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BOOK OF ABSTRACTS

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The technological approach of conditioning gymnasts is based on the following principles: algorithm of the methods aimed at effective achievement of the goal; minimization and optimization of the aids and means of training; selection and usage of training means adequate to individual gymnasts' conditions and those of sport facilities.
Discussion: The final comparison of the young gymnasts test group results with the high qualification gymnasts' data showed less significant differences between them. It certifies that the young gymnasts' main exercise technique performance changed to be closer to the model one. In addition, the test group results' dynamics was considerable and there were some significant differences between the initial and final results of the main exercise technique performance.
This research certifies that usage of the additional instrumental methods of gymnastic exercise performance evaluation allows to reveal performance errors more precisely. It will promote the efficiency of the training process.

A COMPARISON OF GROUND AND TREADMILL ENERGY COST OF RACE WALKING

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Purpose: A prerequisite in the development of a multistage field test is the knowledge of the energy cost of the specific mode of locomotion. There are only few data available about race walking, and most of them have been measured on a treadmill. Therefore, the aim of this study was to compare ground and treadmill energy cost of race walking with the purpose of determining the incrementation rate of a specific multistage field test.
Methods: Six highly trained race walkers of national to international calibre gave their written informed consent to participate in the study. They completed two randomly ordered sessions separated by at least 24 h, one on a 200 m indoor synthetic track, one a laboratory motorized treadmill. The protocol consisted in walking with proper technique at 8, 10, 12 and 14 km.h-1 for 4 minutes without rest in between. Thereafter, speed was incremented by 0.5 km.h-1 every minute until exhaustion to determine peak oxygen consumption. Oxygen uptake and related gas exchange measures were determined continuously on a 30 s basis using an automated cardiopulmonary exercise system (K4b2, Cosmed, Italy).
Results: Mean was 64.5 ± 10.3 ml.min-1.kg-1 and was reached at 14.7 ± 0.8 km.h-1. Combining data of all participants resulted in almost identical -speed relationships between track (y = 4.90x – 7.10, R2 = 0.53) and treadmill race walking (y = 4.85x – 6.74, R2 = 0.72). There was a high interindividual variability, as evidenced by a large standard error of estimate (SEE; 9.3 and 7.6 ml.min-1.kg-1 for track and treadmill race walking, respectively), and by the ~ 30 ml.min-1.kg-1 difference between less and more economical race walkers at 14 km.h-1. Interestingly, we observed a significant relationship between economy of walking at 14 km.h-1 and (r = 0.68, p<0.05). In this small sample of athletes, less economical race walkers compensated their lack of efficiency by higher . The visual inspection of individual curves confirmed the validity of using a linear model. The average energy cost of race walking estimated from such a model increased by 5 ml.min-1.kg-1 per km.h-1, either on the track or the treadmill. In comparison, the average energy cost of running is 3.5 ml.min-1.kg-1per km h-1. (X1 in ml kg-1 min-1) and walking economy (X2, at 14 km h-1 during the track test in ml kg-1 min-1) explained 92% of the variability of the maximal speed attained during the treadmill test (Y = 15.089 + 0.073 X1 - 0.07862 X2, R2 = 0.84 SEE = 0.39 km h-1).
Conclusion: Despite a high interindividual variability, our results underscore the usefulness of developing a specific multistage field test for race walking. Considering that optimal incrementation should allow an increase in of ~ 3.5 ml.min-1.kg-1 every two minutes, a speed incrementation of 0.5 to 0.75 km.h-1 every two minutes appears to be more specific to race walking than the 1 km.h-1 every two minutes incrementation that is usually used in running.

OPTIMAL ELECTRODES SETTING FOR TRANSCUTANEOUS ELECTRICAL STIMULATION OF THE QUADRICEPS

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Introduction: Treatment or training sessions with neuromuscular electrical stimulations (NMES) are generally performed in a transcutaneous manner with the aid of surface electrodes. Several investigators have highlighted the benefits of quadriceps stimulation during rehabilitation following traumatic injury or surgery of the knee and during physical preparation of athletes (Kramer and Mendryyk, 1982). However, the practical modalities of quadriceps stimulation (number, size and localization of electrodes) remain controversial (Vanderthommen and Duchateau, 2007). The present work aimed to determine the optimal electrodes setting for NMES applied to the quadriceps.
Methods: Twenty physically active men (23 ± 2 years, 180 ± 8 cm, 75 ± 12 Kg) underwent first an evaluation of left quadriceps maximal isometric voluntary torque (QMIVT). The exact localization of the motor points of vastus medialis (MPVM) and vastus lateralis (MPVL) was also determined. Then, we tested unilaterally, isometrically and consecutively five electrodes settings (ES) including rectangular (10 x 5 cm) (RE) or square (5 x 5 cm) (SE) electrodes, with identical stimulation parameters (biphasic symmetric rectangular pulses, 80 Hz, pulse duration 0.35 ms, constant current intensity (42 ± 11 mA)): ES1= 1 channel, 2 RE transversally on the thigh (with the distal electrode placed on MPVM and MPVL); ES2= 1 channel, 2 RE longitudinally on MPVM and MPVL; ES3= 1 channel, 2 SE on MPVM and MPVL; ES4= 2 channels, 4 SE (with 2 SE placed on MPVM and MPVL); ES5= 2 channels, channel 1= 1 SE on MPVM and 1 RE transversally on the proximal part of the thigh, channel 2= 1 SE on MPVL and 1 RE transversally on the proximal part of the thigh. For each ES we measured the electrostimulated torque.
Results: The mean QMIVT reached 200 ± 51 Nm. The MPVM and MPVL were situated 10 ± 2 cm and 14 ± 3 from the patellar base, respectively. The stimulated contractions reached 9.2 ± 7.4 Nm (4.6% of QMIVT) for ES1, 8 ± 4.8 Nm (4% of QMIVT) for ES2, 15 ± 8.3 Nm (7.5% of QMIVT) for ES3, 16.3 ± 7.7 Nm (8.2% of QMIVT) for ES4 and 40.4 ± 11.3 Nm (20.2% of QMIVT) for ES5 (p<0.05).
Discussion: During NMES programs it appears crucial to use a proper electrode setting ensuring efficient muscle recruitment and therefore optimized training effects. However, physiotherapists and trainers often place electrodes empirically especially for NMES applied to the quadriceps. This study demonstrated the relevance of using two channels for quadriceps NMES and of setting, for each channel, one small "excitative" electrode exactly on the motor point of vastus medialis or lateralis and one bigger "dispersive" electrode transversally on the proximal part of the thigh (in order to close the circuit).
References

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