EFFECTS OF 40-HOURS SLEEP DEPRIVATION ON PHYSICAL PERFORMANCE AND CORTICOSPINAL EXCITABILITY

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Optimal sleep management is of crucial importance in some sports, such as ultra long sailing, running, cycling, etc. In chase for the best results these athletes try to stay awake as much as possible without losing mental abilities or risking an illness because of a too high stress on the immune system. This study examined the effects of a 40-hours sleep deprivation on some motor abilities and corticospinal excitability respectively.

Ten healthy male volunteers (age 29±4 years) participated in the study. After experiencing normal sleep-wake cycle for three weeks they entered the 56-hours protocol. Extrinsic factors (alcohol, smoking, caffeine, illumination of the environment, food intake, etc.) that might influence results were controlled. One day before the beginning and at the end of the 40-hours sleep deprivation nine motor tests (simple and complex reaction time, squat jump, counter movement jump, 20 m sprint, frequency of alternative movements, dynamic balance test, darts throwing, endurance in muscle force) and corticospinal excitability (Botzmann equation of the MEPs evoked by TMS) were carried out. ANOVA based statistical analyses were carried out using the SPSS software.

Sleep deprivation caused no statistically significant change in all observed motor tests (P>.05) but endurance in force of elbow flexors showed impaired (P=.032) resistance to neuromuscular fatigue. Additionally, corticospinal excitability was significantly decreased (P=.013, .017, and .046 for motor threshold, maximal amplitude and slope of the curve respectively).

Our results show that biological changes known to take place in acute 40-hours sleep deprivation can be compensated, probably by motivational factors, to keep the majority of motor skills at a high level of performance. However, detected changes in corticospinal excitability are very similar to those known to take place in acute neuromuscular fatigue. Since the majority of our subjects were highly motivated experienced athletes, drop in motor abilities could be probably expected only with chronic sleep deprivation.

Keywords: Adaptation, Sleep, Motor Skills