EFFECTS OF TIME-SPECIFIC STRENGTH TRAINING ON DIURNAL VARIATION IN SERUM HORMONE CONCENTRATIONS AND MAXIMAL STRENGTH
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INTRODUCTION
Testosterone and cortisol play important roles in adaptation to strength training. Serum testosterone and cortisol concentrations decline during a day as a result of their circadian rhythmicity. Maximal muscle strength also exhibits diurnal variation with morning nadirs and afternoon peaks (Drust et al. 2005). Typical diurnal rhythm in muscle strength can be modified by the time-specific strength training (Souissi et al. 2002). This study examined whether diurnal patterns of testosterone, cortisol and maximum isometric strength may be influenced by different time of day of training.

METHODS
Thirty eight men underwent a 10-week preparatory strength training period conducted between 17:00-19:00 h. Thereafter, these subjects were divided into the Morning (M, n=20, training times 07:00-09:00 h) and Afternoon (A, n=18, 17:00-19:00 h) training group for another 10 weeks of time-specific training period (TST). Isometric knee extension peak torque (MVC) was measured at 07:00, 12:00, 17:00 and 20:30 h during two consecutive days (Day 1 & Day 2) before (Pre) and after (Post) TST. Blood samples were taken before each test to measure resting serum testosterone and cortisol concentrations. A matched control group (C, n=11) participated in the blood tests only. The timing of diet, sleep and physical activity of the subjects was controlled one day prior to and throughout the tests. Three-factor GLM for repeated measures was used to calculate main effects and interactions.

RESULTS
Testosterone and cortisol concentrations significantly decreased from 07:00 h to 20:30 h at all test days (Time-of-day effect p<.001). 07:00 cortisol was significantly higher on Day 1 as compared to Day 2 in the C and A group at both Pre and Post (Day x Time interaction p<.01). In M, a similar day-to-day difference was present at Pre but not at Post (Time x Group interaction p<.05). MVC significantly increased after TST in both M and A (Pre-to-Post effect p<.001). In A, typical diurnal variation was found at both Pre and Post (Time-of-day effect p<.001). In M, diurnal variation was reduced after TST on both test days (Pre-to-Post x Day x Time-of-day x Group interaction p>.05).

DISCUSSION
Ten weeks of time-specific strength training period did not differentially alter typical diurnal variation in resting testosterone and cortisol concentrations. However, training in the morning resulted in decreased masking effects of anticipatory psychological stress on Day 1 morning cortisol concentrations in M. The same group showed time-specificity in MVC by increasing strength relatively more in the morning than in the rest of day. Thus, the significant diurnal rhythm in strength found at Pre was no longer significant at Post in M. However, large inter-individual differences in sensitivity to time-specific training were observed, probably due to confounding factors such as chronotype.

References:
Drust et al., Chronobiol Int, 22, 21-44, 2005
Souissi et al., J. Sports Sci. 20, 929-937, 2002
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