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A commercial abdominal slide machine exercise (Ab-slide), compared with three other exercises, selectively activated the abdominal muscles more than the non-abdominal muscles (rectus femoris)

Title: An electromyographic analysis of the Ab-slide exercise, abdominal crunch, supine double leg thrust, and side bridge in healthy young adults: Implications for rehabilitation professionals

Authors: Youdas JW, Guck BR, Hebrink RC, Rugotzke JD, Madson TJ, Hollman JH

Reference: J Strength Cond Res 2008; 22(6): 1939-1946

Type of study: Controlled clinical trial (laboratory)

Keywords: EMG, lumbar spine, rehabilitation, muscle activation, rectus abdominis, sit-up

EB Rating: 7.5/10

CI Rating: 7/10

Background: There are a large number of therapeutic exercises that are advocated to selectively activate the abdominal muscles

Research question/s: What is the effectiveness of a commercial abdominal machine (Ab-Slide) and three common abdominal strengthening exercises (abdominal crunch, supine double leg thrust, and side bridge) on activating abdominal muscles, yet minimizing non-abdominal muscle activity?

Methodology:

- Subjects: 22 healthy subjects (male=10, % body fat 10.7+4, females=12, % body fat 20.7+3.2)
- Experimental procedure: Al the subjects underwent testing of four exercises [abdominal slide machine (AbSI), abdominal crunch (AC), supine double leg thrust (SDLT), and side bridge (SB)]. During each exercise surface electromyographic (EMG) activity was recorded in the rectus abdominis (RA), external oblique (EO), internal oblique (IO), and rectus femoris (non-abdominal) (RF) muscles
- Measures of outcome: Peak EMG activity for each muscle (normalized to the EMG values by maximum muscle contractions - %MVIC)



Main finding/s:

- The AbSI exercise resulted in the greatest selective activation of the abdominal muscles (RA, EO, IO) with the least activation of the non abdominal muscle (RF)
- The SLDT exercise resulted in the greatest non abdominal muscle activation

Conclusion/s:

- A commercial abdominal slide machine exercise (Ab-slide), compared with three other exercises, selectively activated the abdominal muscles more than the non-abdominal muscles (rectus femoris)
- In contrast, the supine double leg thrust exercise activated mostly the non-abdominal muscles and should not be used in patients with low back pain

Methodological considerations:

Well conducted study

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There is evidence that high intensity cycling (during a staged race) is associated with muscle damage (early rise of muscle injury markers such as creatine kinase) but not liver damage

Title: High-intensity ultraendurance promotes early release of muscle injury markers Authors: Bessa A, Nissenbaum M, Monteiro A, Gandra PG, Nunes LS, Bassini-Cameron A, Werneck-de-Castro JPS, Vas de Macedo D, Cameron L-C Reference: Br J Sports Med 2008; 42: 589-593 Type of study: Case series Keywords: muscle injury, enzymes, cycling, high intensity, markers

EB Rating: 5.5/10

CI Rating: 6.5/10

Background: High intensity ultra-endurance exercise places substantial stress on the physiological systems of an athlete, including the skeletal muscle – this can be measured using biochemical markers of muscle damage **Research question/s:** Does high-intensity ultra-endurance (HIU) cycling alter biochemical markers of muscle damage?

Methodology:

- Subjects: 4 male amateur athletes participating in a 800km staged cycling relay race (lasting ~ 23 h)
- Experimental procedure: Each cyclist completed a total of about 200km of the staged race and blood samples
 were taken from each athlete before during and after they cycled until exhaustion (Pre, 50kn, 100km, 150km
 and 200km). Markers of muscle damage were creatine kinase (CK) and lactate dehydrogenase (LDH). Other
 liver enzymes (aspartate aminotransferase AST, alanine aminotransferase ALT, alkaline phosphatase and
 y-glutamyltransferase) and haematological parameters were also assessed.
- Main measures of outcome: CK and LDH during cycling

Main finding/s:



- CK levels increased by 300% rise (sigmoidal pattern); LDH levels increased by 30-40% (hyperbolic pattern), while AST (250%) and ALT levels (140%) also increased markers of liver injury did not increase
- Haematological markers: The following pre- to post-exercise increases were documented: platelets (20-30%), white blood cells (200%), leucocytes (210%) mainly neutrophils (300%)

Conclusion/s:

• There is evidence that high intensity cycling (during a staged race) is associated with muscle damage (early rise of muscle injury markers such as creatine kinase) but not liver damage

Methodological considerations:

Case series, small sample size, no control group

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The effects of a combination of cryotherapy and compression are superior to cryotherapy alone in altering Achilles tendon microcirculation

Title: Midportion Achilles tendon microcirculation after intermittent combined cryotherapy and compression compared with cryotherapy alone. A randomized trial Authors: Knobloch K, Grasemann R, Spies M, Vogt PM Reference: Am J Sports Med 2008; 36(11: 2128-2138) Type of study: Randomized controlled clinical trial Keywords: cryotherapy, compression, soft tissue, Achilles tendon

EB Rating: 7.5/10

CI Rating: 7/10

Background: Cryotherapy and compression are two commonly used treatment modalities for soft tissue injuries – the effect of cryotherapy alone or combined with compression on the Achilles tendon is not known **Research question/s:** Does combined cryotherapy and compression change microcirculation in the mid-portion of the Achilles tendon when compared with cryotherapy alone?

