Table VII Nocturnal and daytime sleep measures derived from actigraphy data

Variable name	Abbreviation	Description
Total Night Sleeping Time	TNST	Total night sleeping time is calculated as the sum of all minutes scored as sleep during time in bed.
Number of Nocturnal Sleeping Bouts	NNSB	Number of nocturnal sleeping bouts during time in bed. A higher NNSB indicates more fragmented sleep.
Duration of Nocturnal Sleeping Bouts	DNSB	Average duration of nocturnal sleeping bouts during time in bed. A higher DNSB indicates longer sleeping bouts, and, in turn less nocturnal sleeping disturbances.
Sleep efficiency	Seff	Sleep efficiency defined as the ratio of TNST and time in bed.
Wake After Sleep Onset	WASO	Time spent awake during time in bed after the first nocturnal sleep onset.
Total Day Sleeping Time	TDST	Total day sleeping time defined as the total time spent asleep during the out of bed period.
Number of Daytime Sleeping Bouts	NDSB	Number of daytime sleeping bouts indicates how many naps a patient takes during the day.
Duration of Daytime Sleeping Bouts	DDSB	Average duration of daytime sleeping bouts during the day. A higher DDSB indicates longer naps.

5.2.4 Algorithm

In order to calculate sleep measures, actigraphy data need to be segmented and the time in/out of bed needs to be derived. Time in bed is usually defined as the time from lights off to lights on (i.e. time interval comprised between the moment at which participants were lying down with the intention to fall asleep and the moment at which participants stand up from the bed after the night sleep) [68]. Lying down time, in turn, is defined as the time spent lying down while the participants are awake. In practice, the following definitions of time in bed have been used: (1) fixed time interval (from 21:00pm to 06:00am) [105]; (2) Time interval extracted from subject's daily sleep log [98, 100]; (3) Time interval comprised between the lights off and lights on markers derived from polysomnography (PSG) data [106, 107, 68].

The first two methods are in general not reliable since sleeping behaviour varies from subject to subject and sleeping logs are inaccurate. The last one, when using only actigraphy data, is not possible. Other approaches should be used to guide the analysis of actigraphy data recordings and cluster together sleeping epochs, in a consistent way, in order to compute sleep assessment measures as total night sleeping time or sleep fragmentations (number of sleeping epochs).

Sleep measures are essentially coupled to a biphasic model of human behaviour that assumes, within 24 hours, a sleep and a wake period. It is known that such a model does not