INTER- AND INTRA-INDIVIDUAL VARIATIONS OF Hb CONCENTRATION WITH DIFFERENT INTERVENTIONS IN ELITE CROSS COUNTRY SKIERS.

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Introduction
The variation of the haemoglobin concentration (Hb) and haematocrit (Hct) plays an important role for VO2 max and therefore for the endurance performance in sports. In some sports (e.g. cross country skiing), it is a major factor for being suspended from competition if the concentration exceeds the allowed level of 16g/dl (females), 17g/dl (males) respectively (Fédération Internationale de Ski).

Previous research has shown that Hb and Htc may vary considerably with interventions such as hydration, posture, training and altitude. In elite athletes these changes may be even more pronounced and was the focus of the present investigation (Calbet et al., 2006; Rønsen et al. 2004. The aim of the study was to investigate the basic individual variability and the overall effects of the following interventions: changes in position (sitting vs. lying down), status of hydration (2l, 0.5 l water intake and no water intake), training (before and after training), different altitudes (sea level and medium altitude).

Methods
As subjects served elite cross-country skiers from France (n=12), Germany (n=11) and Sweden (n=11). From each athlete 10 blood samples were taken from the arm vein without stasis and immediately analyzed.

According to the aim of different interventions a cross-over design was used, i.e. the half of the group underwent identical treatments on two consecutive days with different modes of intervention.

Results and discussion
With the various experimental interventions no subject exceeded the levels determining exclusion from competition. However, a remarkable intra- and interindividual variability occurred. The intervention dependent variability was as follows. Drinking of 2 l of water during the one hour resting phase after training: absolute range 0.55 g/dl, relative range 3.7%, compared to no drinking & sitting position.

20 minutes rest with lying position compared to sitting and drinking of half-liter water after breakfast: absolute range 0.3 g/dl, relative range 2%.

Both Hb and Hct at altitude are systematically higher than at sea level. The overall individual variation of Hb concentration, over all interventions (body position, hydration, altitude, training shows a range from 0.75 to 1.25 g/dl (4.9 to 8.7%) with an average of 0.9 g/dl (6.4%).

In conclusion the results support the idea of defining individual Hb values where a variation of e.g. 10% is allowed.

References


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