

MOVEMENT COORDINATION BETWEEN THE LUMBAR SPINE AND HIP WHEN PUTTING ON A SOCK

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INTRODUCTION

Low back pain (LBP) is a major health and socioeconomic problem and is frequently associated with a change in the mobility of the lumbar spine and hips [1], resulting in various forms of functional disabilities. Many back pain patients complain of aggravation of their back pain during activities of daily living. However, there is a paucity of information on the coordination of movements between lumbar spine and hips during activities of daily living especially for those pathological spines. This study was to examine differences in the kinematics and joint coordination of the lumbar spine and hips when putting on a sock in asymptomatic subjects and patients with sub-acute low back pain.

METHODS

Subacute (with symptoms between 1 and 12 weeks) back pain subjects with (n=30) or without (n=30) straight leg raise (SLR) signs and normal asymptomatic subjects (n=20) were recruited. A three-dimensional electromagnetic tracking device was used for measuring movements of the lumbar spine and hips. Kinematic data was captured while each subject put on a sock from a sitting position and each subject was asked to put on the sock on legs of both the painful side (PS) and non-painful side (NP). The kinematic patterns of lumbar spine and hips were analyzed. Coordination between the two joints was studied by cross-correlation. This identifies the strength of correlation and phase lag of the two movements.

RESULTS AND DISCUSSION

The results generally showed that LBP has altered the lumbar-hip coordination accordingly (Table 1). It is interesting to note

that when putting on a sock on the painful side (PS), there were marked alteration in the strength of cross-correlation between lumbar spine and hip. In groups 2 and 3, there was a significant decrease in the strength of correlation between flexion of the lumbar spine and hip. However, there were significant increases in the strength of the cross-correlation in other planes of motion. It is suggested that subacute back pain patients developed well-coordinated compensatory responses in performing activities of daily living.

It was also found that when back pain subjects putting on a sock with positive SLR sign there was altered lumbar-hip coordination in regard to the phase lag. When putting sock on the painful side, the lumbar spine flexed much earlier than hip in subjects with limited SLR when compared to normal subjects (phase lag = 0s, 0s and 2s for Groups 1, 2 and 3). Moreover, the coordinated activity with different planes of hip movements was affected by the presence of SLR sign. This further suggests that joint coordination is markedly influenced by the presence of SLR sign while putting on a sock with a positive SLR sign.

CONCLUSIONS

Our study showed that low back pain will affect not only the lumbar-hip coordination but also the coordination within the hip joint. Assessment of back pain patients should include kinematic analysis of the spine as well as hips.

REFERENCES

1. Shum GLK, Crosbie J and Lee RYW. *Spine*, in press, 2005.

Table 1. Mean (SD) maximum normalised cross-correlation coefficient for different the lumbar spine and hip movements.

Cross-correlation coefficients	Group 1	Group 2-LBP		Group 3-SLR	
	Normal	PS	NP	PS	NP
LxF & Hip F	0.98 ± 0.01	0.96 ± 0.02*	0.97 ± 0.02	0.95 ± 0.05*	0.96 ± 0.04*
LxR & Hip F	0.75 ± 0.23	0.84 ± 0.21*	0.87 ± 0.14*	0.89 ± 0.11*	0.89 ± 0.2*
LxR & Hip R	0.64 ± 0.2	0.76 ± 0.16*	0.69 ± 0.22	0.73 ± 0.17*	0.66 ± 0.17
LxSF & Hip F	0.72 ± 0.22	0.84 ± 0.19*	0.8 ± 0.23	0.89 ± 0.11*	0.81 ± 0.19
LxSF & Hip S	0.62 ± 0.23	0.75 ± 0.18*	0.72 ± 0.23	0.74 ± 0.15*	0.67 ± 0.2
Completion Time	4.8 ± 1.0	8.0 ± 2.5*	8.4 ± 3.0*	9.4 ± 3.2*	9.2 ± 2.8*

Lx = Lumbar; F = Flexion; R = Rotation; S = Lateral Flexion; NP = putting socks on non-painful side; PS = putting socks on painful side.

* P < 0.05, significant difference in symptomatic subjects when compared with asymptomatic subjects (Group 1).