RELATIONSHIP BETWEEN MAXIMUM STRENGTH AND ERGONOMETRIC PERFORMANCE IN SELECTED CHILEAN ROWERS

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ABSTRACT

The aim of this study was to correlate the maximum strength of upper and lower limbs with ergometer performance test in 2000 meters in selected Chilean rowing. The sample consisted of 16 men of 20.37 ± 3.68 years old, 74.71 ± 5.07 and 179.35 kilograms of mass ± 4.15 cms. height called to the squad to participate Remo Chilean American Rowing Championship 2013. To identify the maximum dynamic strength in both lower limbs, as above, we used the test of 1 repetition maximum (1RM) half squat (HS) and horizontal rowing (HR), in terms of performance in ergometer rowing (ER), this was measured by test-specific test in the distance of 2,000 meters. The group presented a mean of 388 ± 9.5 seconds in the test of 2000 meters rowing ergometer, 119.12 ± 22.07 kg. HS raised in 1RM and 89.62 ± 14.24 kg in HR 1RM. The lasting time of exercise testing in 2000 mts. presents a correlation of -0.637 ($p<0.008$) with 1RM HS and -0.791 ($p<0.001$) HR 1RM. The results indicate that the variable maximum force expressed through the 1RM test, could be a predictive factor in rowing ergometer brand of Chilean rowers with high performance.

Key words: maximum strength, performance ergometer, rowing.

INTRODUCTION

Rowing has been for centuries the most common and safest mode of transportation on water, today is a form of sport and entertainment worldwide, considering Olympic sport since 1900 and part of the Olympics since 1908 (FEDEREMO Chile , 2013). In Chile is a sport that has delivered great sporting achievements in South American championships, Odesur Games, Pan American Games, World Championships and Olympics presence.

Considering the increasing scientific breakthrough in regard to sports science, it is necessary to study the profile of high-performance athletes in this context Fernandes Filho et al. (2004) mentions that it is important to evaluate the main physical qualities of the sport, somatotype and genetic characteristics within other options, so we can profile the elite athletes in a specific population, and use them as a reference for other athletes in training.

The rowing boat moves through the application of force and acceleration of body weight in order to mobilize a boat as fast as possible, (Hagerman et al., 2004), which is why the Remo practice, the force plays a fundamental role. The Rowers show excellent levels of isokinetic maximum strength in the lower limbs compared to other elite athletes who work in predominantly aerobic tests (Fredrick, 1984), and this variable performance-related ergonometric features (Niels, 1993) in rowers elite, the 1 repetition maximum test (1RM) leg extension leg press shows a ratio of -0.54 to -0.68, ($p <0.05$) with performance in 2000 m ergonometric rowing in elite rowers (Trent, 2011), on the other hand, lower limbs was recorded a correlation of 0.582 ($p <0.05$) between the maximum force on the upper (Remo Horizontal) and performance in 2000 m ergonometric rowing (Moreira 2009). The aim of this study is to correlate the maximum force performance in selected ergonometric Chilean rowing.

METHODS

The present study is to correlate type, which according to Thomas and Nelson (2007) studied the relationship between two or more variables, and may be used at times to predict performance.

The sample consisted of 16 men of 20.37 ± 3.68 years old, 74.71 ± 5.07 and 179.35 kilograms of mass ± 4.15 cms. Height called to the squad to participate Remo Chilean American Rowing Championship 2013.

To measure the maximum dynamic strength in the lower limbs (MI), we used the test of 1 repetition maximum (1RM) half squat and upper limb (UL) traction arms horizontally. The protocol followed for conducting the test was that of Lopez (2008) which involves making a small specific heat with 3-4 repetitions at an intensity of 50 to 70% of maximum strength, reaching progressively in 3 or 4 attempts the maximum weight the athlete can lift. Ergometric Performance wise, this was measured by test-specific test in the distance of 2,000 meters. on a concept 2 model D ergonometric rowing, preceded by a warm-up consisting of 10 minutes of oxygen through a race at 60-75% of maximum heart rate (MHR), joint mobility 5 minutes, 10 minutes of ergonometric rowing with intensity rise (from 60 to 85% MHR), 5 minute ergonometric rowing high-intensity intervals (10x30 ") and 5 minutes of stretching of short duration (4-6" per muscle group).

RESULTS

Table 1 Descriptive statistics of maximum force and time in 2000 meter ergonometric rowing (sec.)

Descriptive Statistics						
	N	Minimum	Maximum	average		TipicalDesv.
	Statistical	Statistical	Statistical	Statistical	Standard error	Statistical
Ergometric rowing time (seg.)	16	364,00	403,00	388,1250	2,38	9,51
RM MS (kg.)	16	70,30	114,68	89,52	3,56	14,22
RM MI (kg.)	16	89,79	179,58	119,15	5,51	22,02

Table 2 Correlation between maximum force and time in 2000 meter ergonometric rowing (sec.)

