Core Conditioning & Performance

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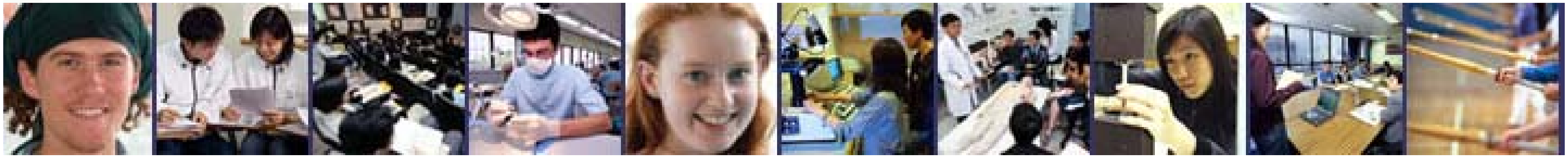
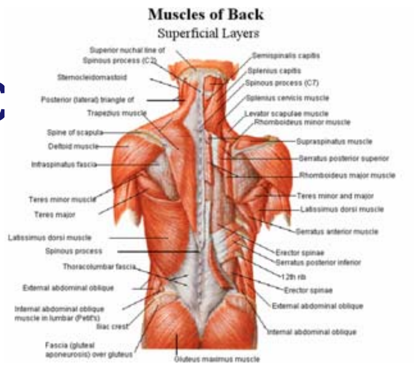
Content

Introduction

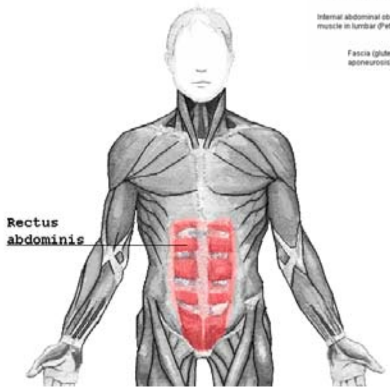


What is the core?

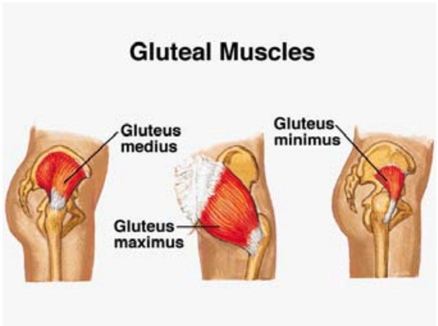
- It is much more than abdominal musc EO, IO, TVA



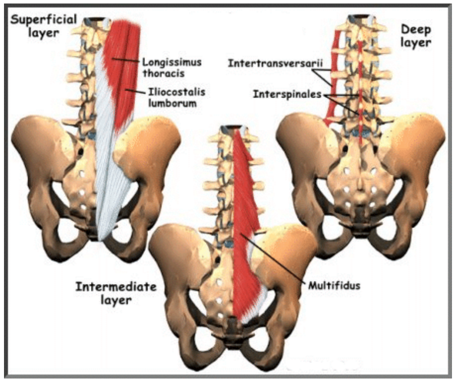
- Lumbar Spine Musculature



- Hip Musculature



- Thoracic Spine Musculature
- Cervical Spine Musculature



What is the value of the core?

- Core (or trunk) strength is important because many movements originate from the core
- A strong and stable core provides a base from which power can be generated to the limbs
- If the core is weak the spine will tend to collapse

Core & Low Back Pain

- Mixed evidence suggests that a reduction of low back pain (LBP) is achieved by strengthening the core musculature.

- Some have found an association between trunk muscle endurance and LBP (Biering-Sorensen. Spine 1984; Luoto et al. Clin Biomech 1995); and extensor/flexor ratio imbalance may contribute to LBP (Lee et al. Spine 1999)

- There is conflicting evidence of an association between core strengthening and reduction in LBP occurrence (Nadler et al. Med Sci Sports Exerc 2002).

