field performance. By measuring the changes in the strength of neuronal electrical signals, we can analyze neural oscillations (i.e. brain waves). Our brains are wired to constantly fluctuate between broad and narrow levels of focus depending on the current environment. By reinforcing the optimal distribution of brain waves associated with heightened attention, we train the athlete’s ability to remain calm and narrow their focus for optimal performance. The athlete was presented with an increased number of distractions, further developing his ability to remain focused on his task. This training methodology translates to a sharper sense of awareness during performance and the ability to hyper-focus on command in the midst of external distractions such as fans, coaches,

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teammates, as well as internal distractions such as thoughts regarding performance and subsequent strong emotions.

Circuit 3 is identified as “Stay Engaged” or Neuromuscular Timing. Mindful Athlete Training trains how each player’s brain connects to multiple muscle groups in order to accurately and holistically measure neuromuscular timing relevant to those used in baseball. By training the athlete to be able to coordinate movements with a recurring bell down to the millisecond, a synchronization effect occurs between different parts of the body. Drills are added through our method of stacking exercises to give the athlete more distractions, stressors, and physical demands. Through this process, the athlete gains stronger neural connections, streamlining communication within the brain to maintain proper timing and execution of physical movements under pressure.

Circuit 4 is identified as “Achieve Integration” or Mental Speed and Reaction Time. By progressing through this circuit of hand and foot drills in response to visual and auditory stimuli, athletes move from gross motor to fine motor activities while gaining greater balance and efficiency of movement. This training sequence integrates the mental skills developed in the previous three circuits while simultaneously training additional mind-body domains such as peripheral vision, stimulus discrimination, and economy of motion. Measured down to the millisecond, these reaction time drills build a “neural superhighway” of enhanced connections within the brain, leading to faster reaction times by the athlete that are nearly instantaneous.

Results

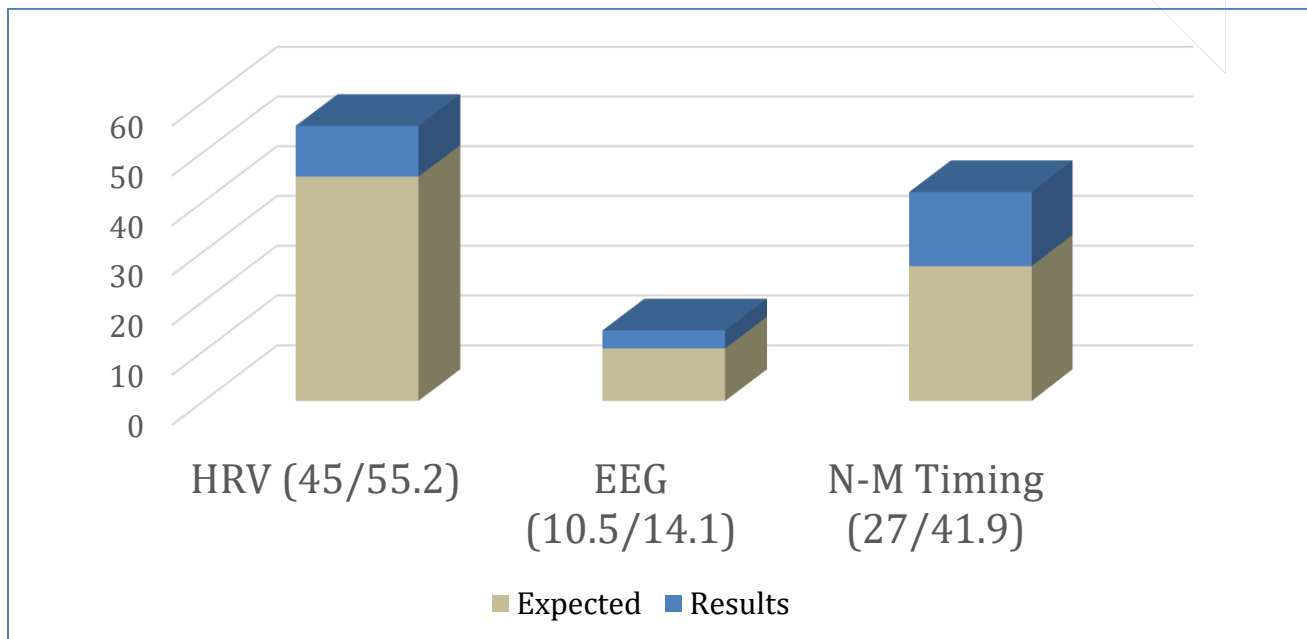
Data was collected for each of the four biofeedback circuits and calculated into aggregate bioQ scores. The results for the first three circuits (Calm, Focused and Engaged) exceeded our initially hypothesized outcomes. Our initial hypothesis for HRV, 45, whereas the actual result was, 55.2 (10.2% greater). Likewise, our initial hypothesized outcome for EEG was 10.5, yet the actual score was 14.1, (3.6% greater). Lastly, the neuro-muscular timing score was hypothesized to be 27, and it was shown to be 41.9 (14.9% greater). These significant differences were linked to the perceived integration effect, which noted that training these methodologies together did in fact have greater outcomes on all of the circuits as compared to the hypothesized outcomes which were based on isolated training of these circuits. The fourth circuit was never hypothesized to have greater reactions times, because greater times would in

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application mean slower player performance, and therefore, were not analyzed in the same manner.

