Increased trunk muscle activity during gait after bilateral experimental pain induction in recurrent low back pain patients during a pain-free period

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INCREASED TRUNK MUSCLE ACTIVITY DURING GAIT AFTER BILATERAL EXPERIMENTAL PAIN INDUCTION IN RECURRENT LOW BACK PAIN PATIENTS

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Introduction

Recurrent low-back pain (R-LBP)

- Global major economical burden and cause of disability
- Spine control mechanisms are important but complex related to individuals and motor tasks

Research gap

- Trunk muscle control is altered in LBP patients but the effect of different experimental pain protocols in currently asymptomatic R-LBP patients is unknown.

Aim

- To investigate the impact of unilateral versus bilateral experimental LBP in pain-free R-LBP patients and healthy controls during gait on a treadmill.

Hypotheses

R-LBP patients compared with healthy during pain:

- ⬆ trunk muscle activity during gait / ⬆ pain intensity

Bilateral versus unilateral pain in both groups:

- ⬆ trunk muscle activity during gait / ⬆ pain intensity

Methods – procedure

- 21 pain-free R-LBP patients and 18 healthy controls completed Örebro Musculoskeletal Pain Questionnaire (ÖMPQ) and Oswestry disability index (ODI)
- Surface EMG signals were recorded from abdominal (rectus abd. and obliquus int.+ext.) and back (ilioco-stalis, longissimus and multifidus) muscles during gait on Zebris™ FDM-T gait pressure treadmill in self-selected velocity pre / post saline-induced uni- and bilateral LBP in randomized order. Pain intensity was recorded on a numeric rating scale (NRS).

Methods - analysis

- Group mean ODI and ÖMPQ were calculated
- 60 seconds EMG were recorded (wireless Noraxon™ EMG system) after 15 seconds treadmill adaptation
- Foot pressure data defined 4 gait phases:

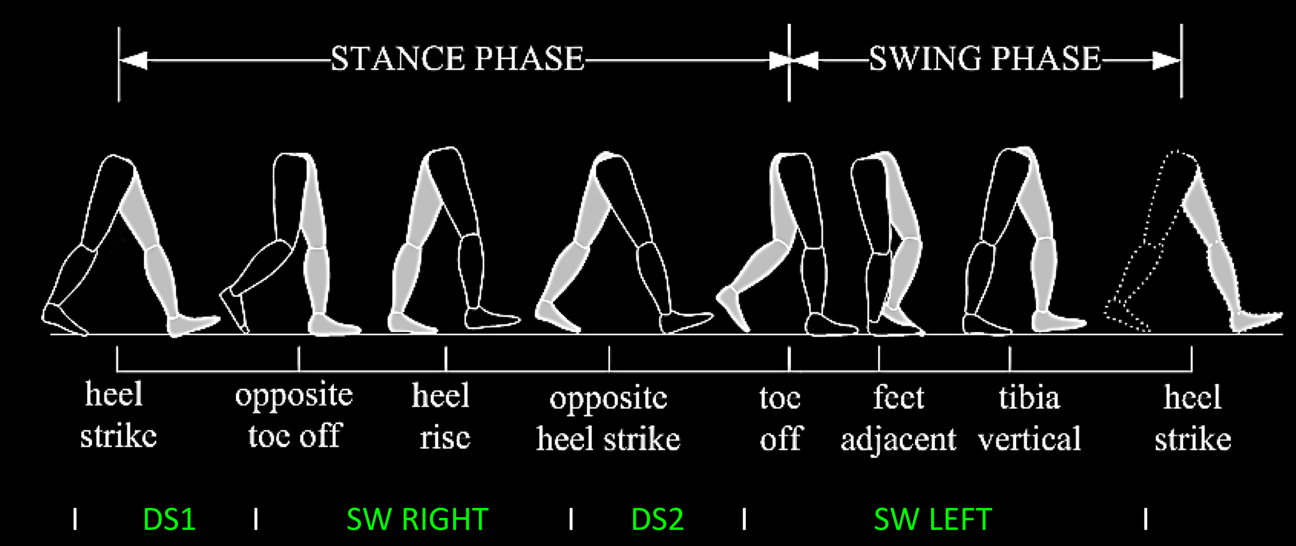

Fig. 1 Double stance (DS) and swing phases (SW) defined by left and right toe-on/off events.

- Pain-evoked Root-Mean-Square EMG differences from baseline (ΔEMG) in each gait phase were averaged across left /right abdominal and back muscles
- Mean NRS and ΔEMG was compared between the groups and between uni- and bilateral pain conditions by mixed model ANOVA and t-tests were used for post-hoc comparison between groups or between conditions

Results

- Controls: mean ODI 0.6% ± 0.4 (no disability) and ÖMPQ 67± 9.2 (low chronicity risk).
  R-LBP: mean ODI 38.9% (moderate disability) and ÖMPQ 111± 9.2 (high chronicity risk)
- Higher mean NRS in controls ($P<0.02$) and R-LBP patients ($P<0.01$) during bilateral compared with unilateral LBP ($P<0.02$) and in R-LBP compared with controls during both pain conditions ($P<0.01$)
- Uni- and bilateral LBP induced increased trunk muscle activity in R-LBP compared with controls (Fig. 2A,B)

Results – continued

Fig. 2A In R-LBP compared with controls, unilateral pain increased left and right ($P<0.01$) back ΔEMG during double stance and decreased ipsilateral abdominal ΔEMG during swing phases.

Fig. 2B In R-LBP compared with controls, bilateral pain increased left and right back and abdominal ΔEMG during double stance ($P<0.02$) and during ipsi- and contralateral swing phases ($P<0.01$)

Conclusion and discussion

- Asymptomatic R-LBP patients compared with controls showed high risk of chronicity in addition to higher pain intensity and increased trunk muscle activity during treadmill gait during experimental LBP

Discussion

- Increased sensory impact and general protective strategies during experimental pain in R-LBP patients indicate changes that may influence the prognosis after acute clinical LBP incidences, but the long-term consequence remains unknown.

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