

## **Circadian rhythm of activity levels: influence of chronotype.**

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**Aim:** The aim of this study is to investigate, by an actigraph monitoring, the differences in the circadian rhythm of activity level in relation to the chronotype for the sake of studying its influence on physical performance. Morning-type (M-type), Evening-type (E-types) and Neither-type (N-type) are the classified chronotypes; several studies showed the differences between M-types and E-types in the circadian rhythm of different physiological variables: M-types use to wake up and go to bed early and to have their best performances in the first part of the day, otherwise E-types go to bed and wake up late and they have the peak performances in the evening (Vitale et al., 2013).

**Method:** The morningness–eveningness questionnaire (MEQ) was administered to 502 college students to determine their chronotypes. Fifty subjects (16 M-types, 15 N-types and 19 E-types) were recruited to undergo a 7-days monitoring period with an actigraph (Actiwath actometers, CNT, Cambridge, UK) to evaluate their sleep parameters and the circadian rhythm of their activity levels. To evaluate the circadian rhythmicity of activity levels we used the single cosinor method (Halberg et al., 1977) and we define three parameters characteristic of each statistically significant rhythm: M, MESOR (Midline Estimating Statistic Of Rhythm); A, Amplitude;  $\phi$ , acrophase. The population circadian characteristics were determined and then compared using the Hotelling test.

**Results:** Rhythmometric analysis, with the single cosinor method, on the activity data collected by the actigraph revealed a statistically significant circadian rhythm ( $p < 0.001$ ) for all the 50 subjects. The population mean cosinors were calculated grouping the different chronotypes: M-types, E-types and N-types ( $p < 0.001$ ). No statistical differences about MESOR were showed for all group combinations ( $p > 0.05$ ) but a significant difference ( $p < 0.05$ ) was observed if considering the Amplitude-Acrophase test for all groups combinations, in particular M-types had an early acrophase of the circadian rhythm of the activity levels, at 14.37, while E-types showed an acrophase with more than 2 hours late, at 17.04 ( $p < 0.001$ ); the group of N-types showed an intermediate acrophase, at 15.45, between morning-types and evening-types.

**Conclusion:** We can assume that there is a clear difference between “larks” and “owls” and this results are in line with other studies that showed the biological differences among chronotypes. We can conclude that M-types are more active in the early afternoon and that E-types have the peak of their activity in the late afternoon. Further studies are needed to better understand if and how the chronotype influence a physical performance.

## **References**

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2. Vitale J.A., Calogiuri G., Weydahl A. (2013). *Percept. Mot. Skills.* 116(3):1020-1028.