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The Body & the Bike: A Kinetic Chain analysis of Cycling Overuse Injury

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Abstract

Introduction: Physiotherapists, osteopaths, doctors, bike-fitters and other cycling injury managers, are perfectly placed to help the ever-growing cycling community to become better riders as well as to prevent pain and injury. Whilst there are a myriad of "bike set-up" protocols available, some more evidence based than others, very few "bike set-up" practitioners take into account the body and its complex neuromuscular and kinematic abilities. There is no argument that understanding the geometry around optimal configuration is an important component for efficiency and injury prevention (Wisbey-Roth 2009), and some leading "Bike-Fit" proponents argue the neuromuscular perspective (Steve Hogg 2007). There are also endless references to optimal pedalling technique- "spinning the pedals", "elegant", "wipe the mud of the shoe", "like a duck swimming" or "smooth and continuous"(Colson from Brukner and Khan 2012), implying that optimising activation patterns has a distinct role in good pedaling technique.

Overuse injuries make up a large portion of injuries in aerobic sports that require long training sessions with a monotonous routine eg, long-distance running, bicycling or cross-country skiing (Bahr 2009). The greatest prevalence in overuse injuries in cycling is at the lumbar spine and knee, and efforts to prevent overuse injury should focus on these areas (Clarsen 2010). Maintaining or restoring precise movement of specific segments is the key to preventing or correcting musculoskeletal pain (Sahrmann 2002), and cycling injury management providers are clinically the best placed to be precise in the assessment and management of the movement patterns of the cyclist.

Kinetic chain: The kinetic chain as a concept was first introduced in 1875, to describe the idea that the body was a collection of interacting segments, creating a system that would allow movement at one joint to affect movement of another joint within the kinetic link. Contemporary literature in the assessment and management of sporting injuries upholds the kinetic chain theory, with mechanical deficiency in one part of the activity chain being the cause of pathology in another part, especially in the case of ACL injury (Hewett 2005) and patello-femoral pain syndrome (Souza and Powers 2009). Cycling injury management has had a historical focus upon the position of the cyclist in relation to the bike, and justifiably so, but as the assessment of bike set-up evolves with the use of technology and sharing of information, deficiencies in the way the cyclist functions must become a part of the ideal bike set-up assessment. As a background we must explore the "Perfect" vs "Imperfect" technique of pedaling, and how this possible imperfect technique can be a source of pain or injury. And what are the measures which guide us in assessing that a pedal stroke is imperfect – kinematics, muscle activation, co-ordination, strength, length-tension relationships, force, power, posture? In the area of muscle activation, the historical perspective was simplistic, with the more realistic pattern represented in **figure 1.** And whilst the gluteals and quadriceps are seen as the main muscles for power production, co- ordination of the pedal stroke utilizing the hamstrings and calves seems an important feature of "perfect" pedaling (Figure 2 Blake 2012) **FIGURE 2.** Finally, given the paucity of research in the area of cause and effect regarding the kinetic chain and cycling injury, how much can we extrapolate findings for other athletes to the cyclist?

Conclusion: pain and injury in the athletic population is complex in its aetiology. Clinical reasoning is essential to optimising management, and in cycling understanding the knowledge base regarding the interaction between the body and the bike is an important cornerstone to expert practice. The kinetic chain approach to analysis of cycling injury is a valid pathway and will bring cycling injury managers into line with world's best practice in athletic injury management and prevention

