


Current Perspectives of Biokinetics in Middle and Long Distance Running - An Examination of the 'Elastic Response'

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For 'Sports Diagnostician'
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ABSTRACT

Most coaches recognise that biokinetic capabilities are important in the 'power' events of athletics: the sprints, hurdles, jumps and throws. There is a common misconception, however, that their role in the middle and long distance events is unimportant or insignificant. While these events do require an emphasis on metabolic capacity over time, they also involve repeated brief, explosive 'spikes' in power output each time the foot contacts the ground. Although they make an important contribution to performance - the author calls them a 'fourth energy system' - the elastic response processes at work in the middle and long distance running stride tend to be ignored by coaches and in coach education curricula. Drawing on recent research this article discusses in detail the physical structures and mechanisms operating in the stride, why endurance runners need to improve certain fundamental movements, what might limit these movements and how to manage limitations. The author proposes that, along with a re-evaluation of the stretch-shortening cycle, related terminology, including biokinetic, aponeurosis, stiffness and the 'windlass mechanism' and the concept and function of the lower kinetic chain muscle-tendon-aponeurosis units (MTAUs) be introduced to coach education materials.

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Introduction

Athletics coaches have traditionally considered the sprints and hurdles, the jumps, the throws and race walking as 'technical' disciplines where the training aims of skill development and increasing physical capacity are of the same order of importance. Middle and long distance running events on the other hand have been viewed as 'non-technical' activities where endurance capacity determines success and the training emphasis needed to be almost exclusively on metabolic conditioning. However, once consideration is given to concepts such as mechanical efficiency and elastic response in the running stride, it becomes obvious that the development of skill is a key determinant of success in these events as well.

Addendum - Implications for Coach Education

While writing this article I reflected that after a coach attends a coach education course or workshop, it can take several weeks or months before their athletes begin, once more, to understand their coach, depending on the how long the course was and the knowledge covered. This unwanted consequence of coach education can be avoided if the coaches are made aware of this potential pitfall while on the course, or if we simply don't give them any knowledge, as some sport science specialists might advocate! Coaches are and should be exposed to new material and ideas on courses but usually they are exposed using only technical language. To develop their coaching competence, how they do their coaching, they should identify how to translate any new knowledge, the 'what' of their coaching, into the language, cues and training practices of their athletes. The technical language should remain and be recognised as what coaches may use when speaking to coaching colleagues or specialists.

In an ideal world, all coaches would have access to the specialised support of doctors, physiotherapists, strength and conditioning practitioners, biomechanists, etc. In an even more ideal world, this specialised support might operate with an intermediary of separate 'sports diagnosticians' to assist in the application of the specialists' recommendations. These diagnosticians would be able to speak the technical language required by coaches and they would be able to speak the academic, technical language of the specialists and translate that into coaching technical language. Such a performance-coach-support environment was proposed in 'New Studies in Athletics' by SCHADE (2010). The author focuses on biomechanics and states: "The interaction between a coach and a biomechanical diagnostician is a crucial element of developing a modern high-level athlete's performance." This concept is applicable across all sport specialisations. He explains the role of

the sports diagnostician as being, "to provide an interface between science and practice. As such, the diagnostician cannot be fully in either camp but must be comfortable working in and speaking the language of both." It is stressed that the diagnostician speaks directly to the coach and only to the athlete with the agreement of the coach. Now, we have identified three 'languages': the language of the specialist, the language of the coach and the language of the athlete.

But, around the world the vast majority of coaches tend to work in isolation, without appropriate access to even specialised scientific or medical help, let alone a sports diagnostician. This is the reality. With this in mind, coach educators have to decide what knowledge coaches need to be given to support their developing coaching competencies. Effective competence-based coach education focuses rightly on both the 'how' and the 'what' of coaching. The 'how' develops a coaching competence that must be supported by the 'what', the knowledge that they need to have, to apply in their practical coaching. In this article I have defined the term 'biokinetics', addressed the topics of aponeuroses, the 'windlass mechanism', re-evaluated the stretch-shortening cycle and introduced a model for the flow of energy through the muscle-tendon-aponeurosis unit in various activities and recognised that it is not just a muscle-tendon unit, MTU, that we must consider but the muscle-tendon-aponeurosis unit, MTAU.

Each of these introduced terms and topics relate to the development and application of biokinetic energy. We now have to decide what the coach needs to know in these particular areas, bearing in mind that they will usually be operating in isolation. Having said that, coach education courses should not be seen as a 'one-stop shop' meeting all their knowledge needs but be purposefully developing the competence of the coach to create their own, individual support team. IAAF coach educators have found, globally, that there are few places where the sport science and medi-

cal expertise does not exist or cannot be accessed, provided the coach knows where to look and actively seeks. The coach needs an awareness of the factors that contribute and determine performance and what support he and his athletes, in their situation and performance paradigm, require. Then, it is for coach educators to decide the breadth, depth and language of this knowledge at the various levels of coach education.

This article has reviewed the latest research materials and proposed that there be a re-evaluation of the stretch-shortening cycle and the terms biokinetic, aponeurosis, stiffness

and the 'windlass mechanism' be introduced to coach education materials, along with the concept and function of the lower kinetic chain muscle-tendon-aponeurosis units and a model for the flow of energy through the MTAU in various activities. It is now up to the teams of coach education specialists to determine and decide the manner and degree to which this is done.

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