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Research article

**Time of Day – Effects on Motor Coordination and Reactive Strength in Elite Athletes and Untrained Adolescents**Alessandra di Cagno<sup>1,2</sup>,  Claudia Battaglia<sup>1</sup>, Arrigo Giombini<sup>2</sup>, Marina Piazza<sup>3</sup>, Giovanni Fiorilli<sup>2</sup>, Giuseppe Calcagno<sup>2</sup>, Fabio Pigozzi<sup>1</sup>, Paolo Borrione<sup>1</sup>

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**ABSTRACT**

**Objectives:** the issue of time-of-day effects on performance is crucial when considering the goal of reaching peak results in sport disciplines. The present study was designed to examine time-of-day effects in adolescents on motor coordination, assessed with Hirtz' s battery and neuromuscular components of strength, evaluated with reactive strength tests. **Methods:** forty-two elite female gymnasts, aged  $13.3 \pm 0.5$  years (Mean  $\pm$  SD), were recruited for the study. Fifty healthy female students (aged  $12.8 \pm 1.7$  years) served as the control group. All participants underwent the testing sessions over two days at two different times of day in a randomized order. **Results:** Oral temperature was measured at the two times of the day and a significant diurnal variation ( $p < 0.01$ ) in both groups was found. MANOVA revealed significant group differences in the overall tests ( $p < 0.01$ ). The gymnast group showed no significant differences in the coordination tests with respect to the time of day, but significant differences were observed for reactive strength as assessed with the vertical jump tests ( $p < 0.01$ ). Gymnasts attained better results in the evening in the reactive strength tests [flight time ( $F_{1,90} = 17.322$   $p < 0.01$ ) and ground contact time ( $F_{1,90} = 8.372$ ;  $p < 0.01$ ) of the hopping test]. **Conclusion:** the temperature effect was more evident in the reactive strength tests and orientation test, especially in the gymnast group in which this effect added to their usual training time effect. The time-since-awakening influenced coordination performances in complex tasks more than reaction strength tests in simple tasks. The main outcome of the study was that we did not observe time-of-day effects on coordination skills in elite gymnasts and in

untrained adolescents. The time of day in which athletes usually trained these skills could influence these results.

**Key words:** Circadian rhythm, closed skill sports, gymnasts, motor tasks, temperature

### Key Points

- The results obtained in this study suggested that the best time to perform a particular task depends specifically on the nature of the task, the precise size of the cognitive load and the level of practice of the participants.
- In the field of practice, it is incumbent for coaches to organise sports selection based on reactive strength, using the morning hours for untrained adolescents, when alertness and the benefits of sleeping could improve performance. Evening hours, conversely, should be used for elite gymnasts who specifically train at that time (specific “temporal training effect” ).
- These study results cannot give indications about the best time of the day to organize selection tests based on coordination skills.

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