BAUERFEIND®

SUMMARY OF SELECTED RESULTS

PROSPECTIVE STUDY OF THE TRUNK MUSCULATURE UNDER THE INFLUENCE OF COMPRESSIVE LUMBAR SUPPORTS IN PATIENTS WITH ACUTE LUMBAR BACK PAIN

Anders, C. et al.

Jena University Hospital, Clinic for Trauma, Hand and Reconstructive Surgery, Division for Motor Research, Pathophysiology and Biomechanics, July 2016 unpublished data:

BAUERFEIND.COM

ABSTRACT

Some 30 to 40 percent of the population currently suffer from acute back pain. The acute lumbar back pain is described as pain episodes which occur for the first time or after at least six pain-free months and last for a maximum period of six weeks [1]. There is often no clear, traceable cause, so in these cases we refer to non-specific or even unspecified back pain.
Possible causes for this non-specific, acute, lumbar back pain could be tense muscles or fasciae, overstretched ligaments or shortened tendons.
There is, however, no clear causal link between symptom description, clinical findings and image-based diagnostics. [2,3]
Since the symptoms have no clear causes, a multimodal and multidisciplinary approach, where lumbar supports are an inherent part of the treatment, is the best course of treatment. [4]
However, critics argue that lumbar supports could weaken the trunk muscles because of the relieving characteristics.
The precise physiological interaction between lumbar supports and the trunk muscles, and particularly in terms of the muscle status of patients with back pain, has not been outlined in scientific literature.
The study examined the question of what effect the use of lumbar supports has on the trunk musculature when walking and under static loading for patients with non-specific, acute, lumbar back pain.

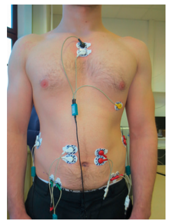
Surface electrodes (surface EMG, SEMG) were used to detect the electrical activity of important muscles in the trunk via the skin, thereby allowing conclusions to be drawn about the strain on the muscles studied, as well as the coordination of these muscles.
The measurements of muscle activities under stress with and without lumbar supports show how and to what extent this medical aid influences the trunk musculature.
The patients' perception of pain was also recorded in a pain diary, in order to be able to find a direct correlation between possible pain reduction from the lumbar support and the muscle activity parameters.

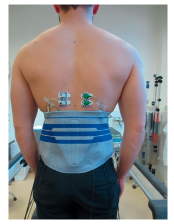
STUDY DESIGN

Controlled, prospective cross-sectional study

METHODOLOGY

Sample:	n = 36 in total; n= 24 men n = 12 women; age [years] = 29 – 63; BMI [kg/m2] = < 26
Test support:	Lumbar support (LumboTrain, Bauerfeind)
Test method:	Gait analysis (OEMG), treadmill, pain diary Static analysis in the CTT Centaur, BfMC



Assessment dates:	U1: max. 2 days after medical diagnosis/U2: 1 week after U1/U3: 3 weeks after U1

Surface electromyography
(SEMG); SEMG electrodes (Ag-AgCl electrodes: H93SG, Covidien) in accordance with international standards (SENIAM, www.seniam.org)
(amplifier: Biovision, measurement system used: ToM, DeMeTec, software; GJB)
The study was conducted on the following trunk and abdominal muscles:
1. M. rectus abdominis (RA) 2. M. obliquus internus abdominis (OI) 3. M. obliquus externus abdominis (OE)
4. M. multifidus lumbalis (MF) 5. M. erector spinae (iliocostalis) (ICO) 6. M. erector spinae (longissimus) (LO); Abb. 2, 3

Inclusion criteria:	· Patients with unspecified, acute, lumbar back pain · BMI less than or equal to 26 [kg/m2] · Adequate constitution and coordination for the measurements
Exclusion criteria:	· Restricted joint mobility, patients with chronic pain, pathological joint positions, fractures, ligament injuries, muscle injuries, soft tissue damage or somatoform disorders

[1] Nationale VersorgungsLeitlinie Kreuzschmerz. www.leitlinien.de/mdb/downloads/nvl/kreuzschmerz/kreuzschmerz-1aufl-vers5-lang.pdf (last accessed on 15 March 2016).

[2] Brennan GP, Fritz JM, Hunter SJ, et al.: Identifying subgroups of patients with acute/subacute „nonspecific" low back pain: results of a randomized clinical trial. Spine 2006; 31: 623–31 CrossRef MEDLINE

[3] O'Sullivan P: Diagnosis and classification of chronic low back disorder maladaptive movement and motor control impairments a underlying mechanism. Man Ther 2005; 10: 242–55 CrossRef MEDLINE

[4] Schäfer A, Gärtner-Tschacher N, Schöttker-Königer T: Subgroup-specific treatment of lumbar back pain. Presentation and quality criteria of the two classification systems. Orthopäde 2013; 42: 90–9 CrossRef MEDLINE

RESULTS (SELECTION)

EMG back muscles:

