Psykinetics and Biofeedback: Abhinav Bindra Wins India’s First-Ever Individual Gold Medal in Beijing Olympics

Timothy Harkness
University of Cape Town, South Africa

Keywords: optimal performance, biofeedback, psykinetics, Abhinav Bindra, Olympic air rifle

The author describes sports psychophysiology interventions with the Indian Olympic gold medal winner, Abhinav Bindra, who performed in the air rifle event at the 2008 Beijing Olympics. The article proposes an evolutionary psykinetics approach, accenting “psykinetic states”—postural patterns linked to dominant personality characteristics. The interventions included biofeedback training using respiration, thermal biofeedback, dermal biofeedback, neurofeedback, and heart rate variability. Training objectives included assisting the athlete to remain extremely calm (to avoid any trembling during sighting) while also remaining mentally alert and reactive. The neurofeedback training was customized to this athlete, and the breathing interventions included training tolerance for extended breath holds, because athletes shoot during a suspension of respiration for stability in sighting. Chiropractic manipulation and muscle activation completed the training regimen.

Introduction

Between February and August 2008, I had the opportunity to work with Abhinav Bindra, who became the winner of India’s first-ever individual Olympic gold medal.

Abhinav is the consummate professional, a supremely talented and determined athlete, and was already a World Champion when he came to see me. So I cannot claim that it was my intervention that made the difference. Instead, what I will do in this paper is describe the work that I did with him, starting with my theoretical approach to sports psychophysiology, and the intervention that follows logically from this theory—neuro/biofeedback training.

Psykinetics and Optimal Performance

I call my theory of sports psychophysiology “psykinetics.” The name is meant to illustrate how factors such as body language, muscle recruitment, stance, visual styles, communications, risk approach/avoidance, cognitions, mood, sports technique, and sports-skill execution outcome operate as a system, rather than independently of each other. Symptoms, problems, or suboptimal performance may manifest in parts of the system in which one cannot easily intervene (particularly during competition), but there may be a connection between factors as diverse as technical errors during skill execution and personality-determined pressure responses. Understanding this system—the psykinetics system—gives the clinician greater insight into the optimal and suboptimal performance of the athlete, as well as a greater range and power of intervention.

Psykinetics is rooted in the evolutionary psychological theory that sport is a form of intraspecies (or intraspecific) hierarchical conflict.

Although traditionally, sports psychophysiology has understood conflict as being about fight/flight, that dynamic actually better describes an interspecies conflict. For example, if you are being charged by an elephant, you either shoot it or run away—there is not a lot of room for negotiation. On the other hand, sport is an intraspecies conflict.

I first realized as a comparative psychology student studying baboons in the South African Drakensberg...
mountains, that intraspecific conflicts contain all sorts of implicit rules, agreements, and “get-out clauses” that shape the conflict more subtly than the concept of fight/flight. Protagonists in intraspecific conflict may choose among three strategies: (a) assertiveness or engagement, (b) ritual aggression or bluff, and (c) submission.

A protagonist will engage in conflict after making a favorable assessment involving necessity of the conflict and potential for success. But often it is better to avoid conflict, and individuals in a species have evolved two behavioral strategies to avoid intraspecific violence, which may be costly to both parties.

Ritual aggression and submission are conflict-avoidance strategies; the former attempts to persuade an opponent that conflict is inadvisable (it is not a good idea to fight a gorilla whose chest thumping is louder than yours), whereas the latter attempts to persuade an opponent that conflict is unnecessary (there is no need to fight a monkey who is cowering while backing away from the fruit).

Aggression and submission need to be clearly communicated to the protagonist, so that the protagonist can choose a respective nonconflict strategy. Different species have particular (although often remarkably similar) facial expressions and body language to communicate these strategies (with some important exceptions to this rule—don’t give a big toothy smile to a chimpanzee!). In human beings, the body language of ritual aggression includes tensed (overactivated or cocontracted) muscles in the extremities, which creates a larger and more threatening appearance, and the body language of submission includes a disengaged (underactivated) core and relaxed extremities, which creates a smaller and less threatening appearance. Assertiveness manifests in the body language of an activated core and relaxed extremities. Like facial expressions, body language is universal, automatic, specific, and subconscious. See Paul Ekman’s (1993) work for more on the universality and specificity of facial expressions.