Table 1

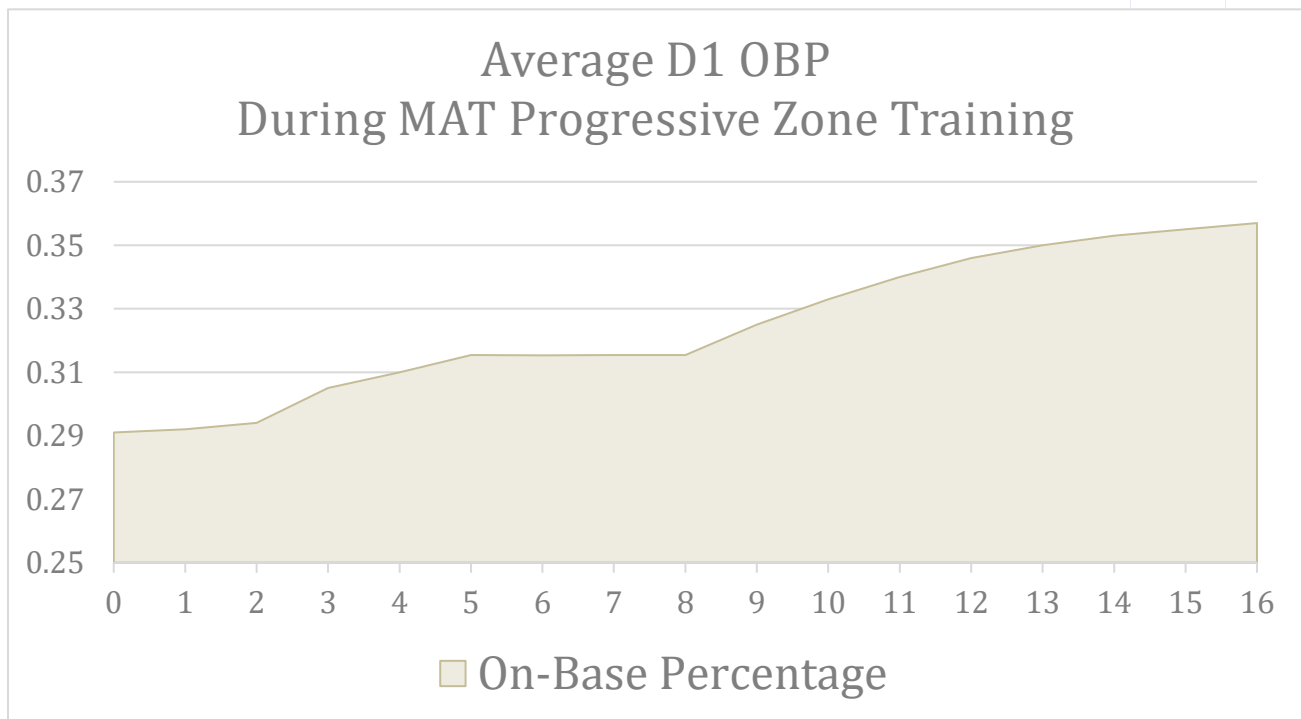


Testing the second hypothesis, bioQ scores were compared to player’s OBP throughout the 16 weeks of Progressive Zone Training. There was an almost immediate rise in OBP (average rise from 0.290 to .310) that both paralleled a rise in bioQ scores and lasted until week 5 of training. There was then a plateau from week 5 to week 8 (average OBP of .315); however, there was a clinically significant increase from week 9 to week 16 - peaking at week 16 with an average OBP of .357. The average OBP gain was 66 points over the 16 weeks of the study. There was shown to be a positive correlation between increasing bioQ data and OBP.

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Table 2



Discussion

The Mindful Athlete Training PZT Integration Model will allow heart rates to fluctuate to encourage the player to be calmer, brain waves to adjust to the game situation in order to get focused, and muscles fibers to fire to stay appropriately engaged in the game.

The patterns within the analyzed rise in OBP need to be analyzed at a more concentrated level. The initial rise can be interpreted as a “treatment effect” - essentially the players are aware they are being measured and thus exert more effort. The plateau from weeks five to nine show this extra effort only takes a player to his highest potential at that point, yet the

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continued rise after week nine shows the integration effect of the mind-body methods impacting true player performance.

It also needs to be considered that maturation effects, such as habituation and sensitization were confounding variables to the treatment effect results. It is also possible that participants were practicing similar methods of training outside of the study (i.e. at practice, trainer). As a result of multiple researchers throughout the 16 weeks during PZT, it is possible that the participants had different relationships with or reactions to different researchers. Age, prior baseball experience, additional pre-training variables (i.e. ADHD diagnosis) as well as baseline mental strength differences also need to be considered as additional confounding variables.

The primary limitation of our research was our small sample size; (n=63) total participants. Environmental variables such as climate of play and playing surface mandate consideration as well. However, our results point to our success with this specific athletic population, motivating us to work with major league players to generalize these results and enhance the performance necessary to proceed to higher levels.

Application

In a metric driven world, MLB athletes are motivated by the numbers. As Major League Baseball front offices begin to consider and implement a more holistic model of operations, mental skills training is at the forefront of player development. Integration Model provides a data-driven path leading to greater self-efficacy of the mental game. It serves as the bridge between the player and mental skills training. In essence, bioQ normalizes sport psychology by making the long sought-after “intangibles” of the game finally quantifiable. bioQ data can be leveraged by teams as a comparative metric to evaluate the effectiveness of club’s current training methods. On a more comprehensive scale, the full Progressive Zone Training model of 16 weeks can be implemented to support players with more mental integrity, throughout all stages of development, maximizing training from player acquisition to professional readiness. Professional baseball players who get on base more often score more runs; equating to more

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wins. BioQ, the statistical by-product of Progressive Zone Training is the science behind the perfect at-bat.

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