The relationship between body positioning, muscle activity, and spinal kinematics in cyclists with and without low back pain

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The relationship between body positioning, muscle activity, and spinal kinematics in cyclists with and without low back pain

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BACKGROUND

- Cycling is an aerobic and low-impact method of exercise with inherent risks for overuse injuries in the lumbar spine.
- The pathomechanics and association of risk factors of lumbar spine overuse injuries in cycling are not clearly understood.
- Approximately 23 million people who regularly cycle, developing at least one overuse injury in their lifetime in the USA.
- Up to 22% of cyclists experiencing time loss from activity reported low back overuse injuries to be the cause.
- Hypothesized mechanisms behind the pathomechanics of LBP in cyclists include: mechanical creep, disc ischemia, muscle fatigue, over-activation of back extensors, and flexion-relaxation phenomena.
- Furthermore, incorrect bike fitting resulting in poor body positioning on the bicycle has a strong association with LBP in cyclists.

OBJECTIVES

- To determine if relationships exist between body positioning, spinal kinematics, and muscle activity in active cyclists with non-traumatic LBP.
- To explore variations in optimal positioning and bike set up in order to address variables associated with LBP in cyclists.

METHODS

- PubMed, CINAHL, Ovid Medline, Scopus searched with narrowed focus on cyclists with non-traumatic low back pain.
- Inclusion criteria: factors relating to non-traumatic low back pain in cyclists deemed “biomechanical” in nature as agreed upon by group consensus.
- Exclusion criteria: articles referenced in previous literature review published by Marden et al. in 2007.
- Research quality assessed using Downs & Black quality assessment scale, with grading assigned based on group consensus.

RESULTS

- Seven articles eligible for review; comparative and observational studies were selected based on research question.
- 238 total subjects; all males ranging from ages 18 to 57, 120 to 160 lbs., and height of 5’3” to 6’1”.
- Four within-participant study designs, two case-control study designs, and one single-case study.
- Average Down and Black score = 10.5 out of 27; highest score = 15 out of 27.
- Studies deemed to be of low to moderate quality.

RECOMMENDATIONS FOR FUTURE RESEARCH

- Address the role of specific muscle activation imbalances in occurrence low back pain in cyclists as the possible primary causal factor.
- Lumbar multifidi, transversus abdominis, internal and external obliques, and erector spinae.
- Further EMG studies between low back pain and control group.
- Correcting muscle imbalances and motor control while cycling through individualized biofeedback, internal and external cues to determine relationship between motor control and spinal kinematics.
- Intervention studies that specifically target muscle imbalances and fatigue in cyclists with LBP are needed to determine if decreasing these impairments will decrease LBP.

LIMITATIONS

- Small sample sizes (only 3 studies where n > 30).
- Several measurement techniques (EMG, MVC, VAS, RBG).
- Populations (all male; trained/untrained).
- Varying areas of study focus (pain, ROM, bicycle design).
- Methodological differences between studies.

REFERENCES