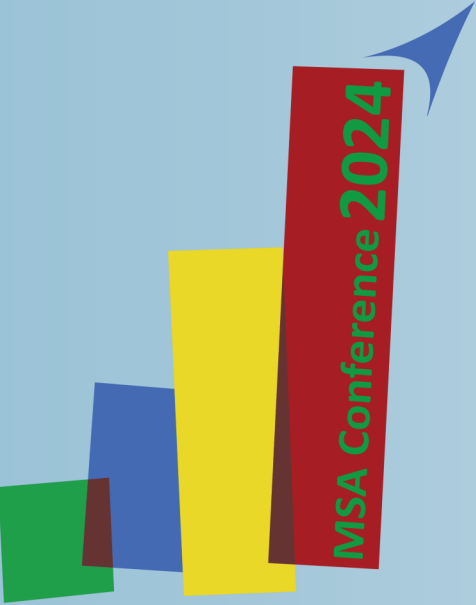




IMPACT OF A SIX-WEEK TRAINING PROGRAM ON ROWERS' MUSCULAR ENDURANCE

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The rowing sport demands exceptional muscular endurance, relative strength, repetitive strength, and aerobic capacity. Work intensity is frequently within the anaerobic threshold.

PURPOSE: The research aimed to assess the effects of a six-week training program on improving rowers' muscular endurance, with a focus on reducing the time needed to complete a standard 2000-meter rowing course on the Concept II rowing ergometer.

METHODS: Overall N=8 nationally ranked juniors (Age 17,4 ±0,33 years; Weight 66,98±12,54 kg) with an average of four years of rowing experience participated in this study. Relative strength and muscular endurance along with VO₂max assessment was conducted using tests of indoor rowing 2000m and 6000m on the Concept II rowing ergometer (Nottingham, UK). Research shows that the ergometer simulates the same bio-mechanical and metabolic rowing as on water. Tests were performed on two separate days with 24h rest intervals in between. The results are shown as a percentage of improvement compared to initial measurements. The 6-week training program has successfully finished with 6 rowers, while two reported illnesses in the fourth week and stopped the training program.

Detailed Training Plan Overview for 6 Weeks

Work week	DAYS					
	TUE	WED	THU	FRI	SAT	SUN
1	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	8km running	10km running
	erg A0 45'	Erg A0+Rmax intervals 4x1500m	Erg 45' A0 + STE 6x10 push-ups, folding razor, jumping jacks, back extensions	Erg 6km A1+A2 + Maximum intensity intervals 8x1min	Erg 30 minutes at A2 intensity + gym 6x12 80% of 1RM pulling, leg press, McKenzie, Russian lunges, bench press, lat pull-down	STE 6x12 push-ups, folding razor, jumping jacks, back extensions, 6x45" plank
2	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	8km running	10km running
	Erg 3x20 minutes A1/A2/A0	Erg A0+AP 4km+4x1000m	Erg A0+A1 Intervals 3x (8x 1/1.5') + STE 6x10 push-ups, folding razor, jumping jacks, back extensions	Erg A0 + A1 + STE 6x12 push-ups, folding razor, jumping jacks, back extensions, high jumps 6x45" plank	Erg 30 minutes at A2 intensity + gym 6x12 at 80% of 1RM max pulling, leg press, McKenzie, Russian lunges, bench press, lat pull-down	Erg A0+AP interval 4x 10/10 10/20 10/30 10/40 at 95% of Pmax
3	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	8km running	10km running
	Erg 50' A0	Erg A0 + A2 3x20'	Erg 12km at A1 intensity + STE 6x10 push-ups, folding razor, jumping jacks, back extensions	Erg 6km at A2 intensity + STE 6x10 push-ups, folding razor, jumping jacks, back extensions	Erg 30 minutes at A2 intensity + gym 6x12 at 80% of 1RM max pulling, leg press, McKenzie, Russian lunges, bench press, lat pull-down	Erg A0+Ap interval 4x 10/10 10/20 10/30 10/40 at 95% Pmax
4	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	8km running	10km running
	Erg 50 minutes at A0 intensity + STE 6x12 push-ups, folding razor, jumping jacks, back extensions, high jumps, 6x45" plank	Erg 9x1500m AP	Erg 12km at A1 intensity + STE 6x10 push-ups, folding razor, jumping jacks, back extensions	Erg AP 4x4000m with acceleration exercises 250/750/500m	Erg 30 minutes at A2 intensity + gym 6x12 at 80% of 1RM max: pulling, leg press, McKenzie, Russian lunges, bench press, lat pull-down	Erg A0+An1 interval 6x 10/10 10/20 10/30 10/40 10/50 at 95% Pmax
5	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	8km running	10km running
	Erg 60' A1	Erg A2+AP 4000m +6x1500m	Rmax/A2 intervals 3x (8x1'/1') + STE 6x10 push-ups, folding razor, jumping jacks, back extensions	Erg 6km at A2 intensity + STE 6x10 push-ups, folding razor, jumping jacks, back extensions	Erg 30 mi at A2 intensity + gym 6x12 at 80% of 1RM max: pulling, leg press, McKenzie, Russian lunges, bench press, lat pull-down	Erg A0+An1 interval 6x 10/10 10/20 10/30 10/40 10/50 at 95% of Pmax
6	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	Running 30', 10' of active stretching	8km running	10km running
	Erg 60' A1	Erg 4km A0, 6x1500m 1-2 A2, 3-4 AP, 5-6 An2 250/2' P/750/2' P/500m	Erg 4km at A0 intensity + Rmax 3x(8x 1'/1') + STE 6x10 push-ups, folding razor, jumping jacks, back extensions	Erg 70' A1	Erg 45 minutes at A2 intensity + gym 6x12 at 80% of 1RM max: pulling, leg press, McKenzie, Russian lunges, bench press, lat pull-down	Erg A0 70'