But our bodies are not only used for communicating conflict states; they are used for executing sports skills also. Aggression and submission may impact the execution of skills by interfering with the ideal muscle recruitment before, during, and after a good shot in golf, tennis, and football. For me, this is the raison d’être of biofeedback in sports. With sufficient training, athletes can be conditioned to respond to pressure differently. Psykinetics is the metacognition of neuro/biofeedback: understanding why thoughts, postures, strategies, and skills that seem easy in practice become more difficult when in competition.

**Psykinetic Interventions With Abhinav Bindra**

To be perfectly honest, I don’t think my neuro/biofeedback training with Abhinav involved anything that isn’t in the public domain. For example, see the article by Wilson, Peper, and Moss (2006) describing the use of biofeedback and neurofeedback training with the Milan World Cup–winning soccer club. That article presents a general framework for the use of biofeedback and neurofeedback training with athletes. I think the success of my training with Abhinav, such as it was, lay in my consultative approach with him, in my understanding of how and why pressure would manifest in technical errors, and where to intervene to correct these errors.

Air rifle is an extremely precise sport. Athletes aim at a target about 3 cm across, and they are scored between 1 and
Psykinetics and Biofeedback: India’s First Olympic Gold Medal

Summer 2009

Biofeedback

10 points for how close to the center they hit. To score 10 points, you must hit the exact center of the target—a point the size of a period. The margin for error is the size of the pellet, 4.5 mm across. So if you are more than 2.25 mm off perfect, you will score a 9. To get into an Olympic final, you probably need to shoot 56 of 60 bull’s-eyes.

In the final, shots are scored with decimal points. So a shot that hits the bull’s-eye with the middle of the pellet scores 10.9, whereas a shot that hits the bull’s-eye with the edge of the pellet scores a 10.0. Abhinav scored a 10.8 with his final shot to secure the gold medal—2 mm off perfect, from 10 m away.

In terms of the neuro/biofeedback training, we used a range of modalities, and in the 6 months prior to the Olympics accumulated about 150 hours of training using a FlexComp Infiniti™ multimodal biofeedback system and BioGraph Infiniti™ software.

Respiration Training

We started with breathing training—diaphragmatic breathing using abdominal and thoracic stretch sensors. Every single day’s training started with breathing. I find it to be the most fundamental and powerful self-regulation technique.

Electrodermal Biofeedback

In the early days, we trained electrodermal response quite hard—until Abhinav’s control became too subtle for the device to detect. On the morning of a competition in Nanjing, China, he spent 45 minutes within .02 units, including time while I was prepping his scalp for neurofeedback. Something that worked well was downtraining electrodermal response while watching DVDs of his competitive performances.

Thermal Biofeedback

Peripheral temperature was a hit-or-miss modality for us. Sometimes Abhinav would respond well to training, and at other times we wouldn’t be able to raise his finger temperature by one degree. I haven’t asked him, but I’d guess he shot his winning 10.8 with ice-cold fingers.

Neurofeedback

The first areas and frequencies we trained with neurofeedback were increasing low alpha at T3 (to quiet the internal monologue), and the Cz, Pz, and Oz sites, with training to increase activity at 10–12 Hz, 12–15 Hz, and 15–18 Hz.

When I do neurofeedback with some clients and I ask them what uptraining a particular frequency feels like, they just smile and shrug their shoulders. By contrast, Abhinav has the greatest self-awareness of any athlete I’ve worked with, so he was able to give precise feedback on the sensation of any wavelength trained. This ability meshed with my consultative approach and allowed us to work as an experimental team with whichever frequencies seemed to give the best response.

Post-Olympic feedback has been that it was the T3 alpha that helped the most. The debate about what to train at Cz, Pz, and Oz centered around the dilemma of needing him to be extremely calm so he wouldn’t tremble as he sighted, but also alert and reactive enough to trigger as the bull’s-eye came into the center of his sight.

Abhinav felt most comfortable training at 10–13 Hz at Pz, but he broke world records in training after training to increase 15–18 Hz at Cz. This is the frequency we ended up training the most, even though he didn’t like it as much as the high alpha. He felt it resembled a competitive state more accurately.

We also downtrained 22–26 Hz and 26–30 Hz. We did not train 38–42 Hz.

Eventually we stopped neurofeedback training. 80 hours seemed to be enough.

Heart Rate Variability Training

HRV training showed initial improvements, which would be lost as competitions drew nearer. Eventually I stopped doing it, because I did not want poor scores to be interpreted as a harbinger of poor shooting.