- Poor lumbopelvic posture may be associated with back injuries (McGregor. Med Sci Sports Exerc 2005)

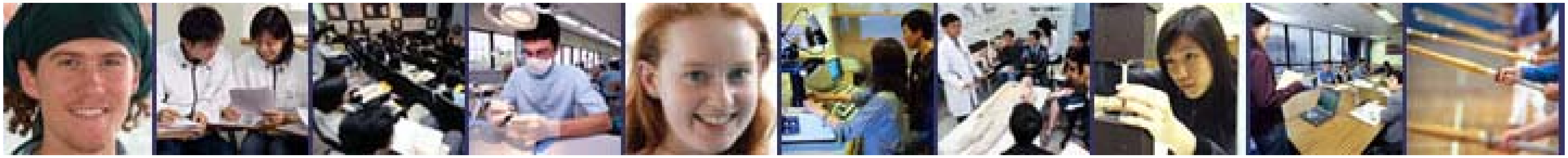
The Trunk

- “increasing core/trunk strength can lead to a greater capacity for speed generation, improved ability to change direction (agility), improved balance and posture, and decreased risk of injury”
  Drock, 2003

- Does it?

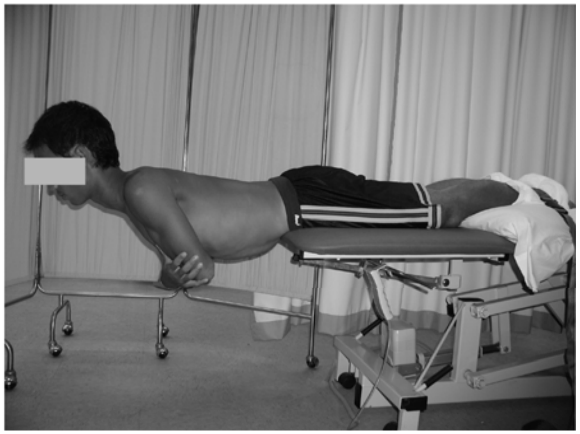
- Stanton et al. JSCR (2004)
- Tse, McManus, Masters. JSCR (2005)
- Butcher et al. J Orthop & Sports Phys Ther (2007)

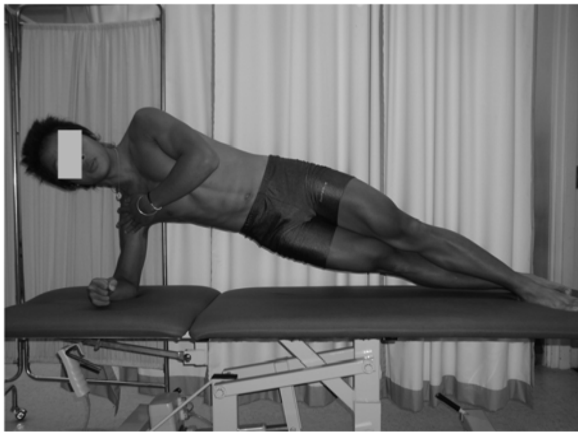
Measuring the core



Core Endurance

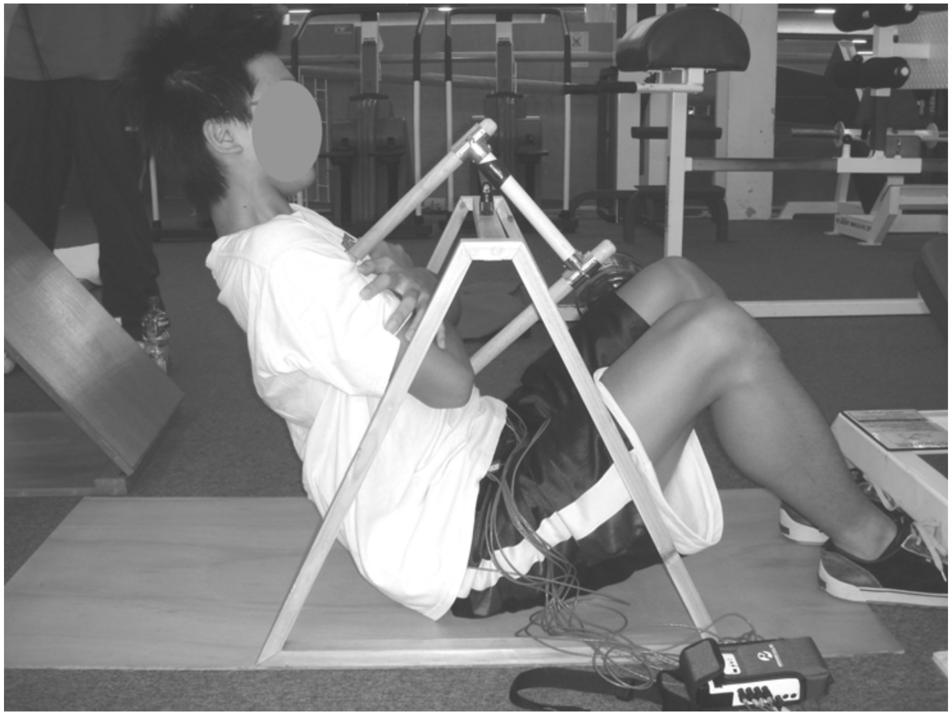
- McGill et al. Endurance times for low back stabilization exercises. Arch Phys Med Rehabil 1999

