SLEEP AND REST-ACTIVITY CIRCADIAN RHYTHM AFTER CONTINUOUS SPORT COMPETITIONS LASTING THREE TO SEVEN DAYS. COMPARISON BETWEEN THREE DIFFERENT RACES.

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Introduction.
Rest-activity circadian rhythm is strongly linked to the organism’s entrainment. Sleep loss and prolonged fatigue might affect the circadian system, inducing neuro-behavioral deficits. Finnmarkslopet (FL) is Europe’s longest sled-dog race, with a 500km and a 1000km category. The competition lasts up to 7-days; the participants (mushers) are physically active most of the time, having little and fragmented rests. The same is the situation in the about 5-days 700km biking event OffroadFinnmark (OF). FL and OF provide interesting conditions for investigating the effects of strenuous physical activity and sleep loss. The aim of this study was to investigate the rest-activity circadian rhythm (RACR) and sleep patterns in mushers and off-road bikers after they participated in the competitions lasting 3- to 7-days.

Methods.
16 subjects (5 participants at the FL-500km, 5 at the FL-1000km, and 6 bikers in the OF-700km) underwent continuous actigraph monitoring (AW4, CNT) for 5-days before and after the race. The actigraphy data were analyzed by Non-Parametric Circadian Rhythm Analysis (NPCRA), Activity Analysis and Sleep Analysis (Actiwatch Activity and Sleep Analysis software, CNT). The parameters of rest-activity rhythm and sleep quality were analyzed for variance by 2-way ANOVA, and t-test was used for post-hoc analysis.

Results.
In all the races the participants had the chance to sleep for about 3/4-h per day. The long lasting physical activity with fragmented sleep induced a mild phase delay for the athletes of all the races, but a proper free-running effect was not evident. The RACR showed reduced amplitude: there were significant differences between the races, and the reduction was greatest after the race with the largest degree of sleep loss (FL-1000km). The intradaily stability (IS) of the RACR was significantly reduced for the FL-1000km mushers; while the interdaily variability (IV) was significantly increased for the FL-500km mushers, and there was a tendency for the OF-700km bikers. Reduced sleep quality was found only among the FL-1000km mushers.

Discussion and Conclusion.
A period of 3-days of little and fragmented sleep (3-4 hours/per day), in which the subjects were engaged in a prolonged physical effort in intensity zone 1, affected the RACR’s structure. A longer period (5/7-days) in such a condition induced even more accentuated alterations, with disturbance in the nocturnal sleep. This induced a sort of vicious circle that made the re-adjustment of the RACR difficult; while increased IV in the 500km mushers and the bikers might indicate a faster re-adjustment.

Keywords:
Rest-activity circadian rhythm, Sleep loss, Re-adjustment