Comparison of Three Tests for Assessing the Aerobic Aptitude to the Elite Swimmers

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Abstract

We have made a study on a sample of 15 swimmers, from the national team of Tunisia, of different age groups, 9 boys and 6 girls, in order to compare three tests of aerobic skills assessment. We chose VAMEVAL test, then we compared with the 2000m and 400m tests, two tests used internationally for estimating VAM. We have noticed that the speed of the 2000m test is not significant compared to VAMEVAL test, while for the 400m test it is significantly correlated with VAM for girls but not for boys. We have also noticed that there are significant differences between girls and boys when speaking of biomechanical parameters that are necessary to assess technical efficiency swimmers during the three tests.

1. Introduction

In order to reach performance in sport, planning and programming will give an overview on implementation, will optimize results (intermediate and final) taking into account the effects of training cycles, progress over time depending on the age and level of the athlete, and alternating periods of work and regeneration (overcompensation) to avoid the risk of under and over training.

The relationship between the amount of training and performance is often determined empirically from simplified criteria such as the number of training hours, the number of kilometers traveled in sessions or by the

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relative intensity of the sessions or performed exercises, which is directly related to the maximum oxygen consumption, but is not enough to obtain high level performance.

The quantification of the training load has long been made empirically by referring to the competition performance. In recent years, tests to assess maximal aerobic speed have been established. These tests have been validated but often require technical expertise and assessment tools that coaches do not have at their disposal. It is for all these reasons we conducted a comparison test reference for the evaluation of the maximum aerobic speed (VAM) the VAMEVAL, a rectangular 2000m test used by the Tunisian national team and 400m test used by our national team.

We will compare the maximum or average speeds reached, distance per cycle and the index of households observed at each test.

2. Goal

Our goal is to look for a validated test available for the coach that would indicate the different parameters in order to monitor training costs, and facilitate the task of the trainer and deduct the training areas.

2.1. Hypothesis

We assume that one of two tests can give very similar results to the VAMEVAL values. The aim is to offer the coach an alternative to VAMEVAL test under scientific conditions that is to say, with differences both in terms of the speed and of technical efficiency below 5%.

In this context, we try at first to define the concept VAMEVAL, then we will take a second time on the tests used in swimming, we will see which test is more reliable in predicting a speed close to the VAMEVAL in training by comparing speeds with the various tests and the test we considered the benchmark VAMEVAL.

3. Materials and methods

3.1. Subjects

Our subjects group consists of seventeen swimmers belonging to the Tunisian National Team swimming, 9 males and 6 females (Table 1). The protocol was submitted to the medical commission of the Tunisian Swimming Federation and after written and informed consent of all subjects, the Committee has agreed to the implementation of our protocol.

All subjects performed all selected tests in the training of the national swimming team at the Rades Olympic Basin (50 meters) swimming sessions. Our testing began February 6, 2009 and ended on 20 March 2009. All sessions took place in the afternoon.

Table 1: Characteristics of the study subjects.

|               | Girls  | Boys  |
|---------------|--------|-------|
| Number        | 6      | 9     |
| Age           | 15±3   | 16±3  |
| Weight        | 62,3±6,4 | 73,5±5,5 |
| Height        | 166,7±7,2 | 179,6±5,8 |
|                         | 2000m (Boys) | 2000m (Girls) |
|-------------------------|--------------|---------------|
| %fat                    | 24.7±2.2     | 13.61±4.3     |
| Years of training       | 6±3          | 5±3           |
| % of performance /world  | 77.5±4.6     | 82.4±3.1      |

3.2. Tests

3.2.1 VAMEVAL (according to Cazorla, 1984, 1991)

Progressive swimming test without stopping at one minute increments to determine the maximum speed reached the maximum oxygen consumption or VO2max. The event is gradual and without judgment, it may be swum in crawl or breaststroke. The increase in speed is 0.05 ms⁻¹ every minute. Depending on the level of swimmer speed first level is set at 0.9, 1, or 1.1ms⁻¹. The total duration of the test must be between 12 and 15 minutes.

The swimmer must be stopped when he can no longer follow the imposed speed and the delay reaches 1 meter. This is the final level which is fully realized and registered.

3.2.2 400m test

The 400m test was performed with the same equipment (cardio-frequency meter and meter rates) or was measured at each 50m rates and transit times also.