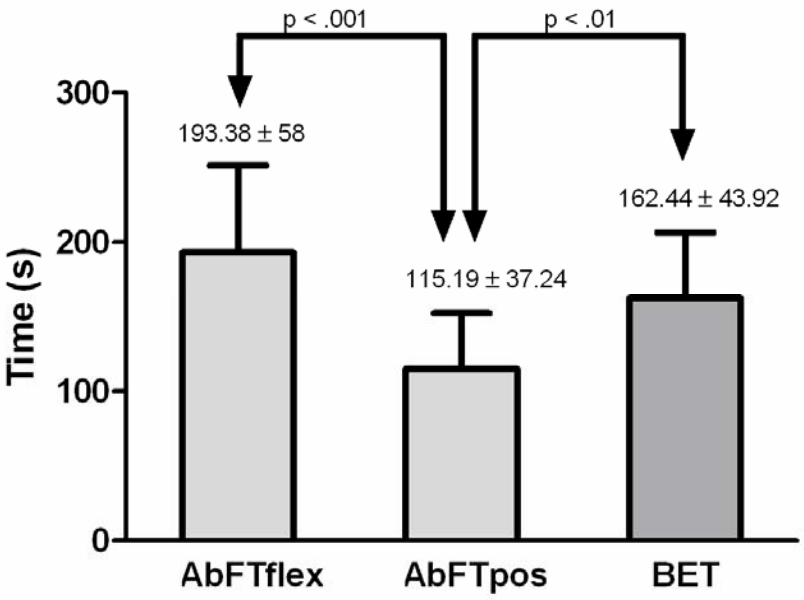




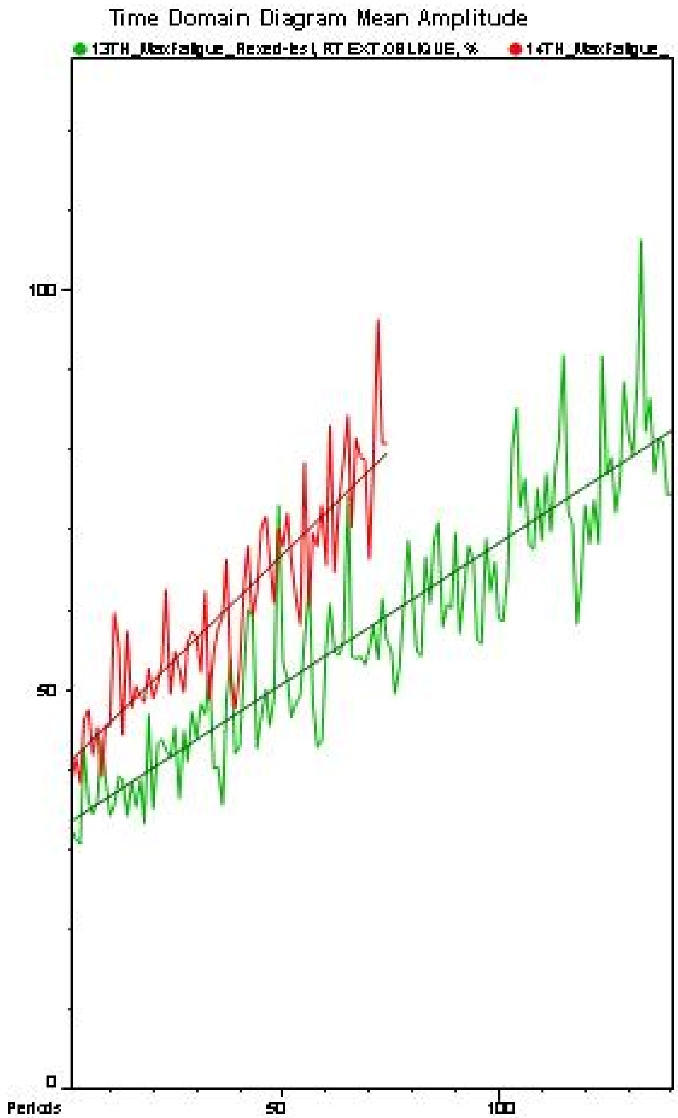
Core Endurance

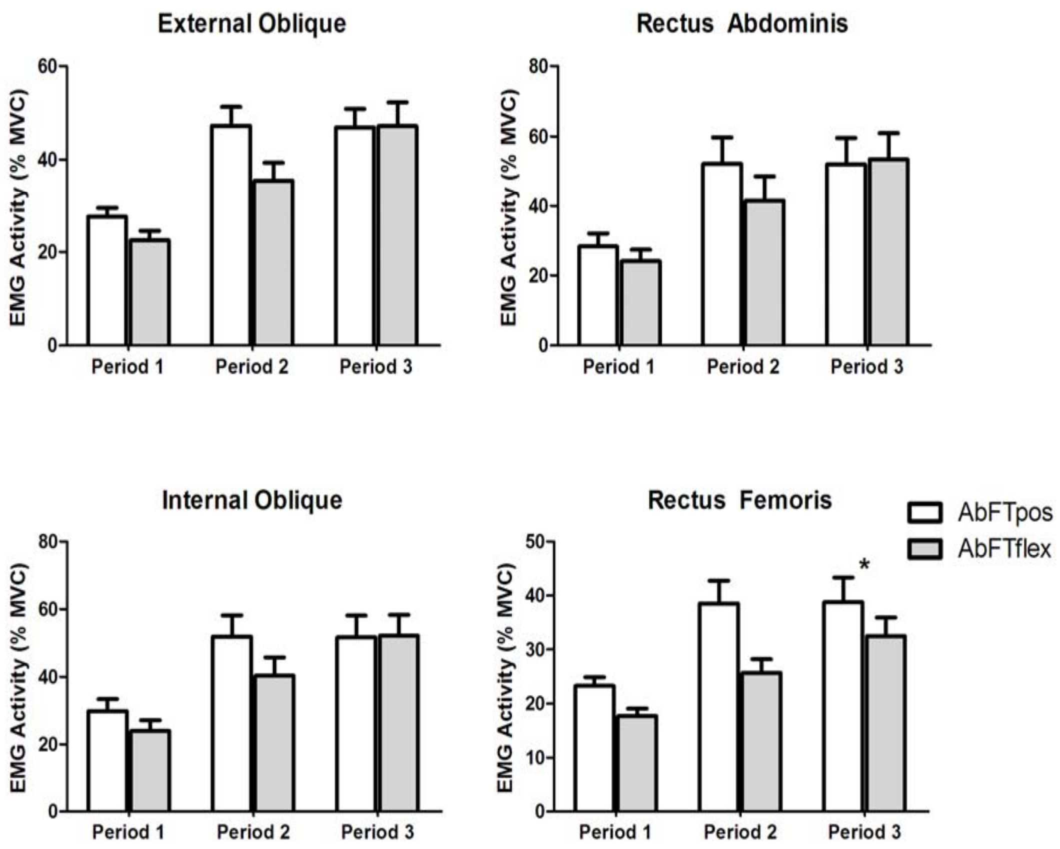
❖ Trunk Muscle Endurance Tests: Effect of Trunk Positioning on Test Outcome





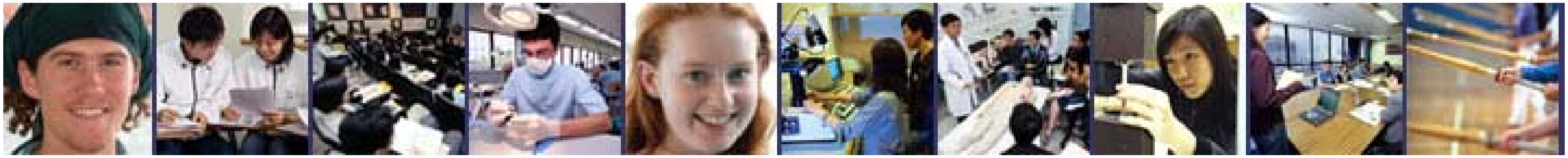
Core Endurance





Tse, McManus, Masters, *Under Review*

Training the core



Training

Training program for core endurance:

1. Swiss ball stability exercises
2. SB pikes
3. SB Russian twists
4. Pelvic thrusts
5. Planks
6. Side bridges
7. Hip raises (double and single leg)
8. Back extensions
9. Medicine ball lunge rotations