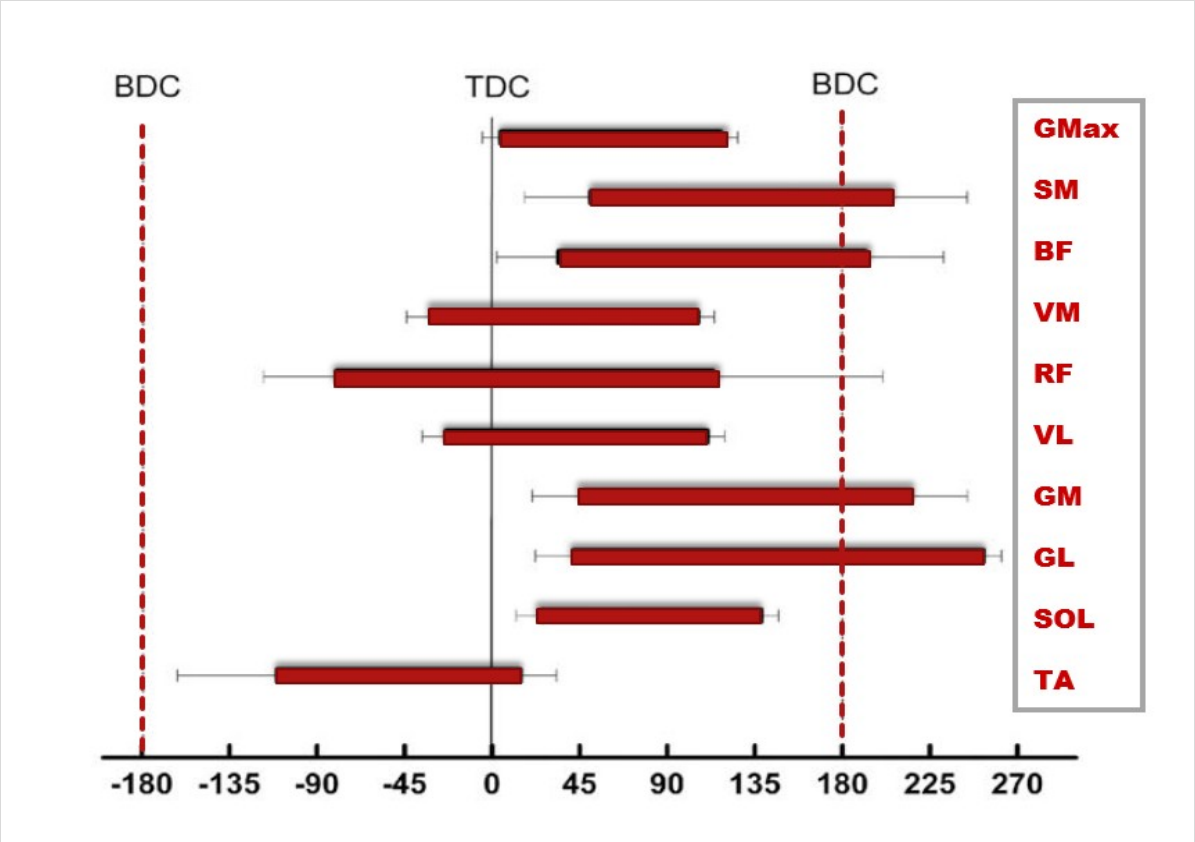

Figure1

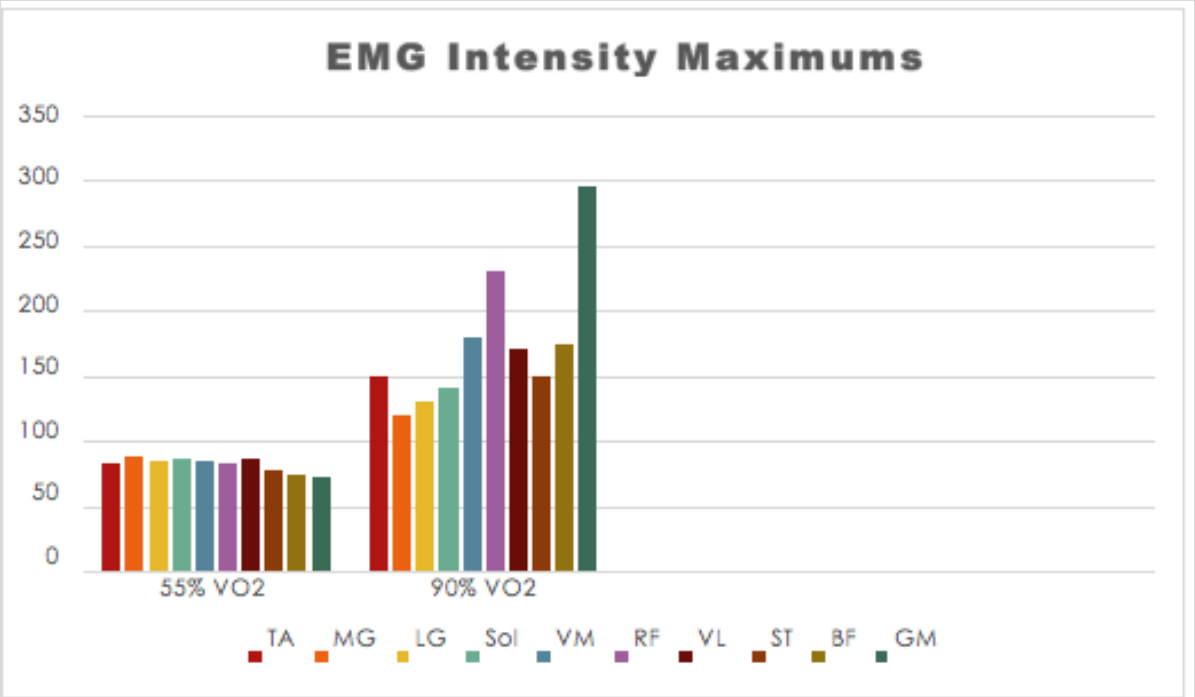

Figure 2

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