	Ergonometric Time (Min.)	**1RM MI (Kg.)**	**1RM MS (Kg.)**
Ergometric Time (Min.)	1	-,637**	-,791**

** Correlation is significant at the 0.01 level (bilateral)

* The correlation is significant at the 0.05 level (bilateral)

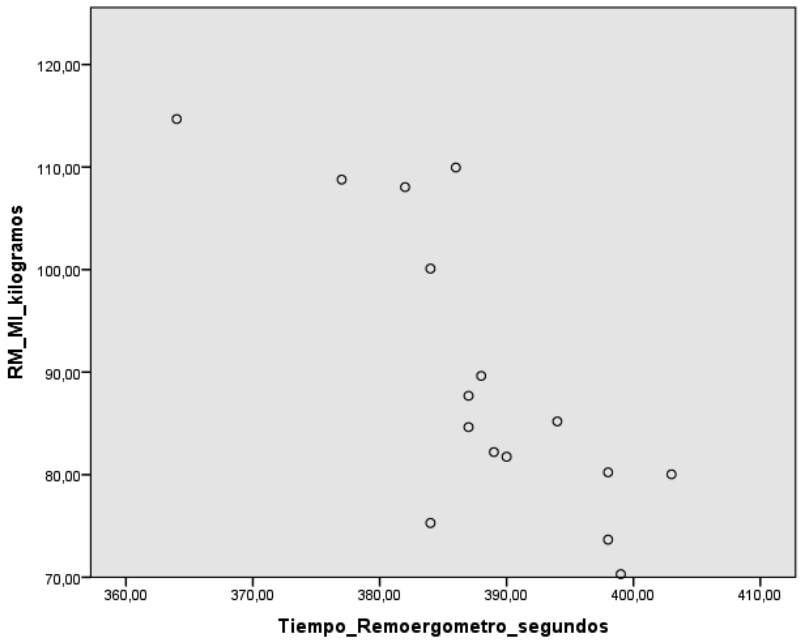

Figure 1
Dispersion Graphic Ratio Maximum Strength (Kg) of lower limbs (MI) with time in 2000 m ergometric rowing (sec.)

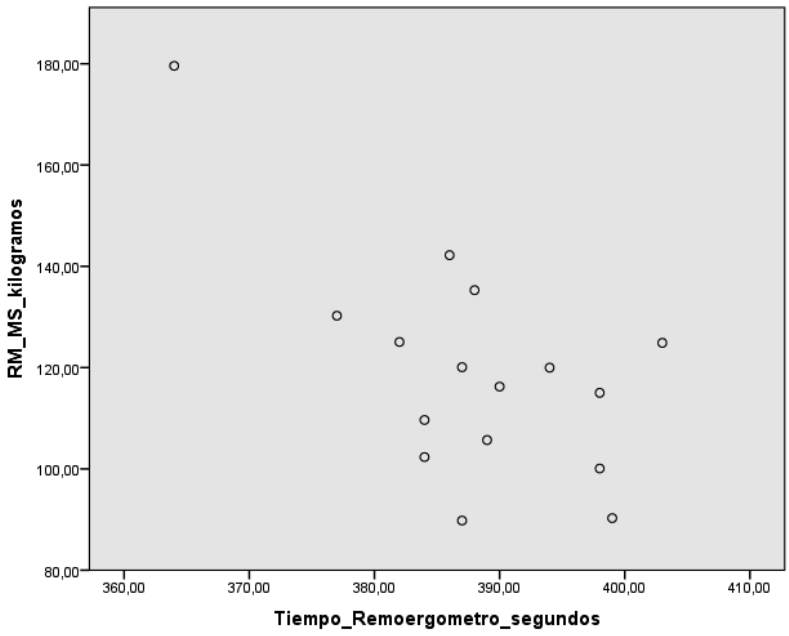

Figure 2
Dispersion graphic ratio relative maximum strength (Kg) of upper limb (UL) over time in 2000 meters ergometric rowing (sec.)

Shown in Table 2 descriptive statistics of study variables observed at the time of 2000 meters ergonometric rowing in an average of 388.13 ± 9.52 seconds, in 1 RM MI an average of 1.59 ± 0.23 MS 1RM and 1.2 ± 0.17. The results in the table show that there is a correlation of -0.637 ($p<0.01$) between time and ergometric 1RM MI, and -0.791 ($p <0.01$) and one ergonometric time RM MS.

DISCUSSION

The data obtained show that there are significant negative correlations between time in 2000 m ergonometric rowing and maximal strength of both upper and lower members (Kramer, Leger et al. 1994), suggesting that performance in 2000 m ergonometric rowing, could be benefited from the increase in the absolute maximum force senior rowers. These results confirm that the higher the maximum force value, the less time in ergonometric rowing (Niels, 1993), marking the half-squat, a correlation coefficient of 0.637 ($p <0.01$) with ergometric performance, similar to that expressed by the press leg extension exercise (Trent, 2011), which ranges from -0.54 to -0.68 ($p <0,05$).

As for upper limbs, the data have a higher correlation coefficient compared to studies conducted in the same year by Moreira (2009), 0.791 ($p <0.01$) versus 0.582 ($p <0.05$) correspondingly (Mikulic, Smoljanovic et al. 2009). In relation to the differences in the correlation coefficients in upper, this situation may be conditioned by biomechanical differences in ergometric test run between the rowers from different countries (Cape Villamil 2009).

The data suggest that the maximum strength of both lower limbs and upper limbs are an ergometric performance predictor, confirming postulates Hueser et al., (2007) and this relationship can be attributed to the benefit that has increased the maximum force

cardiorespiratory capacity in trained athletes (Luque, Castrillón et al. 2009), which charges the Remo highly relevant, considering that this is a sport where performance is largely conditioned by the aerobic capacity of athletes (Leg 2001).

In reference to the important role played rowing ergometric time in the 200 meters, with the specific test rowing 2000 meters, is a high relationship with the classification ergometer performance in late Rowing World Championships (Mikulić, Smoljanovic et al. 2009).

CONCLUSION

The duration of exercise testing in 2000 mts. presents a correlation of -0.637 ($p < 0.01$) and MI 1RM -0.791 ($p < 001$) with MS 1RM. The results indicate that the maximum force relative dynamic could be a predictor of performance in rowing ergometric high performance, may be the increase of the maximum force on an important objective in obtaining shorter time stress test. It suggests further investigate the relationship between maximum force relative to body mass and ergometric performance, maximum strength may relativized muscle mass and / or relating the maximum force specific performance on tests of Remo.

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