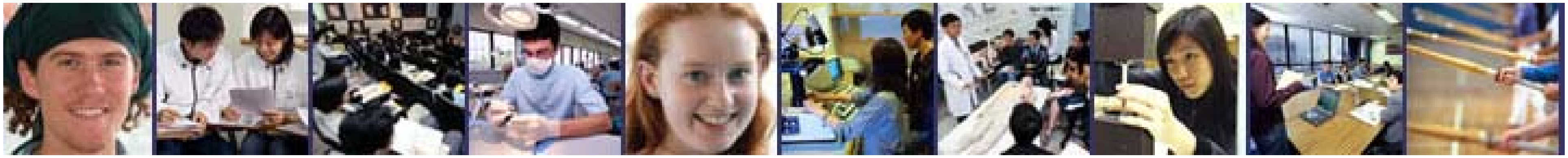
(all exercises 3 sets of 10-20 reps with 20-40 sec rest periods)





Tse, McManus, Masters, JSCR (2005)

The core & performance



Rowing

- Study 1: Training Study
  - 8 – weeks ‘core’ training
  - Does

    “increasing core/trunk strength can lead to a greater capacity for speed generation, improved ability to change direction (agility), improved balance and posture, and decreased risk of injury”?

STUDY 1

TABLE 2. Physical performance tests after 8 weeks of training in the core and control groups (mean ± *SD*).

Group	*n*	Baseline (pretest)	8 Wk (posttest)
Vertical jump (inches)			
Core	19	22.1 ± 2.5	21.8 ± 2.3
Control	14	22.3 ± 1.6	22.5 ± 1.9
Broad jump (cm)			
Core	20	227.3 ± 20.6	216.3 ± 15.5
Control	14	226.8 ± 20.0	214.3 ± 12.8
10-m shuttle run (s)			
Core	20	9.95 ± 0.41	10.09 ± 0.26
Control	14	9.95 ± 0.41	9.86 ± 0.28
40-m sprint (s)			
Core	19	6.27 ± 0.34	6.28 ± 0.23
Control	14	6.28 ± 0.39	6.22 ± 0.22
2-kg Medicine ball throw (m)			
Core	19	9.06 ± 1.40	8.55 ± 0.86
Control	14	9.04 ± 1.23	8.84 ± 0.81

STUDY 1

TABLE 3. 2000-m rowing ergometer test after 8 weeks of training intervention or nonintervention period (mean ± *SD*).

Group	*N*	Baseline (pretest)	8 Wk (post-test)
2kMRET (s)*			
Core	16	454.5 ± 11.5	452.4 ± 9.8
Control	13	443.5 ± 10.5	442.1 ± 9.5
MaxHR (bpm)			
Core	16	187.8 ± 8.7	189.6 ± 8.5
Control	13	196.9 ± 15.9	192 ± 7.1
MaxLA ($mmol \cdot l^{-1}$)			
Core	16	12.2 ± 1.9	12.9 ± 2.5
Control	13	12.1 ± 2.6	12.7 ± 2.3

* 2kmMRET = 2 kilometer maximal rowing ergometer test; MaxHR (bpm) = maximal heart rate in beats per minute; MaxLA ($mmol \cdot l^{-1}$) = maximal lactate in millimoles per liter of blood.

Rowing cont..

- Study 2: What we learnt from study 1:
  - the 2000m ergometer test was not indicative of a normal rowing training session
  - the ergometer bout should be at a relative intensity and not absolute
  - We need more specific information on 'rowing' performance from the ergometer test
  - Consider both core strength and endurance

