

Winning the BIG Medals

In December 2016 we had the opportunity to see an amazing photograph of the greatest swimmer of all time, Michael Phelps, with all 23 of his Olympic gold medals hanging from his neck. Also in December 2016, we witnessed Hungarian swimmer Katinka Hosszú winning 7 gold and 2 silver medals at the 13th FINA World Swimming Championships (25 m) in Windsor, Canada. She had also won 3 gold and 1 silver medal at the Rio 2016 Olympic Games 4 months earlier. The fastest human runner over the 100-m and 200-m distances, Usain Bolt, accumulated 9 Olympic gold medals, as well as 11 gold and 2 silver medals at the IAAF World Championships. Over the longer track distances of 5000 and 10,000 m, Somalian-born British runner Sir Mohamed Farah owns a collection of 4 Olympic gold medals, in addition to his 5 gold and 1 silver medal at World Championships. Achievements like these make it sound like winning the BIG medals is easy, but those of us who work in the elite sport environment know that earning just 1 of those sought-after pieces of metal is no mean feat and requires years of blood, sweat, and tears.

Let's take the case of Spanish swimmer Mireia Belmonte. I have analyzed her blood, I have seen her sweat profusely, and I have witnessed her tears, of fatigue, pain, and frustration but also of joy and satisfaction. In Shanghai 2011, Mireia missed the World Championships bronze medal in the 400-m individual medley by 0.71 second; in London 2012, she missed the 200-m butterfly Olympic gold medal by 0.81 second; in 2013, at her "home" World Championships in Barcelona, she again missed the gold medal in the 200-m butterfly by 0.19 second. Far from discouraging her, these relative "failures" (in the words of Mireia's coach, Fred Vergnoux, at such level of competition "second place does not mean success anymore") only made her will to succeed and determination to train harder and better even stronger. The implications of such determination to win Olympic gold were a complete Olympiad accumulating nearly 200 weeks of >80 km swim per week, 6 to 10 weekly hours of dryland training, 12 to 14 weeks of altitude training per year, a shoulder injury keeping her from racing at the 2015 World Championships, and a lifestyle in keeping with the perceived requirements of her golden goal. In Rio 2016 she earned the coveted gold medal in the 200-m butterfly . . . by 0.03 second!

So, what does it take to be a BIG medal-winning athlete? Over the years, I have had the chance to work with some of these athletes, either as a coach or as a sport physiologist. And I have also been fortunate to collaborate with and get to know many coaches who have designed and led the preparation of the winning athletes. In December 2016 I put together a simple questionnaire asking some of those coaches to name 4 key qualities of medal-winning athletes. Fifteen of them, coaching athletics, canoe-kayaking, cycling, speed skating, swimming, and wrestling, completed and returned the questionnaire to me, either by e-mail or in person at a couple of conferences at which I was invited to speak. What follows is a compilation of their answers.

Key qualities of medal-winning athletes: ability to avoid pressure, ability to focus on task, ability to step on the mat ready, ability to use failure as a learning experience, ambition, appropriate physiology and body build, attitude, biomechanical

ability, committed, commits time to technical skills, concentration, confidence, consistency, constant search for perfect gesture, creativity in competition, dedication and love for the sport, determination, excellence, focused, goal oriented, good technique, hard worker, high level of suffering, high motivation to excel, high percentage VO_2 max, initiative and creativity, intelligence, intrinsically motivated, makes good personal and professional decisions, mental skills including resilience and positivity, mental toughness, more desire than fear, not afraid to work hard, opportunist, performance under pressure, perseverance, physiological qualities, positive, reduces distractions year-round, resilience, selfish, stay healthy and avoid injury, strategist, strong mind, structured, talent, technical skills, will, winner mentality, winning attitude, work

Note that most of the qualities cited by the coaches are psychological, behavioral, and personality traits, whereas only appropriate physiology and body build, high percentage of VO_2 max, and physiological qualities are related to the athletes' physical and physiological makeup. I assume that elite-level coaches take those sport- or event-specific qualities for granted, considering that at the highest levels of competition most or all athletes are so gifted and fit that those other traits and qualities are more determinative of performance outcomes.

