Trunk and knee muscular performance of rowers

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Introduction

Training and sports practice result in the development of a specific musculature according to the modality practiced. The purpose of this study was to assess trunk extensor and knee muscular performance of rowers, non-rowing athletes and a non-athletic population.

Population

12 male rowers (mean age 22.8 ± 8.5 years, weight 74.0 ± 7.6 kg, height 181.4 ± 6.0 cm), 12 male non-rowing athletes (mean age 21.4 ± 2.6 years, weight 70.7 ± 6.7 kg, height 179.8 ± 6.4 cm) and 12 healthy sedentary males (mean age 22.6 ± 1.9 years, weight 71.6 ± 7.7 kg, height 177.8 ± 6.0 cm) participated in this investigation.
Rowers and non-rowing athletes exercised respectively a mean of 11,17 (±4,53) and 10,75 (±1,86) hours per week.

Figure 1

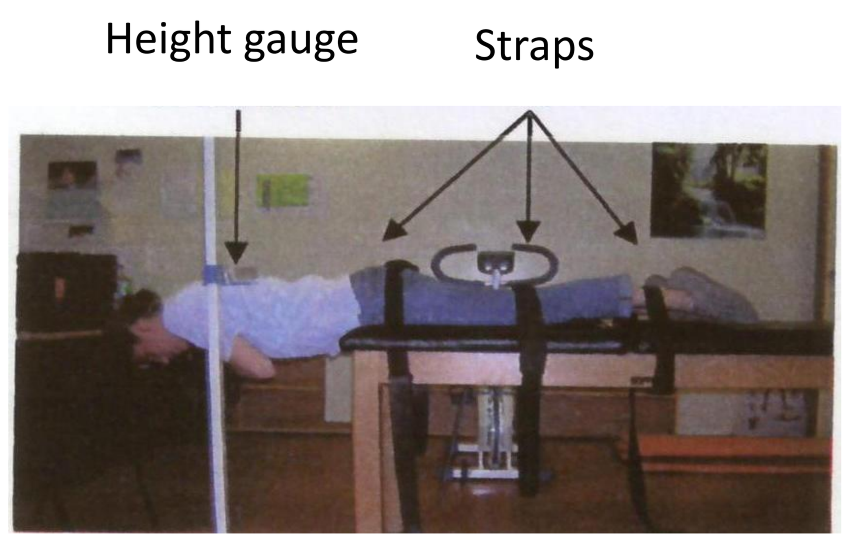

Figure 2

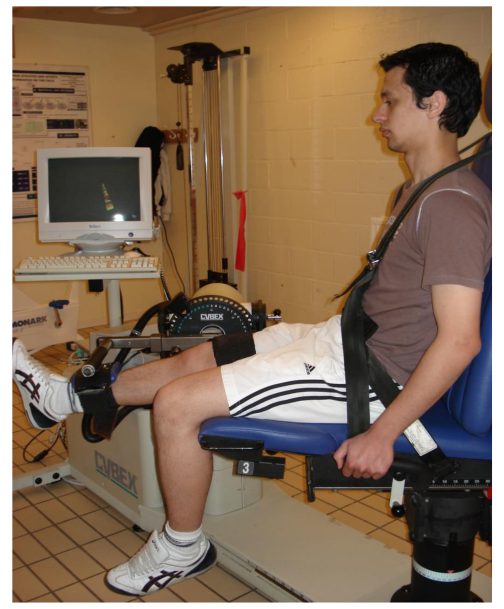

Figure 3

Methods

Trunk extensor performances were assessed by means of a maximum static strength test [maximal voluntary contractions (MVC)] and a dynamic endurance test [performing as much flexion-extension movements as possible using a load corresponding to 40% of MVC test] performed with a specific trunk dynamometer (David International Ltd., Vantaa, Finland). (Figure 1) Moreover, a static endurance test [modified Sorensen test] was also performed. (Figure 2)
Knee flexors and extensors strength peak torques (PT) of the dominant leg were assessed, using a Cybex Norm dynamometer at 60°/s and 240°/s in concentric and 30°/s in eccentric exertions. Muscle fatigue resistance was also measured (30 maximal concentric contractions at 180°/s). (Figure 3)

Results

Regarding trunk muscle performance (Table 1), rowers had significant higher PT than sedentary males (P<.01) and non-rowing athletes (P<.05). By contrast, static and dynamic endurance did not differ between groups. However, during the dynamic endurance test, rowers moved a total load (number of repetitions accomplished x load) significantly higher than control subjects (P<.05).
Regarding knee muscles, rowers had higher extensors concentric PT at 60°/s (P<.05) and flexors total work at 180°/s (P<.05) than sedentary males. In contrast, no difference was shown between groups regarding flexors strength and agonists/antagonists ratios.

Table 1: Trunk extensors performances (Mean (SD))

	Control	Rowers	Non-Rowing
Maximal Strength (N.m)	257 (61)**	382 (84)	299 (93) †
Static endurance test (s)	151 (43)	174 (61)	162 (68)
Dynamic endurance test:			
- Number of repetitions	56 (18)	104 (131)	63 (23)
- Load (kg)	34 (8)**	51 (11)	40 (12) †
- Total load (kg)	1921 (717)*	5509 (7382)	2396 (928)

SD = standard deviation, s = second, * P <.05 between control et rowers, ** P <.01 between control et rowers, † P <.05 between non-rowing athletes and rowers

Discussion & Conclusion

This study showed some difference in trunk and knee extensors strength between rowers and control subjects as well as between rowers and non-rowing athletes. The increased performances of extensor muscles in elite rowers appear to be related to the specificity of this sport. In the drive phase of rowing, rowers sequentially push with the legs and then pull with the arms and lower back, requiring both muscular strength and endurance. However, no difference was shown between groups regarding dynamic and static trunk extensor endurance. Further study is required to clarify if trunk and knee muscle strength and/or endurance are related to rowing performance.