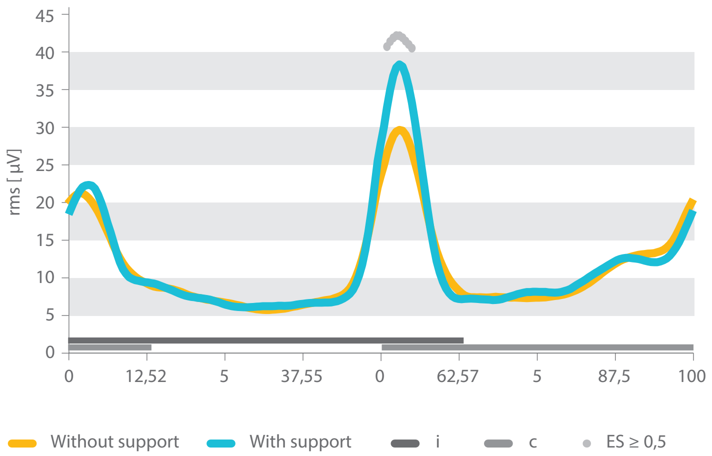


Fig. 1: Representation of the amplitude curves of all the muscles studied, averaged at 4 km/h, entire group, (men and women). X-axis: 0%-100 % = total floor contact phase of the foot in one step, y-axis coordination pattern, muscle activity in µV .i = ipsilateral foot/floor contact phase; c = contralateral foot/floor contact

RESULT:

The greatest back muscle activity can be measured in the stance phase, where both feet are in contact with the floor. The muscle activity of the contralateral side of the back to the supporting leg is (at around 35 µV) higher than that of the ipsilateral side (with around 22 µV). This basic pattern is the same in both groups, support and control.

The back muscle activity of the support group is higher than the muscle activity of the control group (see fig. 1) for all three assessment dates U1 – U3 (U1 = max. 2 days after diagnosis, U2 = 1 week after U1, U3 = 3 weeks after U1).
The increased activity of the back muscles in the support group is around 16%, around 21% after a week and around 13% after 3 weeks compared to the control group at the time of treatment with the support.

DISCUSSION:

For all three times when the measurements were taken, the back muscle activity pattern of the support group corresponds to the activity pattern of the control group. The support does not have a fundamentally altering effect on the neuromuscular control of the back muscles, i.e. the movement sequence also results in physiological activity patterns when wearing a support.

The absolute values of back muscle activity in the support group for all three assessment times are above those of the control group.
The activity values of the support group are above those of the control group even at U1. This indicates that the effect of the lumbar support occurs immediately and does not slowly increase over a possible adjustment period.
A reduction in the muscle activity of the support group is not shown. After three weeks of wearing the lumbar supports, the measured muscle activity in the support group is higher than in the control group. This argues against any muscle atrophy caused by wearing lumbar supports.
An habituation effect from wearing the support is also not shown, because the activity values in the support group remain at the same high level over three weeks and do not drop to the values of the control group.

The data for the maximum strength values (no picture) support these claims. It is clear that there is no influence from the support on the values for the maximum strength values of the back muscles. Muscle atrophy would cause a fall in the maximum strength values. This cannot be shown after three weeks of treatment.

Perception of pain using the visual analog scale (VAS).

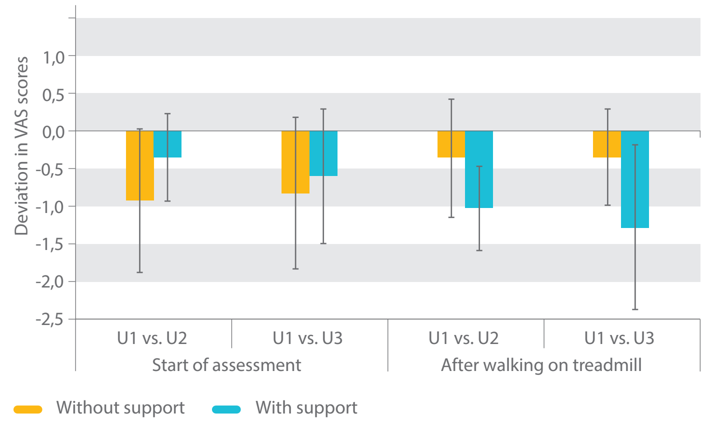


Fig. 2: Representation of the differences in pain: negative figures indicate a reduction compared to the first value (U1); U1, max. 2 days after diagnosis, U2 = a week after U1; U3 = 3 weeks after U1. Within the VAS scale: 0 (no pain) – 10 (maximum level of pain imaginable)

RESULT:

In each case, at the start of the assessment, BEFORE measurement on the treadmill, the difference in the VAS pain values in the control group from U1 to U2 “fell” by 0.9 VAS points, and from U1 to U3 by 0.8 VAS points.
In the support group, the differences were 0.4 points (U1 to U3) and 0.6 points (U1 to U3) lower.

The pain reduction compared to the first assessment U1 BEFORE the start of the U2 and U3 assessments was higher in the control group than in the support group.

The difference in the VAS pain value after the EMG test on the treadmill in the support group from U1 to U2 “fell” by 1 VAS point, and from U1 to U3 by 1.3 VAS points.
The values in the control group only fall by 0.4 points in each case.

The pain reduction compared to the first assessment U1 AFTER the treadmill test for each of the U2 and U3 assessments was greater in the support group than in the control group.

DISCUSSION:

Pain relief in the control group before the start of the assessment is greater than in the support group. The values could reflect the normal healing process for acute back pain, where the severity of pain can be seen as a predictor for the stage of recovery.

The difference in the amount of pain perceived by the support group on the various assessment dates was lower. This could be a reflection of the pain-relieving effect of a support. At U1 the perception of pain has clearly reduced partly due to the support, so the differences between U2 and U3 are not as great.

After the measurement on the treadmill, the control group felt more pain than the support group.

The support can be understood as providing passive stabilization and a simultaneous stimulating effect on the back muscles. This combination of effects promotes and thereby shortens the natural healing process.

CONCLUSION:

Supports relieve pain and activate muscles immediately.
This effect continues when wearing a support.
No evidence of muscle atrophy has been found