

SportsMedUpdate

ASSESSMENT OF LUMBAR SPINE KINEMATICS USING DYNAMIC MRI: A PROPOSED MECHANISM OF SAGITTAL PLANE MOTION INDUCED BY MANUAL POSTERIOR-TO-ANTERIOR MOBILISATION

Kulig K, Landel R, Powers CM. *J Orthop Sports Phys Ther* 2004;34:57-64

Background:

Postero-to-anterior (PA) mobilisation is employed to assess spinal segmental mobility, and although studies have described the kinematics of the movement, the direction of motion has not been well described.

Research question/s:

What is the segmental motion of the lumbar spine during a PA mobilisation procedure using dynamic magnetic resonance imaging (MRI)?

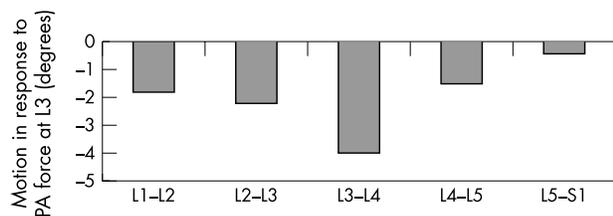
Methodology:

Subjects: 20 asymptomatic subjects (31.1 + 7.0 yrs; male = 12, female = 8).

Experimental procedure: Each subject underwent testing during sagittal plane MRI. An experienced physiotherapist applied PA mobilisation (Grade IV Maitland) at each segment L5 to L1. Images at rest and end range were examined.

Measures of outcome: Intervertebral motion (degrees; defined as the change in the intervertebral angle between the resting and end range vertebral positions) at each segment.

Main finding/s:



- A PA force that is applied at one spinous process caused significant motion at the target vertebra.
- A PA force that is applied at one spinous process caused motion which was propagated caudally and cranially.
- The observed motion at the target segment was always into extension.

Conclusion/s:

A postero-anterior force that is applied at a single lumbar spinous process causes significant motion at that segment but also of the entire lumbar region.

Evidence based rating: 7/10 **Clinical interest rating:** 6.5/10

Type of study: Controlled laboratory study

Methodological considerations: Well conducted study

Keywords: lumbar segmental mobility, lumbar zygapophyseal joints, manual therapy, spine mobilisation

USEFULNESS OF BRONCHIAL REACTIVITY ANALYSIS IN THE DIAGNOSIS OF BRONCHIAL ASTHMA IN PATIENTS WITH BRONCHIAL HYPERRESPONSIVENESS

Garcia-Rio F, Mediano O, Ramirez M. *et al. Respiratory Med* 2004;98:199-204

Background:

It is well established that not all patients with bronchial hyperresponsiveness are asthmatic, and bronchial challenge tests can perhaps be used to determine which of these subjects are asthmatic.

Research question/s:

Which bronchial reactivity indices can identify bronchial asthma in patients with airway hyperresponsiveness?

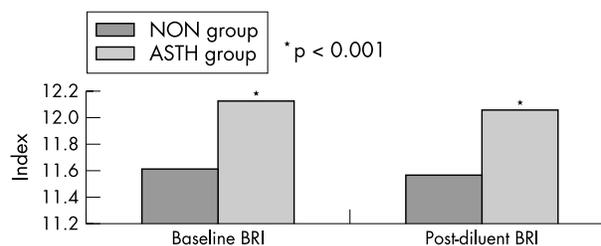
Methodology:

Subjects: 88 patients with bronchial hyperresponsiveness (+ve response to histamine bronchial challenge $\geq 20\%$ fall in FEV1).

Experimental procedure: Based on a clinical diagnosis remaining in the case history for 2 years after the bronchial challenge, subjects were grouped into asthmatics (ASTH = 55) and non-asthmatics (NON = 33). The dose-response curves of each subject were characterised by their sensitivity (PD₂₀) and reactivity.

Measures of outcome: Dose-response slope, continuous index of responsiveness (CIR) and bronchial reactivity index (BRI) with respect to baseline and post-diluent baseline values.

Main finding/s:



Conclusion/s:

The BRI (calculated with respect to baseline FEV1) can be used in the diagnosis of asthma in patients with airway hyperresponsiveness.

Evidence based rating: 7/10 **Clinical interest rating:** 7/10

Type of study: Case control study

Methodological considerations: Well-conducted study

Keywords: airway hyperresponsiveness, bronchial reactivity, bronchial asthma, bronchial reactivity indices, diagnostic

MR IMAGING OF THE HIP AND KNEE BEFORE AND AFTER MARATHON RUNNING

Hohmann E, Wortler K, Imhoff AB. *Am J Sports Med* 2004;32:55-9

Background:

Repetitive loading associated with long distance running could potentially predispose to the subsequent development of osteoarthritis.