Note: Mondays are rest days.
LEGEND: Erg - Ergometer; P - Rest; n'/m` - slow/fast'; SPM - strokes/min; A0- 16 – 18SPM; A1- 18 – 20 SPM; A2 - 20 – 24SPM AP –24-28SPM; An1—26-30SPM; An2—28-34SPM; AP—34+SPM; gym / STE— Strength training exercises

Exercise on ergometer

Strength training exercises



Workload Zones (Ilić, 2019)

Zones	Duration	Strokes /min SPM	Heart rate	Rest (h)	Characteristics	Lactate (mmol)
A0	90' – 120'	16 – 18	130 – 140	8	Developmental character, throughout the entire year, goal: technique development	<2
A1	50' – 80'	18 – 20	140 – 150	24	Strength development, throughout the entire year;	2
A2	40' – 60'	20 – 24	150 – 170	48	Maximum strength development, throughout the entire year;	3
AP	30' – 40'	24 – 28	170 – 185	72	Adaptation to high demands, pre-competition period;	4-6
An1	20' – 30'	26 – 30	180+	72	Anaerobic glycolytic work, pre-competition and competition period;	6
An2	12' – 20'	28 – 34	180+	72	Anaerobic glycolytic work, pre-competition and competition period;	8
R, Rmax	6' – 12'	34+	max	72	Glycolytic work regime, competition period;	max

RESULTS: The training program individually improved muscular endurance, with maximum power outputs increasing in range from 3,64% to 6.95% (at 2000m) and 3,64% - 15.19% (at 6000m), relative strength from 2,23% to 6.29% (at 2000m) and 3,42% - 16.55% (at 6000m). The VO₂max value increased in range from 2,01% - 13,43%, measured only at 2000m.

Table of progress on 2000m

No	Rower	Gen.	Progress			
			T - Time	Watt	W/kg	VO ₂ max
1	ROW1	M	<u>2,14%</u>	6,95%	5,12%	1,53%
2	ROW2	F	<u>1,28%</u>	3,89%	5,12%	6,91%
3	ROW3	M	<u>1,52%</u>	4,57%	6,29%	7,47%
4	ROW4	M	<u>1,14%</u>	3,64%	2,23%	2,01%
5	ROW5	M	<u>-0,49%</u>	-1,37%	-3,25%	-4,03%
6	ROW6	F	<u>1,92%</u>	5,88%	3,80%	13,43%

DISCUSSION: The aim of the program was to reduce the time required for standard corse rowing on a 2000m on ergometer. From the total number of participants, 5 of them achieved that goal, two did not finish the program due to illness, and one of the participants did not complete the program entirely he only attended 34% of all the training sessions. These results are in line with several other foundings (Quidel-Catrilelbún et al., 2024; Pérez-Castilla et al., 2023).

These findings highlight the positive effects of a carefully planned and individualized six-week training program on rowers' muscular endurance, relative strength, and aerobic capacity of individual rowers.

CONCLUSION: This testing methodology can provide practitioners and coaches with a simpler and more precise alternative to comprehensively assess a rower's maximal performance profiles. By utilizing this approach, they can gain deeper insights into the athlete's abilities and tailor training programs more effectively to enhance overall athletic development.

Refrences:

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