The effectiveness of using a rowing machine for developing aerobic capacity and technical skills in rowing

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Abstract

Due to the progress in the scientific field and the methods of training based on the scientific basis and the exploitation of all potentials in the athletic body in the second half of the twentieth century, the rowing sport has been able to make a huge leap and reach higher levels of performance.

Recently, specialists have been working on developing and upgrading the athletic individual to reach the highest levels, which requires the early knowledge of the rower's physical fitness quality through the use of scientific methods in order to highlight and direct those capacities and tendencies constituent aspects of personal, physical, development, refinement and progress towards the outstanding results.

It is therefore necessary for workers in the field of rowing and physical fitness to acquire awareness and the conditions and methods of evaluation in assessing the abilities and preparations of each junior / youth objectively and directing all these capacities to the specific goal of achieving achievement at the international and global levels.

Introduction

In this respect, Sorour (2001) emphasized that the circulatory and the respiratory system are the basic components of the elements of fitness and that the cyclic endurance element is the basis for achieving any other element of fitness and indicates that the exercise of sports of all kinds requires the acquisition of these elements to varying degrees, However, it is not possible to perform any activity without the functioning of the circulatory and the respiratory system (3 : 77)

In the sport of rowing, most rowing competitions run for 2000 meters with a competition time ranging from 5 minutes and 30 seconds to 8 minutes, such sport with such a time of competing, competition and physical requirements, where the rower who can withstand the highest average speed during the race on top the list of results, to define the sport of rowing in the end as a sport endurance.

Physical requirements and competitive time for any rowing race makes the relative contribution of aerobic and anaerobic energy consumption during the competition will be in the range of about 80% of the aerobic and about 20% of the anaerobic.

In a 1000 meter competition, the distribution will be about 60% of the aerobic and about 40% of the anaerobic. In long distance races (6 -10 km), the contribution of aerobic consumption will reach 90%. (6 :31)

Rowing is a strength-endurance type of sport and competition performance depends on factors such as aerobic and anaerobic power, physical power, rowing technique and tactics. Therefore, a rower has to develop several capacities in order to be successful and a valid testing battery of a rower has to include parameters that are highly related to rowing performance. Endurance training is the mainstay in rowing.

A rower depends mainly on his or her aerobic metabolism because energy stores and glycolysis are limited to cover the energy demand only for approximately 1.5-2.0 minutes.""! Aerobic power can be defined as the maximal oxygen consumption (VO2mx)".

Many factors affect physical performance during rowing. Power depends on aerobic and

anaerobic energy supplies balanced by efficiency or technique. Efficiency is expressed as the relationship between energy expenditure and boat velocity and it depends on the technical skill of the rower.

Effective Exercise The American College of Sports Medicine makes the following recommendations for the quality and quantity of training for developing and maintaining cardio-respiratory fitness in healthy adults:

- The activity should be one that uses large muscle groups, is maintained continuously and is rhythmical or aerobic in nature.
- The duration should be from 20 to 60 minutes, of continuous activity.
- Training should be regular; three to five times a week.
- The intensity of training should raise the heart rate to 60 to 85% of maximum heart rate (MHR).
- Strength training of moderate intensity should be added twice a week. (4 : 1.02)

Technique

The definition of technique is "The skill required for the mastery of a task". Identifying the task is simple with indoor rowing because the task is to cover a given distance in the shortest time. This doesn't mean that the people who produce the best times on the rowing machine have the best technique. Good technique has to account for efficiency measured by the performance when compared to the potential capacity of the athlete. So good technique on the Indoor Rower is the ability to convert potential into performance. Developing good technique is carried out in three phases. The first phase is to develop the motor skills to master the sequence of movements, this is the cognitive phase of learning. Muscles respond to electrical impulses from the brain carried via the nervous system. Repeating a movement establishes a strong neurological pathway, which carries these tiny impulses. Breaking the rowing stroke down into its component parts and carrying out each segment slowly until it is mastered is the best method of establishing this pathway. This is followed by joining the segments together, gradually building up to the full stroke cycle. During the development of motor skills there is no consideration to load; this comes next and is known as the functional stage. Here the muscles become familiar with the load, range and speed that they are required to work at and how it relates to other working muscles. The final phase is the autonomous phase and here the muscles know their role with respect to the outcome task and movements become automatic. (4 : 2.02)

When people arrive at this stage, they think that this is all the work they need to do on technique, technique and not just fitness must be continually developed in order to realize your full potential. Technique is converting potential into performance, as you continue to train your capacity increases and the emphasis of technique is to carry this increase in physical capacity over into faster times. The focus has now changed from the body position to the output display on the monitor.

Physical development will require hours of training, sweat and pain. Through technique you produce a result.

