PREDICTORS OF PERFORMANCE OF THE CLASSICAL CROSS-COUNTRY SKIING SPRINT
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Introduction: Sprint XC skiing was introduced in the mid of the 90s. Interestingly, the theme sprint-skiing is nearly untouched by scientific research up to now. Therefore published investigations are lacking and only a few comments about the sprint can be found. Hence, most knowledge is based on coaches' experience or is adapted from studies in other sports. The specific aims of that project were a) to summarize results of numerous studies for the cross-country skiing sprint, and b) to examine relationships of measured biomechanical and physiologic variables and consequently extract the main predictors of performance for sprint cross country skiing. Methods: 31 XC skiers volunteered in the single studies. The level of performance ranged from national to World-Cup level. All used tests have already been investigated on reliability and validity in separate studies (see references). The majority of the tests were performed using roller skis on a large treadmill. A) For determination of maximal speed in double poling (DP) (grade 1.5°) and diagonal stride (8°), treadmill speed was steadily increased until the athlete was no longer able to handle the speed. B) In the VO2max test inclination was raised gradually every 30s at constant speed. C) Maximal power output and power endurance of the upper body was determined by a rollerboard test. D) DP sprint performance over race distance was measured in a 1000m test on the treadmill (1.5°) using a velocity self control device. Athletes had to perform the 1000m with maximal possible speed from the beginning to calculate a fatigue index. E) A classical sprint competition was simulated on the treadmill, using the profile of the WC in Stockholm. Athletes passed through 3 sprint heats using the velocity self control device. Heart rate (HR), VO2, lactate, and cycle characteristics (video analysis) were measured. Finally all measured variables were correlated to 1000m DP performance and performance in the classical sprint competition. Results: High correlations towards sprint performance in the heats were found for maximal speed in DP (r=0.93) and diagonal stride (0.87), peak lactate post heat 3 (0.80), cycle length (0.77), and test time of the VO2max test (0.74). No correlations were found for VO2max (0.51), VO2peak during the heats (<0.43), HR (0.16), and cycle frequency (0.06). Maximal DP speed showed the highest correlation to 1000m DP performance (r=0.95), followed by the fatigue index (-0.89), power endurance (0.83) and peak power output (0.78) of the upper body. Again no correlations between physiological parameters and 1000m performance were found. Discussion: Maximal speed in the single techniques was found to be the most predicting variable for classical sprint skiing. The high correlation of cycle length, but non existing correlation of cycle frequency to sprint performance illustrated that faster athletes could produce more propulsion at equal frequency. Additionally fastest athletes showed higher power output of the upper body and less fatigue. Together with the non significant correlation of VO2max and VO2peak it might be suggested that sprint performance was more dependent on muscle power factors than high aerobic performance. Owing to a relatively high level of VO2max in the group it might be argued that high VO2max should be the basis, but the ability of achieving maximal running speeds represents the cherry on the cake. For details look:

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