3.4.2.3 2000m test

The 2000m was analyzed in the same way.

Note: All tests were started by a start in the water as the reference test.

4. Measures

Various parameters were the subject of our research and they were assessed as follows:

- Speed = distance / performance.
- Frequency = number of cycles per unit time (clock frequency).
- Distance = distance traveled per cycle at a cycle of arms.

Taking into account non-swim parts and departure, statistical analysis shows a significant difference between girls and boys in speeds over the two tests (VAMEVAL, 2000m) (according to Orwoll et al., 1989).

In the 400m there is no significance between girls and boys and it confirms our hypothesis. We can thus conclude that the greater the distance the greater the significance increases between the two sexes.

Several reasons may explain these differences (anatomical, physiological, bioenergy).

Table 2: comparison between the speeds of three different tests and the difference between girls and boys.
4. Discussion

It is thus noted that the speed of 2000 m is not significant to deduce the VAMEVAL in the interpretation of results and we confirm the idea of Phillipart (2005) when he said "The time Support the VAMEVAL is estimated between 4 and 9 minutes depending on the individual"

The results show, first, that, on average and in line with the previous work, test Lavoie and Montpetit (1986), 400m speed is significantly correlated with VAMEVAL. This observation we record for girls and not for boys. This observation can be explained by the fact that girls have lower VAMEVAL than boys and therefore 6 minutes approach described in the literature as the time limit.

From technical point of view and swimming efficiency we can talk about the index swimming, by referring to our results we see that the index is larger for males than for females. This finding is generally of a physical ability and is certainly related with distances specialty swimmers and there are used different coordination (sprinters: beats 6-time swimmers background: 2 beats time) setting characteristics related spatial time with the energy aspects. This hypothesis is corroborated by the work of Deschodt (1996).

This study shows the need to develop an assessment of speed and technical efficiency, but also to take into account the effectiveness of swimming throughout the swimmer training process.

The values obtained in our work show that each test has a clear indication of the maximum aerobic speed.

5. Conclusion

Through the 400 test we can give very similar values (5%) of the data speaks VAMEVAL with cheaper conditions which could be accomplished by all coaches.

It therefore appears that the maximal aerobic speed depends on a key parameter for quantifying training load. VAM is measured by field tests but require a relatively high-tech and knowledge to be used widely in all clubs.

Use performance 400m to estimate VAM appears to be correct for girls and lesser for boys, depending on their level of performance: the more efficient he is the less effective the test is to refer to the speed of 400m to estimate its VAM. However, the use of performance 400m seems more logical than the 100m which is often used by coaches and better than the empiricism very present in our pools.

Technical efficiency indicator is the index of swimming and it remains a very reliable factor for improving the performance of the swimmer.

It is for the coaches the opportunity to determine the VAMEVAL for their swimmers through various tests, but it is clear that much remains to empiricism in the methods used. The notion of support time and VAMEVAL is apparently never addressed. This data was introduced by Billat (2003), in the course training runners to allow customization of training by taking into account the characteristics of the athlete and is profoundly changing the designs in walk. It seems that the world of swimming is so far impervious to this approach, however, is an interesting line of research training material.

| Gender | VAMEVAL Speed | 2000m Speed | 400m Speed |
|--------|--------------|-------------|------------|
| Girls  | 1,175*       | 1,3698      | 1,172*     |
| Boys   | 1,288*       | 1,472       | 1,336*     |

* Significant difference between girls and boys
References

Billat, V., (2003). Physiologie et méthodologie de l’entraînement de la théorie à la pratique, De Boeck Université

Cazorla, G. (1984). Human immunodeficiency virus type 1 subtypes in cohort of infected patients, France: Saint-Etienne.

Cazorla, G. (1991). Echocardiographic assessment of myocardial performance after prolonged strenuous exercise. J, Sport Science 6: 93-101

Deschodt, V. (1996). Paramètres cinématiques et niveau de performance en crawl, thèse de l’université de Lyon

Lavoie, J.M., & Montpetit, R.R., (1986). Applied physiology of swimming, Sports Med. 3(3):165-89.

Orwoll ES, Ferar J, Oviatt SK, McClung MR, & Huntington K. (1989). The relationship of swimming exercise to bone mass in men and women. Sports Med. 149(10):2197-200.

Philipart, F., (2005) - The VMA Swimming - April 2005