Factors Affecting Spinal Movement in Cyclists with and without Low Back Pain

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Summary

Cyclists often choose their riding posture to increase aerodynamics, by altering the saddle position and hand position. This mixed methods study explored the factors affecting spinal movement in cyclists with (n=7) and without (n=7) low back pain. Spinal kinematic data was collected from the sagittal, coronal and transverse planes. Significant differences between cyclists with low back pain (LBP) and no low back pain (NLBP) were noted. Increased range of motion (ROM) was seen in the coronal and transverse plane in the lumbar to pelvis (PEL) segments, and increased ROM in the sagittal and coronal plane for the thoracic segments. A greater consideration on saddle and handlebar position needs to be given by cyclists with LBP to reduce spinal motion whilst cycling.

Introduction

A lack of scientific research exists surrounding the epidemiology and aetiology of low back pain (LBP) amongst cyclists [1]. LBP prevalence rates in amateur cyclists has been reported at 65% [2] and 45% in professional cycling teams [3] confirming it as one of the most common sites for injury. Cyclists spend long periods of time with a near-maximally flexed trunk to increase their aerodynamic riding position. Evidence around the influence of saddle and hand positioning on spinal kinematics is limited, with fewer studies exploring the influence of low back pain on spinal kinematics in three planes of movement [4,5]. This project aimed to assess the factors affecting spinal movement in cyclists with and without low back pain.

Methods

Seven symptomatic (LBP) and asymptomatic (NLBP) cyclists (n=14) volunteered for this study. A single session lab-based study explored the affects LBP has on spinal kinematics. Participants cycled in three different saddle positions (Fig. 1A) and three different handlebar positions (Fig. 1B) on a fixed turbo trainer. Spinal kinematic data from the sagittal, coronal and transverse planes, via six segment spinal model including: (Pelvis (PEL); Lower/Upper Lumbar (LL/UL); Lower, Mid and Upper thoracic (LT, MT, UT)) was explored using between segment Range of Movement (ROM). Data was collected for 30 second intervals for each condition using 10 movement analysis cameras (Qualisys, SE) captured at 250Hz.

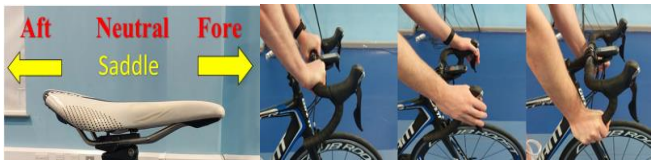

Figure 1A (Left): Saddle position on the Saddle Rails
Figure 1B (Right): Three handlebar positions

Results and Discussion

Cyclists with LBP displayed more spinal ROM than those with NLBP, when changes were made to the saddle and handlebars position. Significant changes in spinal ROM ($p<0.05$) were seen in the coronal and transverse planes for the LL/PEL segment; coronal and transverse planes for the UL/LL segment; sagittal and coronal planes for the MT/LT segments and sagittal plane for the UT/MT segment (table 1). Cyclists with LBP were less able to adapt to changes in cycling position. A significant change ($p = 0.047$) was seen between handlebar positions for the UL/LL segment in the coronal plane.

Table 1: Mean Diff. (MD) between spinal segments comparing NLBP and LBP.

		LL/PEL	UL/LL	MT/LT	UT/MT
Comparison	**Plane**	**MD**	**MD**	**MD**	**MD**
NLBP and LBP	**Sag.** °	-0.554	-0.134	-0.393*	-0.306*
	Cor. °	1.191*	0.009**	0.543*	0.285
	Trans. °	0.564*	-0.234*	-0.034	-0.182

* Significant differences were found between NLBP and LBP group
** Significant differences were found between the handlebar positions

Conclusions

Cyclists with LBP displayed altered spinal kinematics when compared to NBLP cyclists. Changes to cycling position caused increases in spinal motion which may be a contributing factor to why LBP cyclists experience pain. For cyclists with LBP, the focus should shift from performance and aerodynamic riding positions, to consider the impact of saddle and hand position in reducing excessive movement within the spine potentially reducing pain.

References

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