Research question/s:

Does external impact loading in marathon runners result in internal stresses on bone and cartilage that can be demonstrated on magnetic resonance imaging (MRI)? Participants were separately assessed for static lower extremity alignment, using standard radiographs?

Methodology:

Subjects: Eight runners (six recreational, two semi-professional).
Experimental procedure: All the subjects underwent MRI of the hip and knee before (Pre) and after (Post) a standard marathon run using coronal T1-weighted and coronal STIR sequences.
Measures of outcome: Presence of oedema, periosteal reactions, and joint effusions.

Main finding/s:

- There was no demonstrable bone marrow oedema, periosteal stress reactions, or joint effusions in 7/8 runners.
- In the one subject, there was a small effusion in the knee where a reconstruction of the anterior cruciate ligament was performed 18 months before the test.

Conclusion/s:

Following a standard marathon, no significant changes on MRI scan (bone marrow oedema, periosteal reaction or effusion) were observed in the knee and hip joints of runners, indicating that the high impact forces are well tolerated.

Evidence based rating: 6.5/10 **Clinical interest rating:** 7.5/10
Type of study: Case series
Methodological considerations: Small sample size, selection bias in sample (well trained runners), descriptive study, follow-up after multiple exposures would be of interest
Keywords: long distance running, MR imaging, osteoarthritis, malalignment

EFFECTS OF SPECIFIC EXERCISE INSTRUCTIONS ON ABDOMINAL MUSCLE ACTIVITY DURING TRUNK CURL EXERCISES

Karst GM, Willett GM. *J Orth Sports Phys Ther* 2004;**34**:4-12

Background:

Trunk curl exercises are widely prescribed in rehabilitation protocols, but unless patients are properly instructed, trunk curls activate rectus abdominis, rather than internal and external oblique abdominis muscles.

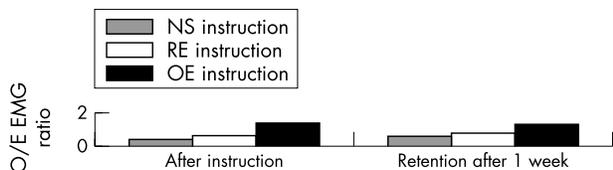
Research question/s:

Using specific instructions, can subjects learn and retain the ability to alter the relative activity of abdominal muscle groups when performing trunk curl exercises?

Methodology:

Subjects: 25 subjects.
Experimental procedure: Subjects performed trunk curl exercises in accordance with three different sets of instructions: nonspecific instructions (NS), instructions intended to emphasise rectus abdominis activity (RE), and instructions intended to emphasise oblique abdominis activity (OE). Electromyographic (EMG) activity was recorded from the upper and lower rectus and the internal and external oblique abdominis muscles while a physical target was used to insure that the trunk was raised to the same height for all conditions.
Measures of outcome: EMG amplitude (normalised root-mean-square measures) to detect changes in the EMG activity of the oblique relative to the rectus muscle groups (O/E ratio).

Main finding/s:



There was a greater normalised oblique:rectus EMG ratio following OE instructions (mean (+SD) oblique-rectus ratio, 1.45 + 0.34) than when following RE (mean (+SD) oblique-rectus ratio, 0.76 + 0.24) or NS (mean (+SD) oblique-rectus ratio, 0.63 + 0.23) instructions, and retesting 1 week later indicated that subjects retained this skill.

Conclusion/s:

During a trunk curl exercise, the nature of the instruction to the patient can significantly alter the pattern of abdominal muscle activation, with specific instructions resulting in greater activation of the stabilising muscles (internal and external oblique).

Evidence based rating: 7/10 **Clinical interest rating:** 7.5/10
Type of study: Controlled clinical trial
Methodological considerations: Well-conducted study, surface EMG activity measured, not tested in injured subjects
Keywords: Electromyography, lumbar spine, lumbar stabilisation, rehabilitation

MECHANISMS OF EXERCISE INTOLERANCE. INSIGHTS FROM TISSUE DOPPLER IMAGING

Skaluba SJ, Litwin SE. *Circulation* 2004;**109**:972-7

Background:

Slowing of left ventricular relaxation (measured as a decreased ratio of early to late diastolic mitral inflow velocities) is widely believed to indicate significant diastolic dysfunction, and may cause exercise intolerance.