Coaches, of course, are a big part of every medal won by athletes. Many elite athletes spend more time with their coaches than they do with their families and friends, and vice versa. But not all coaches have the knowledge, the passion, and the commitment often required to guide athletes in their quest for the BIG medals. Why do some coaches succeed repeatedly, whereas others seldom or never do? What does it take to be a medal-winning coach? To answer these questions, I also asked the elite coaches to name 4 qualities they considered necessary to help athletes succeed:

Key qualities of medal-winning coaches: ability to balance and control emotions, ability to see big picture, ability to speak with the athletes, ability to communicate using multiple modes, coach to the athlete's needs, commitment, competence, consistent, constant learner, continued will to explore the limit of the athletes and teaching them the same mentality, continuing education, cooperative, creativity, curious, discipline, earns athlete's trust, empathetic ability to relate to athletes, experience, flexibility, good listener, good staff, great communicator, has a strong plan yet remains flexible, honesty about the athlete's goals, inspiration, intelligence, knowledge, knows their athlete, love for sciences (also unrelated to sport), mastery, mentor, new ideas on altitude training, not accepting the limits of an athlete, observation, organized, original training contents and planning, passion for the sport, passion to help athletes succeed, patient, positive mentality, professionalism, relationship skills, resilience, selfless, sport-science and event-specific knowledge and experience, sport-training knowledge, structured, understanding performance and winning, vision, willing to learn, winning attitude

If you are coach, you may want to reflect on whether or not you already have or nurture these qualities, and if you don't, you can take this list as part of your continued education and willingness to be a constant learner!

I can imagine, however, that most readers of this editorial are sport scientists in general or sport physiologists in particular. Although we scientists like to think that we make major contributions to the competitive success of elite athletes and coaches, their perception may not necessarily agree with such a view. For your information and in case you have not read it, the second issue ever published of the *IJSPP* (Volume 1, Number 2, pp 161–168, June 2006) contains an excellent roundtable featuring a panel of academic experts with plenty of experience in the applied environment debating on whether sport-science research influences practice.¹ More recently, *IJSPP* Editor Emeritus David B. Pyne and Associate Editor Martin Buchheit wrote insightful editorials dealing with this very topic in March 2016 and May 2016, respectively.^{2,3}

One of the questions included in my questionnaire for medal-winning coaches was “In your view, has sport science (eg, sport physiology, nutrition, biomechanics, physiotherapy, psychology) made a significant contribution to the medal-winning performance or performances of your athletes?” To this question, 14 coaches answered *yes*, and only one answered *no*; however, the coach who answered *no* pointed out that he believed in the contribution of sport science to elite performance but that the particular medal-winning performance he was referring to when completing the questionnaire (ie, a gold-medal performance by an African long-distance runner) did not directly benefit from sport science. When asked to name 4 key qualities of sport scientists making a significant contribution to medal-winning performances, coaches' responses were as follows:

Key qualities of sport scientists making a significant contribution to medal-winning performance: ability to be part of a group not the “star” of the group, ability to develop open-minded athletes, ability to relate to coach and athlete, ability to relate data in real time that effects change, ability to communicate information, application to daily coaching, adaptability, availability, biomechanical analysis, challenging, communicator, competence, control, creativity, current on scientific information and studies, dedication, develops strength plans athletes stick to, easy access, feeling with the athletes during activity and ability to learn from their experiences, experienced in the sport, helping a project not changing it, individualization, innovative, knowledge of the reality of the sport, listening, make knowledge relatable, monitoring, moving from practice to theory not the opposite, must have pedagogical mindset, nutrition, open minded, performance analysis, persistence, positive mentality, practical application, presence, program design, quick data

turnaround, readiness for cooperation, relationship, recovery, recovery and healing science to reduce down time in training and competition, structured, technical feedback, technology, test evaluation training, training monitoring, understands that data are not the only piece of the puzzle, willing to make long-term commitment to gain trust

This list of qualities should provide valuable food for thought to established and aspiring sport scientists intending to make a meaningful contribution to elite athletes' and coaches' attempts at winning the BIG medals.

In addition, I would like to end this editorial by directing interested readers to some references that have influenced my own views and approach to elite-level coaching and applied sport science.⁴⁻¹¹

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