

KINEMATIC ANALYSIS OF GAIT IN SUBJECTS WITH LUMBAR DISC HERNIATION

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Introduction

Low back pain (LBP) is a very common problem. Various studies have investigated the gait in subjects with low back pain, however there is a problem with homogeneity of sample [1].

Aim

The aim of this study was to compare the gait of subjects with lumbar disc herniation who do not undergo surgical intervention with healthy population.

Materials and Methods

Observed groups

- Ten subjects with lumbar disc herniation participated in this study: mean age 41 ± 8 years, mean weight 79 ± 15 kg, mean height 177 ± 6 cm. These subjects have not had pain in lumbar area during experiment.
- The control group consisted of 12 subjects: mean age 47 ± 10 years, mean weight 67 ± 8 kg, mean height 169 ± 7 cm).

Experimental set-up and data collection

- Kinematic analysis - Vicon Mx system (Vicon Motion Systems, Oxford, UK)
- 7 infrared cameras, frequency 200 Hz
- 35 reflective markers (14 mm in diameter) were attached on the subject
- Three successful trials for each subject were analysed

Data analysis

- Vicon Nexus and Vicon Polygon software were used for kinematic variables processing
- Kinematic variables of lower limbs and pelvis were evaluated during gait (Figure 1)
- Statistical processing (Mann Whitney U test) was performed by Statistica programme (version 8.0)