Check that the trunk is held firm so that the power developed on the footplate is transferred directly to the handle right through the Drive phase. Often rowers transfer stability from the trunk to the legs and use the trunk to supply power. This can go almost unnoticed at low intensity work but is very inefficient. Although the upper body is responsible for over 50% of the stroke length the legs are responsible for 70% of the total power. This is because the load is at its greatest at the beginning of the stroke and decays to the finish. Good technique matches up the most powerful muscle groups in the legs to the greatest load and the faster muscles in the arms to

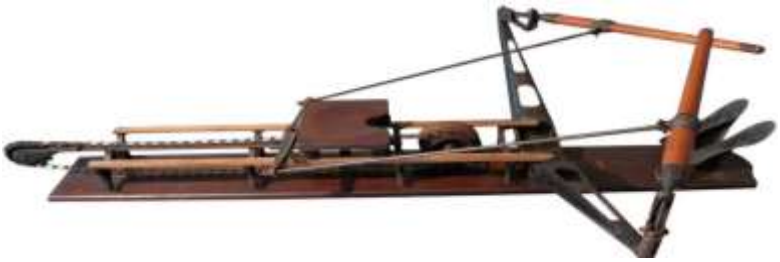
the lighter but faster Finish. (4 : 2.03)

Rowing machine

An indoor rower, or rowing machine, is a machine used to simulate the action of watercraft rowing for the purpose of exercise or training for rowing. Indoor rowing has become established as a sport in its own right. The term "indoor rower" also refers to a participant in this sport.

For long time ago start the need of a rowing machine (Figure 1)

EARLY ROWING MACHINE, It was very simple, early exercise rowing machine with wood base and iron hardware. Two outstretched iron arms (riggers) with oarlocks that hold wooden oar handles. Thick square link chain attached to iron wheel mechanism, wood seat on rollers, and shaped iron footrests.



(**Figure 1**)

Early rowing machine

A merged exercise machine between horseback riding and rowing has shown up in the 1940s (Figure 2)

The rowing machines have been established to train inexperienced and beginners oarsmen technique and timing before they go on boats.

Modern indoor rowers are often known as ergometers (colloquially erg or ergo), an ergometer being a device which measures the amount of work performed. The indoor rower is calibrated to measure the amount of energy the rower is using through their use of the equipment. Typically the display of the ergometer will show the time it takes to row 500m at each strokes power, also called split rate, or split.

For exercise, one advantage of a rower compared to other types of machines is the high count of muscles worked on, and the monitor has given the truly rise to the rowing machine / ergometer blooming

(**Figure 2**)

Riding and Rowing machine in one

Methods

Participants

Seven Norwegian junior A (16-18 years) rowers on a high level participated in the study.

Procedures

The junior rowers were tested on a 5000m and 2000m in week 44 - 2016 and retested on the same two tests in week 2- 2017.

Week 44 (31.Oct – 5.Nov)

Week 2 (08.Jan – 14.Jan)

Total research length was 75 days.

Descriptions of Tests

1. 5000 meters test: This type of test is considered to be one of the measurement of the rowers endurance capacity, and its objective is to measure the maximal performance on the distance based on rowing time observations. Some trainers prefer to calculate the average time observed in every 1000 meters, if it is possible. It is also not obligatory for the examiner to stabilize the average during the test. It is recommended that this test should be performed at a relatively constant speed. The speed of the stroke count in the test is 24 - 28. It is allowed to perform this test with juniors and up to master rowers.
2. 2000 meters test: This type of test is a measurement of speed and capacity, 20% anaerobic and 80% aerobic. The goal of this test is to measure the maximum performance in the distance of 2000 m, which is the distance of international, world and Olympic races.

Performed training

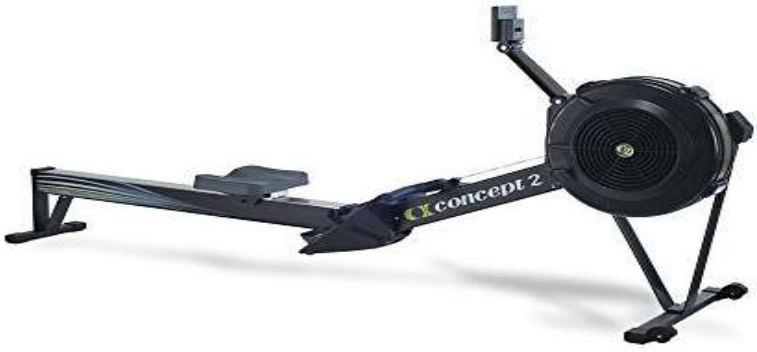
The junior rowers trained 10 times a week (20-25 hours a week) in the period from week 44-2016 to week 2 – 2017. The training performed was mostly long distance training on the rowing machine and cross-country skiing. The strength training were performed twice a week with many series and repetitions on 60-70% of 1RM.

Instruments

To test the rowers performance on 5000m and 2000m we used Concept2 Model D w PM5 (figure 3).

