

## **Measuring High-Resolution Sleep Position in Adolescents over 4 Nights with Smartphone Accelerometers**

Raimon Jané<sup>1</sup>

Yolanda Castillo-Escario, Dolores Blanco-Almazán and Ignasi Ferrer-Lluis

<sup>1</sup> Institut de Bioenginyeria de Catalunya (IBEC)

Sleep position affects sleep quality and the severity of different diseases. Classical methods to measure sleep position are complex, expensive, and difficult to use outside the laboratory. Wearables and smartphones can help to address these issues to track sleep position at home over several nights. In this study, we monitor high-resolution sleep position in 13 adolescents over 4 nights using smartphone accelerometer data. We aim to investigate the distribution of sleep positions and position changes in adolescents, study their variability across nights, and propose new measures related to nocturnal body movements. We developed a new index, the mean sleep angle change per hour, and calculated three other measures: position shifts per hour, mean time at each position, and periods of immobility. Our results indicate that participants spent 56% of the time on the side (32% right and 24% left), 32% in supine, and 12% in prone position, similar to what happens in adults. However, adolescents moved more than adults during sleep according to all measures. There was some variability between nights, but lower than the inter-subject variability. In conclusion, this work systematically analyzes sleep position over several nights in adolescents, a largely unstudied population, and offers innovative solutions and measures for high-resolution sleep position monitoring in a simple and cost-effective way.