

## ActiGraph White Paper

### Actigraphy Sleep Scoring Algorithms

At present there are two algorithms that are primarily used to perform sleep scoring on actigraphy data captured by ActiGraph devices. These are the Cole-Kripke<sup>1</sup> algorithm and the Sadeh<sup>2</sup> algorithm.

#### **Cole-Kripke algorithm**

The Cole-Kripke<sup>1</sup> algorithm is considered appropriate for use with adult populations because it was developed using subjects ranging from 35 to 65 years of age. Roger J. Cole and Daniel F. Kripke adapted a scoring method developed by J. B. Webster with an experimental wrist Actigraph for the AMI Actigraph in 1992. It was developed using 10, 30 and 60 epochs, with the highest level of accuracy resulting from the 10 second epoch.

The algorithm was adapted to the ActiGraph ActiSleep monitor by performing a side by side test using the AMI device and the ActiSleep monitor worn together. The data were scaled then put through the algorithms until the ActiSleep monitor sleep score matched that from the AMI device.

#### **Sadeh algorithm**

The Sadeh<sup>2</sup> algorithm is considered appropriate for younger populations because it was developed using subjects ranging from 10 to 25 years of age. It was developed by Dr. Avi Sadeh while working at Brown University in 1994. He used the same device that Cole-Kripke used to develop their algorithm, and ActiGraph therefore adapted it in the same way by scaling our data until it matched up with the scoring results of the AMI device. This algorithm is limited to only 60 second epochs, which the software will automatically reintegrate to 60 if necessary.

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Roger J Cole discussed the different algorithms in his paper indicating the estimates for each algorithm are very similar and are close to 90% agreement with PSG. He went on to say “...automated scoring of sleep from wrist activity is relatively insensitive to details of the algorithm or to the nature of the transducer...”.



<sup>1</sup> *“Automatic Sleep/Wake Identification From Wrist Activity”, Roger J. Cole, Daniel F. Kripke, etal, Sleep 12(5):461-469, 1992 American Sleep Disorders Association and Sleep Research Society*

<sup>2</sup> *“Activity-Based Sleep-Wake Identification: An Emprical Test of Methodological Issues”, Avi Sadeh, K.M. Sharkey and M. A. Carskadoon, Sleep17(3): 201-207, 1994 American Sleep Disorders Association and Sleep Research Society*