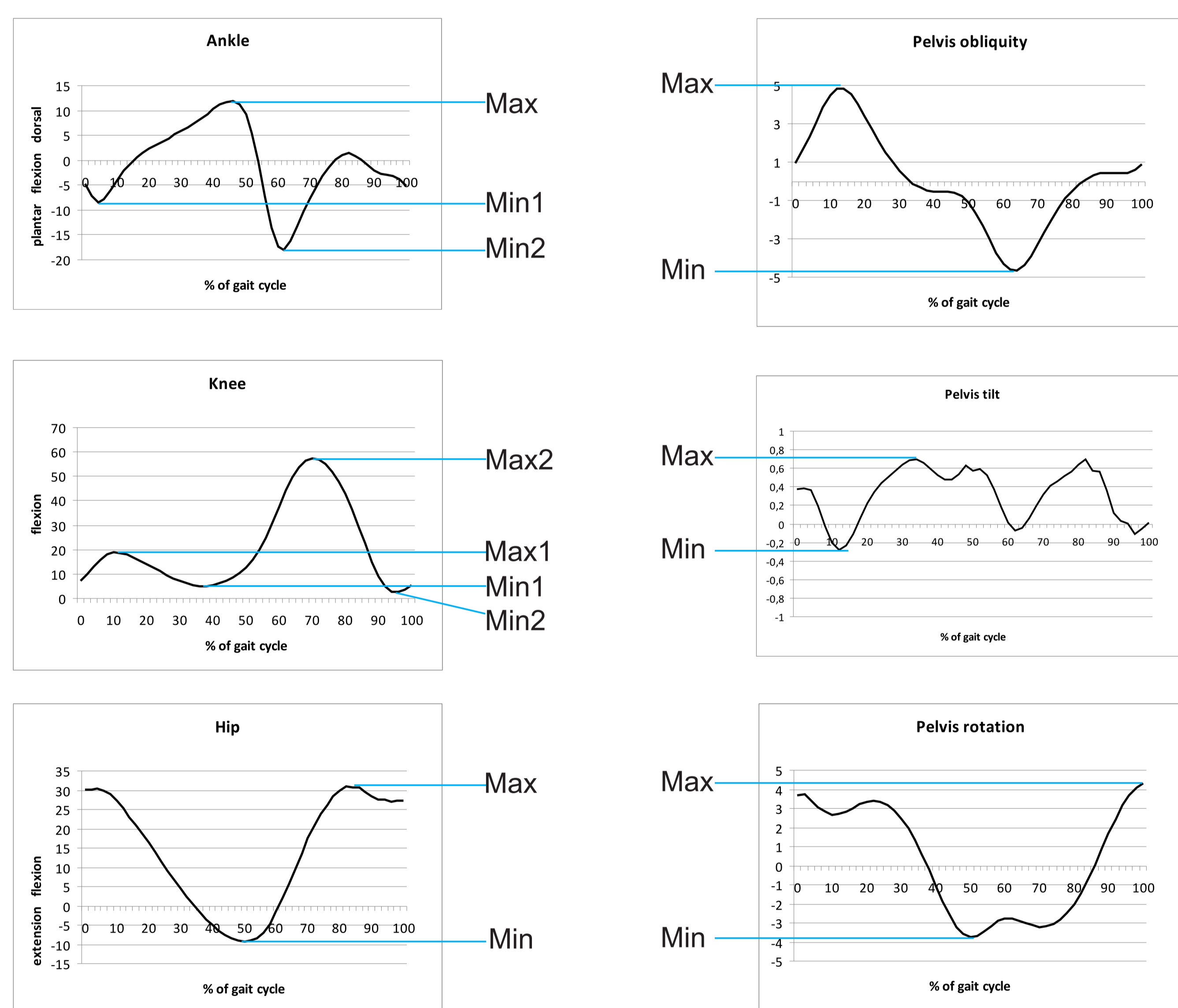


Figure 1 Evaluated variables

Results

Table 1 Angle variables of pelvis and lower limbs

Variable	Healthy		Affected side		Unaffected side		Significant differences		
	Mean	SD	Mean	SD	Mean	SD	H x A	H x U	A x U
Ankle_S_Max	12,3	4,79	10,9	6,59	9,2	7,74	0,683	0,068	0,250
Ankle_S_Min1	-8,9	4,67	-10,2	4,66	-9,9	6,58	0,333	0,504	0,776
Ankle_S_Min2	-19,5	8,83	-16,4	6,87	-19,0	10,06	0,108	0,942	0,139
Knee_S_Max1	19,0	6,38	13,5	8,63	11,1	8,68	0,007	0,000	0,264
Knee_S_Max2	58,0	12,66	55,2	16,96	48,5	24,11	0,357	0,047	0,366
Knee_S_Min1	4,6	4,53	2,1	3,04	2,4	4,01	0,001	0,005	0,631
Knee_S_Min2	1,8	5,56	0,7	5,12	-0,3	3,85	0,138	0,005	0,499
Hip_S_Max1	31,9	10,42	26,8	8,53	22,8	11,92	0,002	0,000	0,082
Hip_S_Min1	-9,8	8,46	-12,6	4,48	-10,7	5,25	0,186	0,949	0,265
Pelvis_F_Max1	5,1	4,80	3,0	1,90	4,5	1,98	0,000	0,462	0,002
Pelvis_F_Min1	-5,1	4,85	-4,3	1,81	-2,9	1,70	0,221	0,000	0,001
Pelvis_S_Max1	2,0	5,18	0,3	2,94	0,2	2,74	0,304	0,221	0,805
Pelvis_S_Min1	-1,7	4,80	-3,0	3,23	-2,7	3,01	0,221	0,448	0,666
Pelvis_T_Max1	6,1	4,58	4,0	4,14	5,5	3,56	0,071	0,701	0,163
Pelvis_T_Min1	-5,1	4,60	-5,3	3,54	-3,0	3,85	0,528	0,098	0,026

Legend: F - frontal plane, S - sagittal plane, T - transversal plane

Table 2 Range of movement of pelvis and lower limbs

Variable	Healthy		LBP		Significant differences H x LBP
	Mean	SD	Mean	SD	
RA	32,4	7,7	32,8	7,6	0,834
RK	58,2	8,4	59,7	3,7	0,351
RH	43,0	6,1	41,2	4,4	0,010
RP_F	10,5	3,0	7,1	2,3	0,000
RP_S	3,9	2,4	3,1	1,5	0,116
RP_T	11,4	5,0	9,1	2,2	0,019

Legend: LBP - subjects with lumbar disc herniation, H - healthy (control group), R - range of movement, A - ankle, K - knee, H - hip, P_F - pelvic obliquity, P_S - pelvic tilt, P_T - pelvic rotation

Significant differences between the experimental and the control groups were found in movement of knee, hip (figure 2) and pelvis (figure 3).