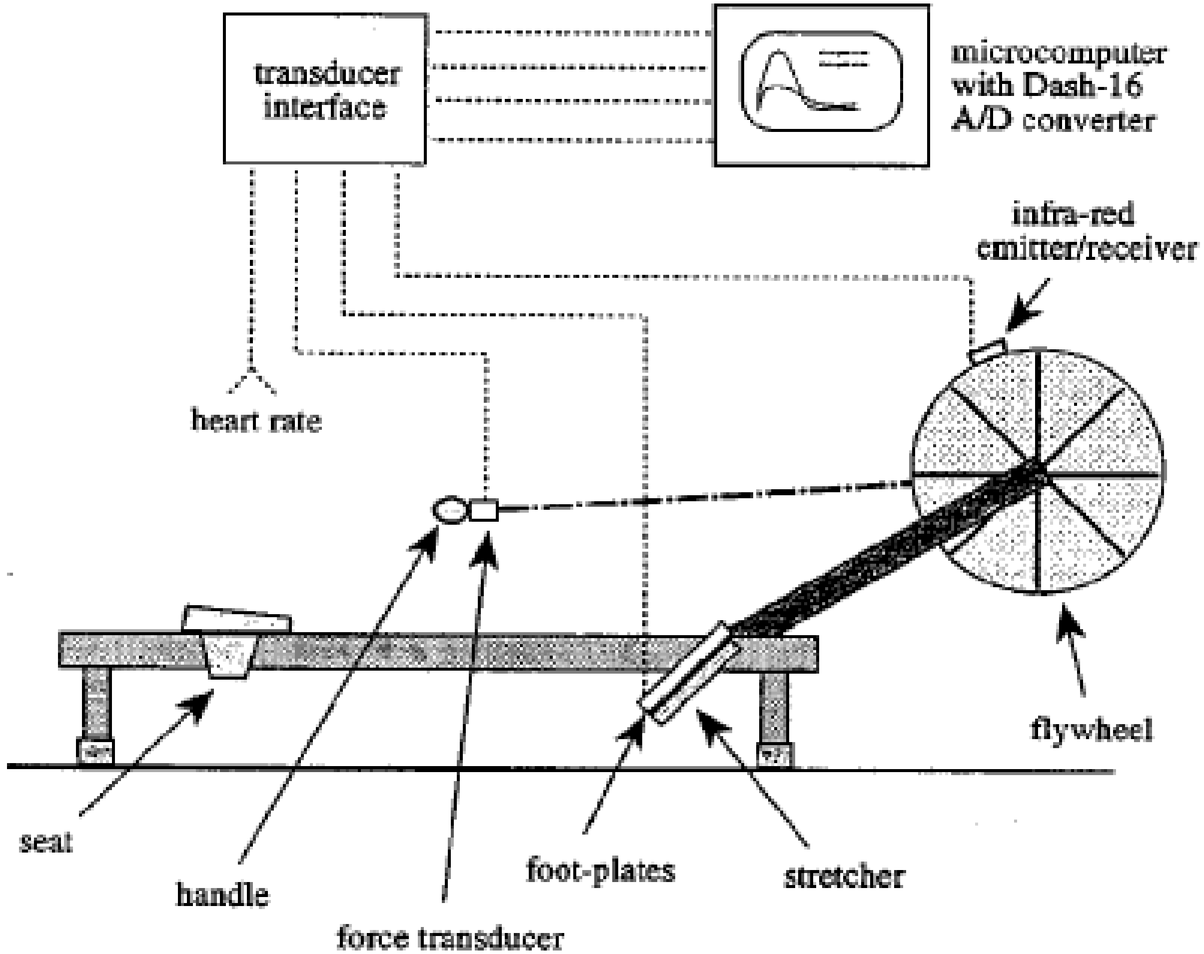


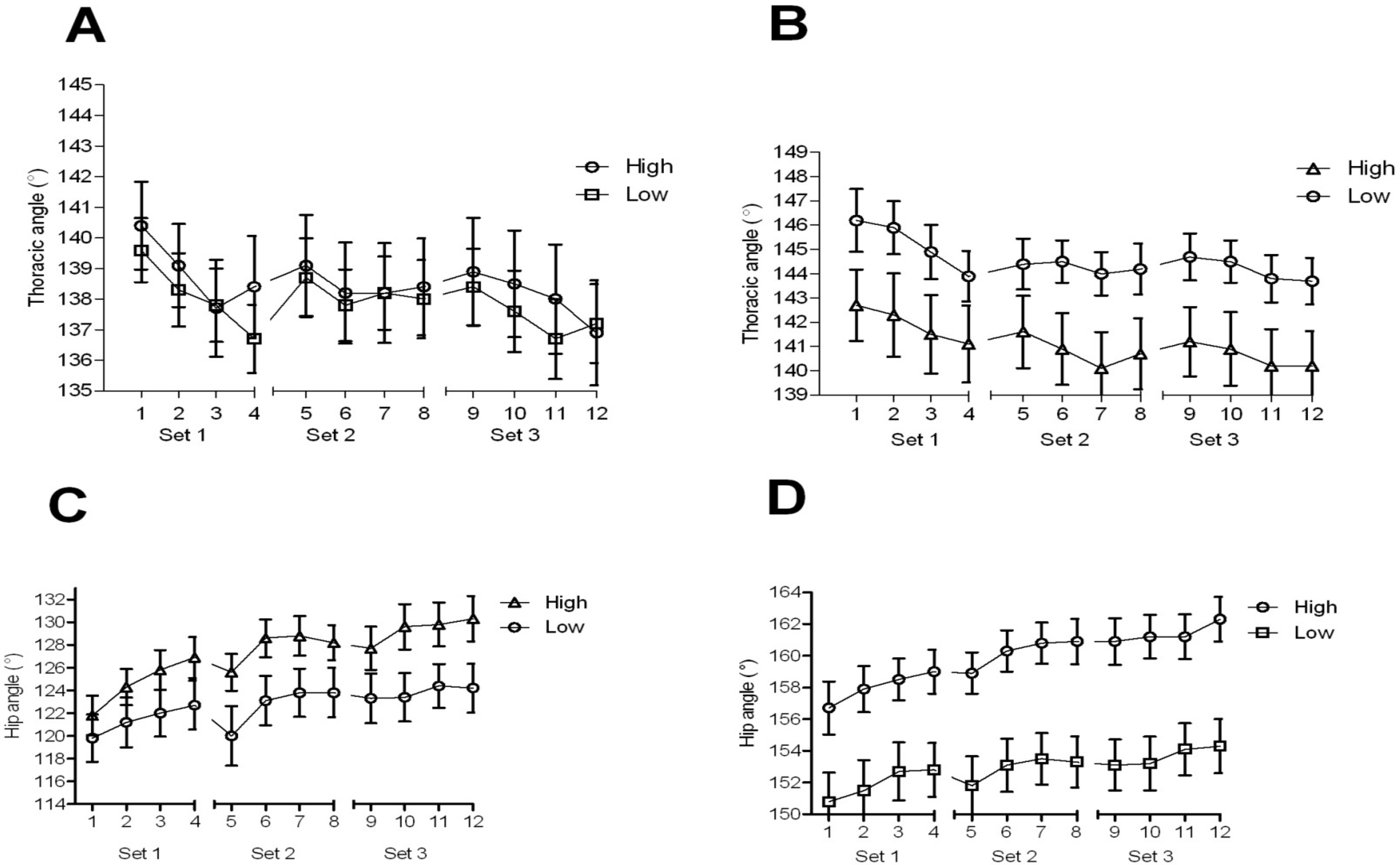
Figure 1 Schematic diagram of the modified Concept II rowing ergometer and data-acquisition system.

From MacFarlane et al. JSS (1997)

