ANALYSIS OF PERFORMANCE IN EXTREME UPHILL DURING A WC CROSS COUNTRY SKI RACE
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Cross country ski races usually take place on a great variety of distances in which slopes are generally lower than 20%, and if steeper, they are very short. During the 2007 World Cup, the new event Tour De Ski, included a special final race (Val Di Fiemme, Italy, free technique 15km for men and 11km for ladies) concluding in an alpine ski track, (length 3km, average slope 14.5%) to travel in uphill direction. For this study the time to cover selected tracts, the technique used, the cycle length and the cycle frequency has been taken on 36 men (M) and 30 women (W). The data were recorded using a stopwatch system and a video-camera in two different track sections of 30 m length, at the bottom and at the top of the central climb (length 1213m, slope 23.2%) respectively. Time to cover this climb was calculated from video data while the total race time was taken from official race results. The mean time to cover the central climb was 11'42 ± 0'51 for M and 14'28 ± 1'27 for W and it represented a considerable part of the whole race, about 35% for M and 39% for W. The time to skiing in the top section for both M and W was not higher than the time for bottom sections, (top vs bottom: 9.2 ± 0.2s vs 10.1 ± 0.6s for M, 11.1 ± 1.7s vs 12.7 ± 1.4s for W). Similarly cycle length did not change significantly going from first to the second video recording area (top vs bottom: 4.18 ± 0.27m vs 3.52 ± 0.24m for M, 3.38 ± 0.34m vs 2.99 ± 0.20m for W).

Individual time to cover the central part of the climb correlates with the performance both in the bottom and in the top sections for both sex, while only for W athletes, central part time correlates also with the cycle length. Total race time is highly related for both sex (M: r=0.89, W: r=0.96) with the flat part of the track. However, just for W, total race time is additionally correlated (p<0.01) with the time taken to cover the central climb (r=0.98). In the M athletes no correlation between central part and total race time has been seen. The time to cover the central climb resulted again significant correlated with the total time of the whole Tour De Ski competition (r=0.80 for M, r=0.86 for W). The results allow to hypothesise that, despite the climb was extremely challenging and involved a significant part of the race, it did not establish the final time of that race for male athletes. On the contrary, the time to cover this uphill section resulted to be well related with global result for women.. In spite of the fact that the final climb of the competition was suspected to be very demanding for athletes, data analyses of the speed and cycle length, usually considered as index of performance, revealed very similar values before and after this climb allowing to hypothesise that no fatigue effects has been suffered by skiers.

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