Finally, we trained Abhinav in respiratory sinus arrhythmia at six breaths per minute, three breaths per minute, and two breaths per minute with 40 second pauses while he exhaled. This was very useful. Still target shooting
happens during breath holding. When shooters are anxious, they may under-estimate their breath-holding capacity, and thus feel under pressure to trigger before they run out of breath. Learning to overcome an inhalation stimulus removed some of the time stress of triggering (although if you take too long to trigger, you’re probably doing other things wrong anyway).

All of this biofeedback training was done “in the chair” and while shooting.

**Other Neuromuscular and Postural Interventions**

Other interventions that helped were chiropractic manipulations, by Dr. Martin Khoury, to increase range of motion, and muscle activation, by Dr. Costa Kapnias. Muscle activation involves massaging meridian points to achieve optimal recruitment of major muscles involved in stability. For example, we used electromyography to monitor and to show a 200% increase in activation of gluteus maximus muscles after massaging a meridian point at the hinge of the jawbone—with a corresponding increase in Abhinav’s reported experience of stability.

All of this training would have been less helpful had we not understood Abhinav’s pressure responses.

When human beings are faced with an intraspecific conflict, they have the choice of submission or aggression (the conflict-avoidance strategies) or assertiveness. As demonstrated in the above picture, the body language of submissive involves a disengaged core, whereas the body language of aggression involves tensed extremities.

Submissive body language will manifest in shooting as compromised stability, whereas aggressive body language will manifest as an increased tremor. Assertive body language involves an engaged core with soft extremities, which allows for stability and a tremor-free rifle.

Tendencies to assume one or another of these psykinetic states under pressure may be linked to dominant personality characteristics, as well as personal/familial conflict histories, which may have shaped and conditioned pressure responses. Obviously, for reasons of confidentiality, I will not discuss the subtleties of Abhinav’s psykinetics.

The difficulty with psykinetic states is that not only are these states rooted in personality characteristics and personal histories, but aggressive/submissive responses are (a) actually adaptive in that they effectively diminish the conflict (if you’re feeling the heat of a shooting competition, getting submissive, losing core stability, and shooting a couple of 9s takes you out of contention and makes the pressure go away nicely), and (b) difficult to detect, because just as frowning feels natural when you are sad and smiling feels natural when you are happy (not smiling when you are happy would feel strange), tensing your extremities when aggressive feels appropriate, natural, or not out of the ordinary, and is thus difficult to detect. This is why an athlete can be obviously physically tense to an observer but be unaware of his own tension.

So the athlete needs (a) to learn his/her own personal/historical psykinetic tendencies, (b) to become more sensitive to suboptimal psykinetic states (using anything from an awareness of posture to noticing telltale cognitions to observing a pattern of technical errors), (c) to learn to anticipate when these states will manifest, and (d) to learn at which point in the psykinetics system to intervene (i.e., strategically, with a focus on body language, cognitions, and/or emotional control) to regain optimal performance.

Neuro/biofeedback thus becomes an important tool in teaching an athlete to recognize and control psykinetic states, while psykinetics becomes the framework through which the athlete applies his or her self-regulatory skills.

**Conclusion**

Abhinav Bindra earned India’s first gold medal for his performance in the air rifle event in the 2008 Beijing Olympics. Abhinav entered the Olympic Games ranked 17th in the world. He had been shooting with scores between 594 and 596 (54–56 bull’s-eyes out of 60 shots) in the warm-up competitions. The expectation was that it would be necessary to shoot 598 in the Olympics qualifiers to have a chance in the final (qualifying scores are carried through to the final). In the qualifiers, Abhinav shot 596—but his main rival, Quian Zhu, shot 597. He went into the finals only 1 point behind. Between the qualifying and sighting for the final, Abhinav’s
Psykinetics and Biofeedback: India’s First Olympic Gold Medal

rifle sight somehow was moved 40 clicks off straight. As a reference, after a cross-continental trip, he may need to correct his sight by 2 or 3 clicks. Sabotage is a possibility. Abhinav had the composure to correct his rifle sight in the 5 minutes of sighting and went on a rampage in the first six shots of the final, establishing himself with a clear lead. Zhu fought back with shots 7–9, leaving Abhinav needing a 10.4 or better to win the gold. He shot a 10.8.

References


Correspondence: Timothy Harkness, 16 Morewood Crescent, Westville, 3630, KwaZulu-Natal, South Africa, email: tharkness@mweb.co.za.