C2 the model A introduced in 1981, and the model B came out in 1984 and its little digital monitor PM1 (Performance Monitor 1), the difference between these two models is the loud, and the plastic fins attached to the wheel's spoke for resistance had a tendency to get launched during a piece, model B was smoother and safer too with the wheel now enclosed in a cage.

The C2 model C was unveiled in 1994 with more changes later models were D (2003) and E (2006).



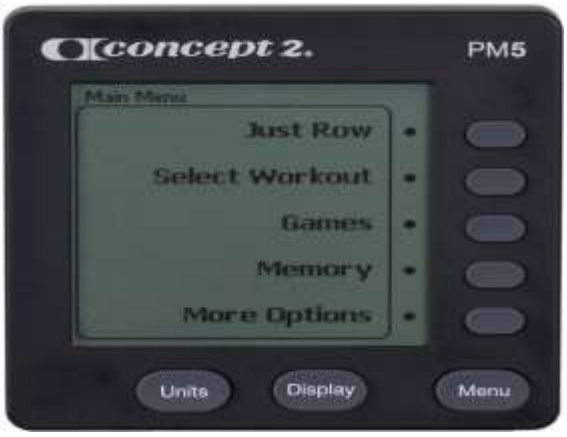
(Figure 3)
Updated concept2 rowing machine with PM5

The PM5 is another leap forward in what a performance monitor can do. Track distance, speed, pace, calories burned, and watts—all presented on a clear, backlit display.

Connects to wireless heart rate monitors and via bluetooth to the optional Erg-data App to track detailed workout data. The monitor itself can be custom positioned using the adjustable monitor arm. USB flash drive compatible and built for machine-to-machine racing. (Figure2)

To adjust how much air enters the flywheel housing on each stroke, the Model D Rower includes a unique spiral damper that you can adjust from a setting of 1 to 10.

This functions much like the gears on a bike, affecting how much energy will be needed to accelerate from one stroke to the next.



(Figure 4)
Performance monitor 5

Results

Table 1 show the result from the 5000m and 2000m testing of the junior A rowers in week 44 – 2016 and week 2 2017. The main finding was the result development.

Table (1)

Time results of the testing of the junior A rowers in week 44 – 2016 and week 2 in 2017.

		Juniors (A) (BOY)	Time 5000m		Time 2000m		Weight Kg	Length Cm
N	Year	NAME	Uke 44 - 2016	Uke 2 - 2017	Uke 44	Uke 2		
1	1999	N.Y.B.	16,44,1	16,53,7	6,18,8	6,14,9	92kg	191cm
2	1999	Jaime Aalders	17,39,1	17,26,5	6,39,6	6,34	78kg	184cm
3	2000	Gjerland, Oskar	18,26,4	17,55	6,54	6,44,7	80kg	193cm
4	2000	Sam Lorgen	18,41,2	18,33,8	6,55,9	6,55,9	88kg	188cm
5	2000	Petter Bratli	19,15,9	19,26,2	7,06,1	7,20,7	80kg	180cm
6	2000	Lars Moberg Værnes	19,17,4	19,08,7	7,01	7,17,7	72kg	182cm
7	1999	Hermann Hovde	19,37,1	19,15,7	7,22,1	7,21,1	70kg	175cm

Discussion

5000 meters test: Some trainers prefer to calculate the average time observed in every 1000 meters, if it is possible. It is recommended that this test should be performed at a relatively constant speed. The speed of the stroke count in the test is 24 - 28. It is allowed to perform this test with juniors and up to master rowers.

2000m test: This test is used to improve performance and results on the distance, and the test is performed for all ages participating in rowing. The average speed of the strokes in a minute of this test is 30-34.

The researcher finds from the results that the statistical averages obtained by the Norwegian rowers in the 5000 m came better out on both attempts.

Moreover, the average performance obtained by the Norwegian athletes in the 5000 m is better in both attempts. This indicates that there are differences in the capacity level. The researcher refers this to the quality of the training program performed by the Norwegian athletes and their trainers adopt of the latest methods of physical training loads based on scientific knowledge, and the use of programs that have modern equipment in rowing as well as the regularity in attendance to training.

The researcher finds that the results of the average performance obtained by the Norwegian athletes in 2000 m test is better in both attempts.

The researcher refers to the quality of training performed by Norwegian athletes and the adoption of the latest scientific based training programs and adaptation of greater training loads in the field of rowing. The use of modern equipment in the field of measurement and assessment of rowing as well as the regularity in attendance to training may also influence the test results.

Conclusion.

The researcher refers to the quality of training performed by Norwegian athletes and the adoption of the latest scientific based training programs and adaptation of greater training loads in the field of rowing. The use of modern equipment in the field of measurement and assessment of rowing as well as the regularity in attendance to training may also influence the test results. A high quality sports friction in competitions and competing in a high level among European countries is another point that gives the challenge which makes the need of creativity in the trainers to upgrade all aspects of training very fast.

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