Methodology:

- Subjects: 60 healthy active volunteers (male=33)
- Experimental procedure: All the subjects were assessed and then to receive intermittent treatment (3 x 10min application with 10 min re-warming in between) with either combined cryotherapy and compression (Cryo/Cuff) (CR+C=30; 32 ± 11 yrs) or cryotherapy alone (KoldBlue) (CR=30; 33 ± 12 yrs). The microcirculation parameters in the mid-portion of the Achilles tendon were determined at two depths (2mm and 8mm) at 1, 3, 5, and 7 min during each application and during each re-warming period using a combined laser Doppler and flowmetry system (O2C)
- Measures of outcome: Blood flow (AU) (expressed as % of flow at rest pre-intervention), tendon oxygen saturation (%), tendon oxygenation (%), post-capillary venous filling pressures (AU)

Main finding/s:



- There was a significant reduction in superficial and deep capillary tendon blood flow within the first minute of application (and subsequent applications) in both groups during recovery, superficial and deep capillary blood flow was re-established significantly faster using CR+C group
- Tendon oxygen saturation was reduced significantly in both groups, but more so in the CR+C group. There was
 significantly higher tendon oxygenation in the CR+C group in the superficial and deep tissue during all
 recoveries, and there was a significant reduction in post-capillary venous filling pressures in both groups with
 marginally lower pressure in the CR+C group

Conclusion/s:

• The effects of a combination of cryotherapy and compression are superior to cryotherapy alone in altering Achilles tendon microcirculation

Methodological considerations:

Well conducted study, compression alone was not studied, only health subjects were studied

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In pre- and early puberty, increased daily physical activity is associated with an increased weight bearing bone (hip) mineral content in boys but not in girls

Title: Weight-bearing bones are more sensitive to physical exercise in boys than in girls during pre- and early puberty: a cross-sectional study

Authors: Kriemler S, Zahner L, Puder JJ, Braun-Fahrlander C, Schindler C, Farpour-Lambert NJ, et al **Reference:** Osteoporosis Int 2008; 19: 1749-1758

Type of study: Cross sectional study

Keywords: bone, children, exercise, muscle, physical activity, sex

EB Rating: 7/10

CI Rating: 8/10

Background: The association between physical activity and bone mineral content in pre- and early pubertal girls and boys has not been studied – gender differences in the relationship between physical activity and may well exist **Research question/s:** Are there gender-specific differences in the relationship between bone mineral content and physical activity pre- and early pubertal girls and boys?

Methodology:

- Subjects: 269 children (boys=128) from randomly selected schools (6-13 yrs) (a subgroup from a larger study)
- Experimental procedure: All the subjects were assessed (including anthropometry, Tanner score) and bone
 mineral content/density (BMC/BMD) and fat-free mass (FFM) were measured using dual-energy X-ray
 absorptiometry (Total, lumbar spine, hip). In addition, lower extremity strength was measured (jump-and-reach
 test), and physical activity was determined using accelerometers. Subjects were grouped into tertiles according
 to vigorous physical activity per day (min)
- Main measure of outcome: Relationship between physical activity per week and bone (BMD and BMC) (Total, lumbar spine, hip) adjusted for height, weight, Tanner and leg strength

Main finding/s:

• Gender differences: Boys had higher hip and total body BMC and BMD, higher FFM, higher muscle strength and were more physically active than girls



vigorous physical activity per day (Tertiles)

• There was a significant association between total hip BMC and physical activity in boys (r=0.20-0.33), but not in girls (r=0.02-0.04 (after adjusting for fat free mass and muscle strength)

Conclusion/s:

• In pre- and early puberty, increased daily physical activity is associated with an increased weight bearing bone (hip) mineral content in boys but not in girls

Methodological considerations:

Descriptive study, no cause effect can be shown, some limitations with data capturing (Tanner staging, measure of physical activity)

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Patients with multiple sclerosis have reduced muscle power and this is related to poor postural stability, slower walk times and increased fatigue

Title: Leg power asymmetry and postural control in women with multiple sclerosis Authors: Chung LH, Remelius JG, Van Emmerik REA, Kent-Braun JA Reference: Med Sci Sports Exerc 2008; 40(10): 1717-1724 Type of study: Case-control study Keywords: multiple sclerosis, skeletal muscle, balance, fatigue, stability, center of pressure, rehabilitation

EB Rating: 7/10

CI Rating: 7/10

Background: In patients with multiple sclerosis (MS) the relationship between muscle strength, walking speed, postural control, and symptomatic fatigue are not known

Research question/s: In patients with multiple sclerosis, is there an association between muscle strength symmetry, postural control, and symptomatic fatigue?

Methodology:

- Subjects: 12 females with multiple sclerosis (MS Expanded Disability Status Scale = 4±1), 12 age-matched female controls (CON)
- Experimental procedure: All the subjects were assessed for 1) muscle strength/power [peak knee extensor (KE) and dorsiflexor (DF) isometric torque and isotonic power (Biodex dynamometer) and asymmetry] and 2) balance [center of pressure (CoP) variability during 20sec of quiet stance - anteroposterior (AP) and mediolateral (ML) directions]. Normal and brisk walk times (25 ft) and symptomatic fatigue (Visual Analog Fatigue Scale and Fatigue Severity Scale) were measured before strength and balance testing.
- Measures of outcome: Fatigue, walk time, muscle power, knee extensor power asymmetry (%), postural variability

Main finding/s:

- Fatigue and walk time: Both fatigue and walk time was greater in the MS compared to the CON group ($p \le 0.01$)
- Muscle strength/power: Muscle strength and power was similar between groups, but knee extension power and knee extension power symmetry was significantly lower in the MS compared with the CON group



 Knee extension power asymmetry was significantly related to fatigue and walk times (p<0.02) and anteroposterior Center of Pressure variability was related to fatigue, walk times, and power asymmetries (p<0.05)

Conclusion/s:

 Patients with multiple sclerosis (MS) have reduced muscle power and this is related to poor postural stability, slower walk times and increased fatigue – muscle strength rehabilitation may be an important component of the treatment of MS

Methodological considerations:

Case-control study, no cause effect, only females were studied

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