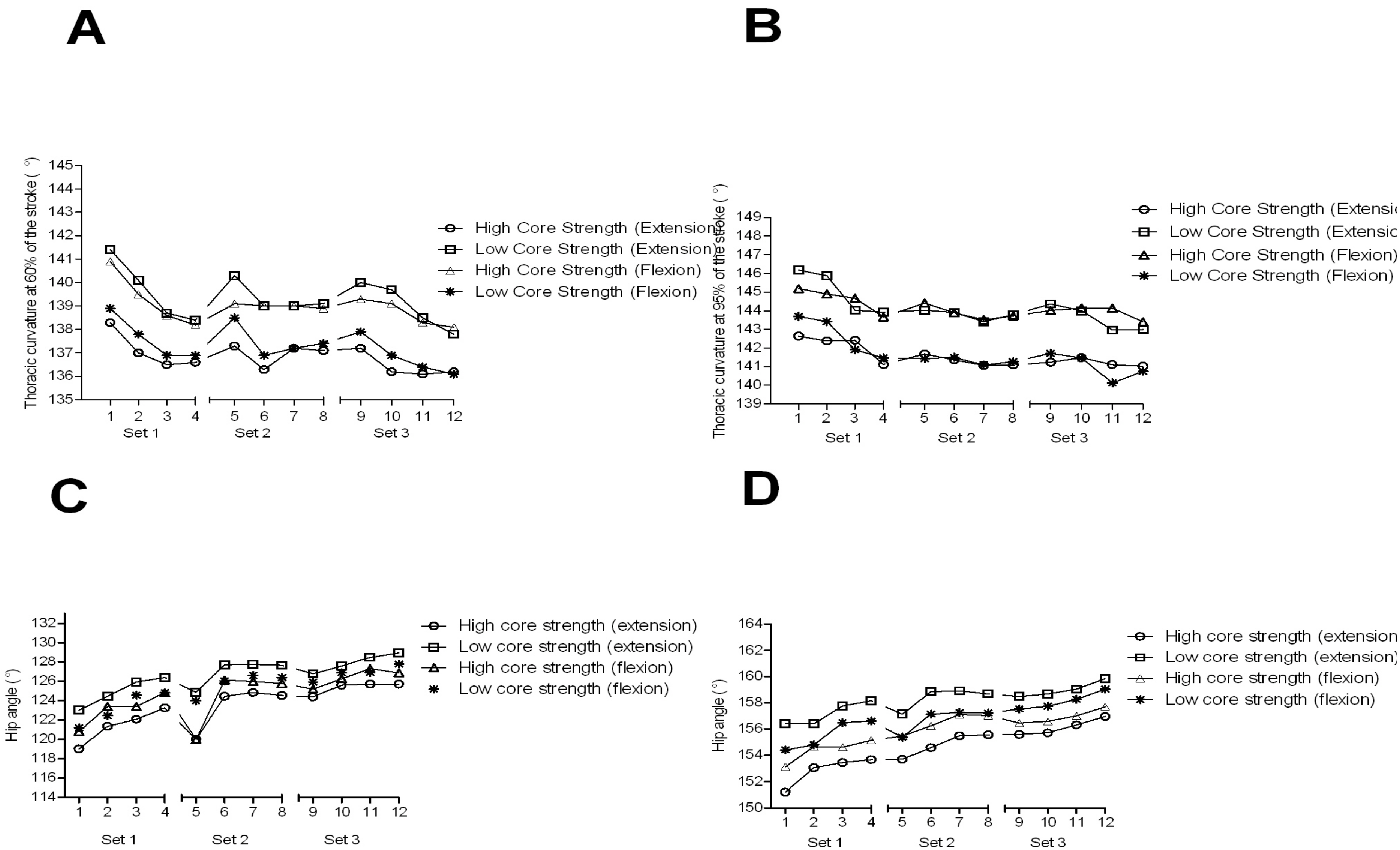
Study 2

	High Core Endurance (n = 20)	*Low Core Endurance (n = 21)*
Age (y)	21.24 (1.07)	21.51 (1.02)
Height (cm)	168.5 (11.9)	170.2 (9.6)
Weight (kg)	58.8 (8.5)*	65.3(9.4)
Abdominal Fatigue (s)	185.2 (43.4)*	143.2 (28.9)
Right side bridge (s)	264.2(96.7)*	147.0 (61.6)
Left side bridge (s)	119.4 (28.0)*	78.0 (26.7)
Back extension (s)	123.7 (22.0)*	99.6 (36.4)
Isometric trunk extension (N)	366.2 (110.5)	366.6 (81.1)
Isometric trunk flexion (N)	191.9 (74.4)	208.9 (77.3)

Thoracic and hip curvature at 60% (Panels A, C) and 95% (Panels B, D) of the stroke cycle by time and group (high vs. low core endurance).



Thoracic and hip curvature at 60% (Panels A, C) and 95% (Panels B, D) of the stroke cycle by time and group (high vs. low core flexor/extensor strength).



Time to peak power at the handle and feet by core strength.

		Time (s) to PP at hands in 11th min	Time (s) to PP at hands in 22nd min	Time (s) to PP at hands in 33rd min	Time (s) to PP at feet in 11th min	Time (s) to PP at feet in 22nd min	Time (s) to PP at feet in 33rd min
Extensor strength	*High*	.46 (.02)	.46(0.02)	.46 (0.02)	.46 (0.7)	.46 (.07)	.46 (.05)
	Low	.47 (.02)	.47 (.02)	.47 (.02)	.47 (.08)	.47 (.07)	.46 (.07)
Flexor strength	*High*	**.41 (.02)**	**.40 (.02)**	**.40 (.03)**	**.42 (.09)**	**.40 (.09)**	**.39 (.10)**
	Low	.46 (.02)	.45 (.02)	.44 (.02)	.46 (.11)	.45 (.10)	.46 (.09)

Key message

Conclusions:

- Both core endurance and strength play a role in postural maintenance during rowing.
- Core strength plays a role in power generation during rowing.

Key Findings

- There is scant evidence of the role of the core in performance.
- Measurement of the core requires well-controlled methods.
- We have shown some evidence that core endurance and strength are relevant to rowing.
- We have shown that core endurance is relevant to posturally demanding non-sporting situations.

Thank you.