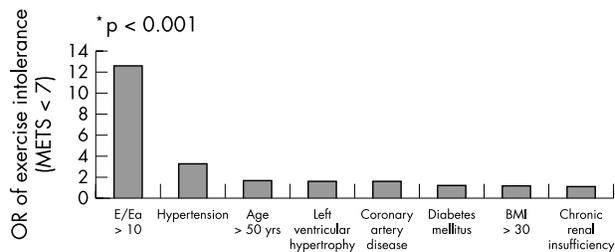
Research question/s:

Is slowed left ventricular (LV) relaxation associated with exercise intolerance?

Methodology:

Subjects: 121 subjects (55.4 + 13.1 yrs; male = 59, female = 62) who underwent echocardiography and exercise testing but were free from ischaemic heart disease.
Experimental procedure: All subjects underwent exercise testing (Bruce protocol) and echocardiography, and during which various parameters were documented including early (E) and late (A) diastolic mitral inflow velocities and early diastolic velocity of the mitral valve (Ea). Subjects were then classified as those with E/Ea <10 (measure of normal LV filling pressure, n = 85), those with E/Ea >10 (increased LV filling pressure, n = 36).
Measures of outcome: Echocardiographic measures predicting reduced exercise intolerance (METS <7).

Main finding/s:



Exercise capacity was similar in subjects with a normal mitral inflow pattern and those with a slow relaxation pattern when E/Ea was <10, but was reduced in the presence of both slow relaxation and E/Ea >10. The echocardiographic parameter with the best correlation to exercise capacity was E/Ea (r = -0.684, p<0.001). E/Ea was strongly associated with exercise capacity in all age groups and in those with preserved or reduced systolic function.

Conclusion/s:

Increased left ventricular filling pressure is a strong predictor of exercise intolerance in older males and females. In subjects with slow LV relaxation, only those with E/Ea >10 have reduced exercise tolerance,

indicating that elevated LV filling pressures rather than slow relaxation per se reduce exercise capacity.

Evidence based rating: 7/10 **Clinical interest rating:** 7/10

Type of study: Case control design

Methodological considerations: Well conducted study, no cause effect can be determined

Keywords: echocardiography, Doppler, heart failure, diastole, exercise, imaging

EFFECTS OF PSEUDOEPHEDRINE ON MAXIMAL CYCLING POWER AND SUBMAXIMAL CYCLING EFFICIENCY

Hodges ANH, Lynn BM, Bula JE, et al. *Med Sci Sports Exerc* 2003;35:1316-9

Background:

The potential ergogenic effects from pseudoephedrine are not well documented.

Research question/s:

Does a therapeutic dose of pseudoephedrine increase "anaerobic" cycling power and "aerobic cycling" efficiency?

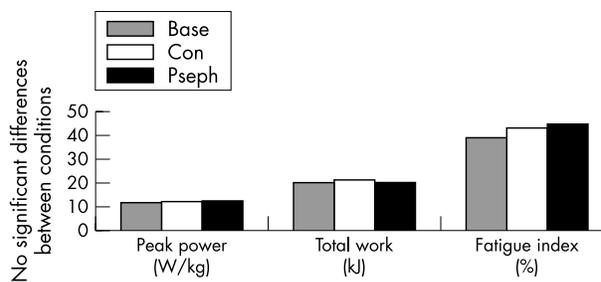
Methodology:

Subjects: 11 healthy moderately trained males (VO_{2peak} 4.4 ± 0.8 L.min⁻¹).

Experimental procedure: Subjects underwent baseline (Base) tests for anaerobic (Wingate test) and aerobic (VO_{2peak} test) cycling power, and then ingested either 60 mg of pseudoephedrine hydrochloride (Pseph) or a placebo (Con) in a randomised fashion. After 90 min rest, testing (Wingate or cycling efficiency) took place.

Measures of outcome: Wingate (peak power (PP), total work and fatigue index (FI)), cycling efficiency (heart rate (HR) and VO_2 at 40% and 60% of the peak power).

Main finding/s:



Cycling efficiency: HR at 40% power (Pseph = 138 ± 10 , Con = 137 ± 10 beats/min) or 60% power (Pseph = 161 ± 11 , Con = 160 ± 11 beat/.min) and cycling efficiency at 40% power (Pseph = 18.8 ± 1.8 , Con = $18.5 \pm 1.8\%$) or 60% power (Pseph = 20.3 ± 2.0 , Con = $20.1 \pm 2.1\%$) were similar in both conditions.

Conclusion/s:

The ingestion of a therapeutic dose of pseudoephedrine hydrochloride (60 mg) does not improve "anaerobic" cycling performance or "aerobic" cycling efficiency.

Evidence based rating: 7.5/10 **Clinical interest rating:** 7/10

Type of study: Double blind, placebo controlled clinical trial

Methodological considerations: Well-conducted study

Keywords: ergogenic, pseudoephedrine, Wingate, banned substance, stimulant, exercise