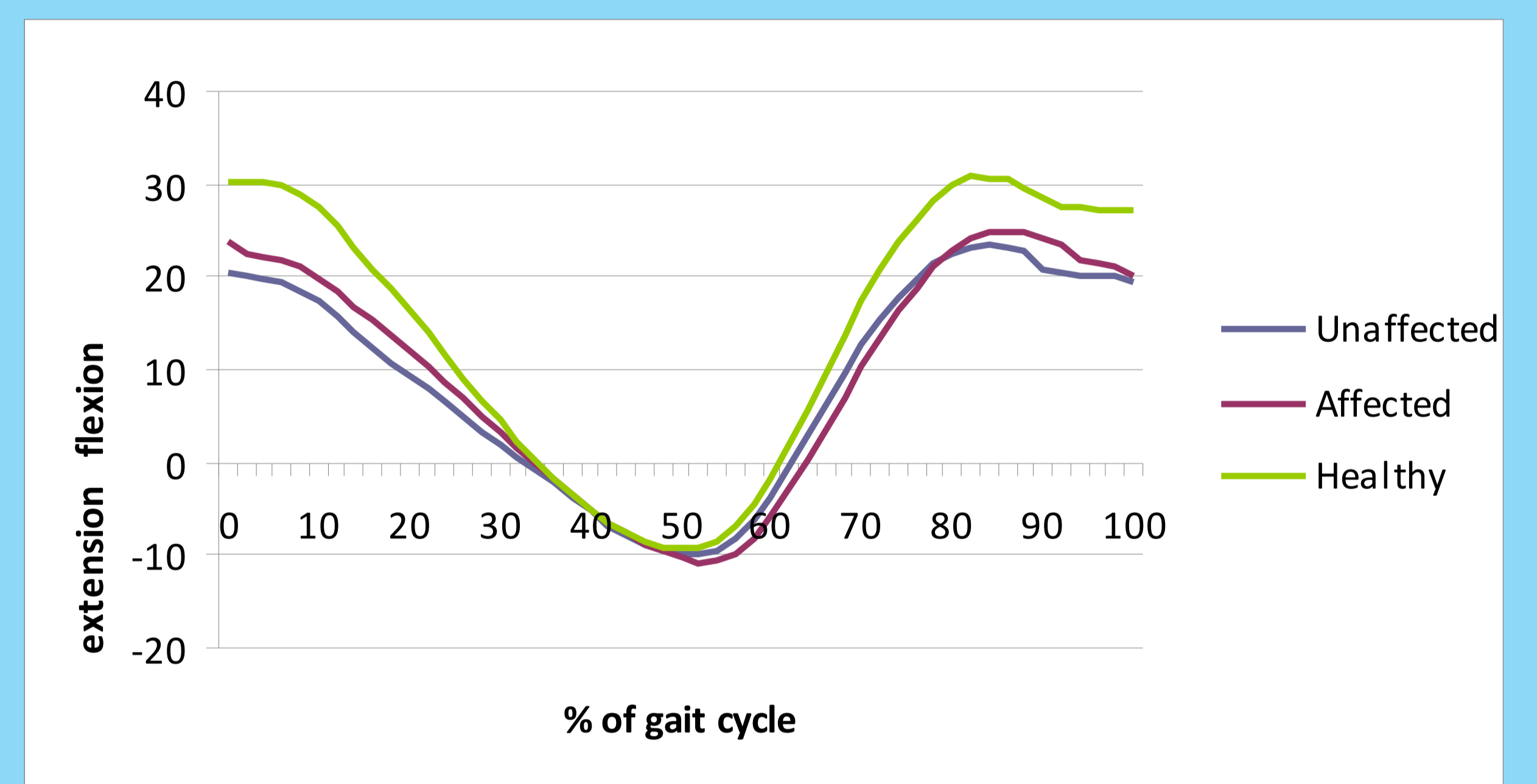


Figure 2 Hip flexion and extension

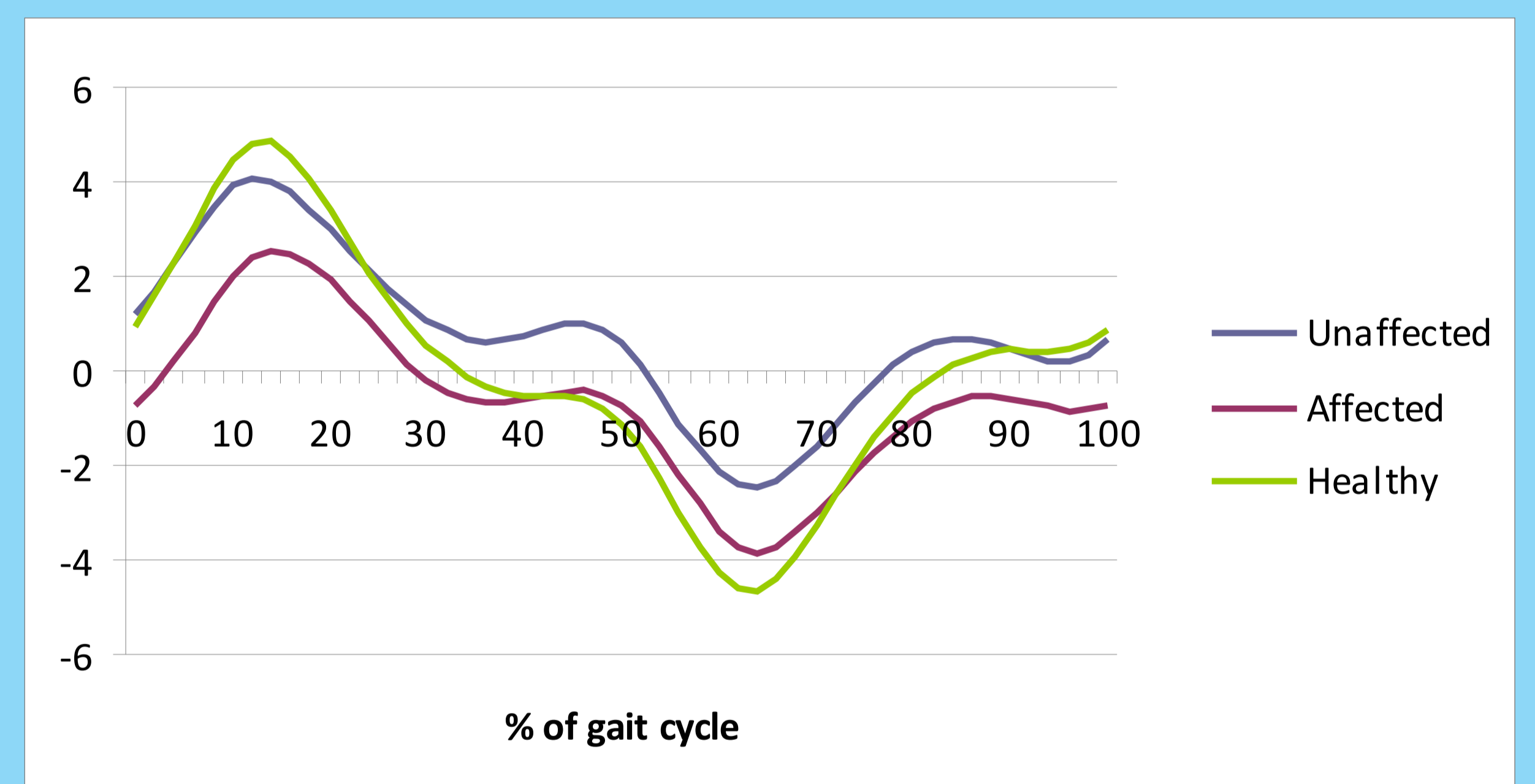


Figure 3 Pelvis obliquity

Discussion

Gait of subjects with lumbar disc herniation is characterized by reduced pelvic and hip movement. Similar results in subject with chronic low back found Lamoth et al. [2]. They presented that the coordination between transverse thoracic and pelvic rotations and lumbar and pelvic rotations was more rigid and less variable than in healthy controls. This information can be useful for physiotherapists. Da Fonseca et al. [3] suggested that patients with low back pain use strategies to attenuate the amount of force imposed on their body which can be changed by some rehabilitation methods.

Conclusions

The results of the study showed limitation of movement in pelvis and hip during gait in subjects with lumbar disc herniation which have already not pain in lumbar area. These findings can be useful for physiotherapists for subsequent care concerning these patients.

References

- [1] Wand, BM, et al., *BMC Musculoskelet Disord*, 9 (2008) 11.
- [2] Lamoth, CJC, et al., *Eur Spine J*, 15 (2006) 23-40.
- [3] da Fonseca JL, et al., *J Sport Rehabil*, 18 (2009) 269-282.

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