Iñigo Mujika earned PhDs in Muscular Exercise Biology (University of Saint-Etienne, France) and Physical Activity and Sport Sciences (University of The Basque Country). He is also a level III swimming and triathlon coach and coaches Olympic distance, long distance, Ironman and XTerra World Class triathletes. His main research interests in the field of applied sport science include: training methods and recovery from exercise, tapering, detraining and overtraining. He has also performed extensive research on the physiological aspects of professional cycling. He received research fellowships in Australia, France and South Africa, published nearly 60 papers in peer-reviewed journals and 10 book chapters and has given over 80 lectures and workshops in international conferences and meetings. Iñigo was Senior Physiologist at the Australian Institute of Sport in 2003 and 2004. He was the physiologist and trainer for the Euskaltel Euskadi professional cycling team in 2005. Since 2006, he has been a sport scientist/physiologist at Athletic Club Bilbao professional football club. He is also an associate editor for the International Journal of Sports Physiology and Performance and associate professor at the University of the Basque Country.

PC: Your updated definition of tapering states that it is, “a progressive nonlinear reduction of training load during a period of time in an attempt to reduce the physiological and psychological stress of daily training and improve sport performance.” What do you mean by “progressive and nonlinear” in relation to training reduction? It seems that these terms may conflict with one another.

IM: “Progressive” means that the training load is reduced in a stepwise manner so that the load is smaller and smaller as competition approaches. This is in contrast with a step-taper or reduced training strategy in which the load is suddenly decreased and remains constant at the new reduced level for the duration of the taper. “Nonlinear” means that the reduction is bigger in the first days of the taper than in later stages. This is because exponential reductions of the training load seem to have a higher positive impact on performance. In the question of tapering methods what needs to be determined is it the "shape" of the exponential training reduction versus the linear reduction which makes it more efficient, or the lower total load that usually characterizes the exponential reduction.

PC: At what level of performance should an athlete consider the concept of tapering to be beneficial?

IM: I believe a well-designed taper could help every athlete's performance. I think, however, that there is no point in tapering unless an athlete has previously accumulated sufficient training to really stress his or her physiological adaptation capabilities. In other words, you cannot taper off insufficient training. Young athletes or those undertaking limited training loads should recover much faster than highly-trained and elite athletes following intensive training programs, so it is probably not necessary for them to follow a specific taper strategy to prepare for competition. A few days of relative rest should be equally beneficial to them.

PC: Which biological indices improve during tapering and how does this contribute to improved performance?

IM: This is a hard question to answer in just a few lines because efficient tapering programs have been shown to induce several cardio-respiratory, metabolic, biochemical, hormonal, immunological and neuromuscular changes. All these changes are beneficial to performance. Many physiological characteristics are impaired during periods of heavy training and the taper should allow the body to recover and further enhance physiological adaptations that can contribute to optimal sports performance. I would refer the interested reader to my recent review on this subject, "Physiological changes associated with the pre-event taper in athletes." Sports Medicine 34:13 (2004), 891-927.
PC: Which psychological indices improve during tapering and how does this contribute to improved performance?
IM: The same principle applies to several psychological indices, such as mood state, feelings of fatigue, perception of effort or quality of sleep, which are usually stressed during intensive training but recover during the taper. This psychological recovery allows the athlete to feel more positive about his or her capabilities, more vigorous and fresh. All this can only favor competition performance.

PC: What are the outcomes of a reduction in training intensity from pre- to post-tapering and what is its impact on performance?
IM: Training intensity has been shown to be a key factor in retaining training-induced adaptations during periods of reduced activity, and that is exactly what the taper is. Although a reduction in training intensity would probably speed-up the recovery process, physiological adaptations could be lost along the way. It is thus important to maintain or even increase the quality of training during the taper if all adaptations are to be retained or further enhanced.

PC: What are the outcomes to a reduction in training volume from pre- to post-tapering? What is its impact on performance?
IM: Considering that we have just said that training intensity must be maintained during the taper, it is clear that total training must be reduced at the expense of training volume. This can be achieved either by reducing the duration of training sessions or by decreasing the number of sessions (i.e. training frequency). Research suggests that reducing training frequency by as much as 50-66% is not counterproductive for moderately-trained subjects. Such frequency reductions, however, are not warranted in elite performers, probably because of a potential loss of "feel," which is very important for high-caliber athletes.

PC: What are the variables that determine the optimum length of a taper in an individual and what are the consequences of tapering too long or too short?
IM: Although the duration of most tapering programs usually ranges between one and three weeks, the "optimal taper duration" is totally individual and depends on each athlete's fatigue and adaptation profiles. Some athletes recover quickly when the training load is reduced; some need longer periods of reduced training. Others respond to small reductions while some need marked reductions and still other athletes are at a higher risk of losing adaptations (i.e. detraining) than others, etc. In summary, taper duration is all about finding an optimal balance between dissipating residual or accumulated fatigue (i.e. allowing sufficient recovery), and not losing or further enhancing previously attained physiological and performance adaptations. There are some markers and clues that may help to define the ideal taper duration for each athlete, but basically this is where an athlete's self knowledge and the art of coaching come into play.

PC: Define the different types of tapering. How does an athlete decide what is right for them?
IM: There are some physiological and psychological indices that may help an athlete with good sports science support decide on the most suitable tapering design and duration for him or herself. Given that no marker is 100% reliable, it usually comes down to good self knowledge, good coaching, and trial and error. However, some of the key issues discussed above are based on solid science and could be successfully applied by most athletes. Individual taper programs can then be fine-tuned to optimize competition performance.

PC: What performance improvements should an athlete expect from tapering and how does their training history immediately preceding the taper effect these results?
IM: The body of the scientific literature on tapering indicates that performance generally improves by about 3% during a successful taper, but this average value can range between 0.5% and 6.0%. These improvements have been observed in various sports such as swimming, middle- and long-distance running, cycling, rowing or triathlon. More research is clearly needed to define suitable strategies and expected performance gains in strength and power events. As for the impact of pre-taper training, recent mathematical modeling studies suggest that an overload training cycle preceding the taper (i.e. overreaching the athletes) may result in a bigger performance gain, but a longer taper would be required.

More Information Please! Contact Iñigo at i.mujika@athletic-club.net