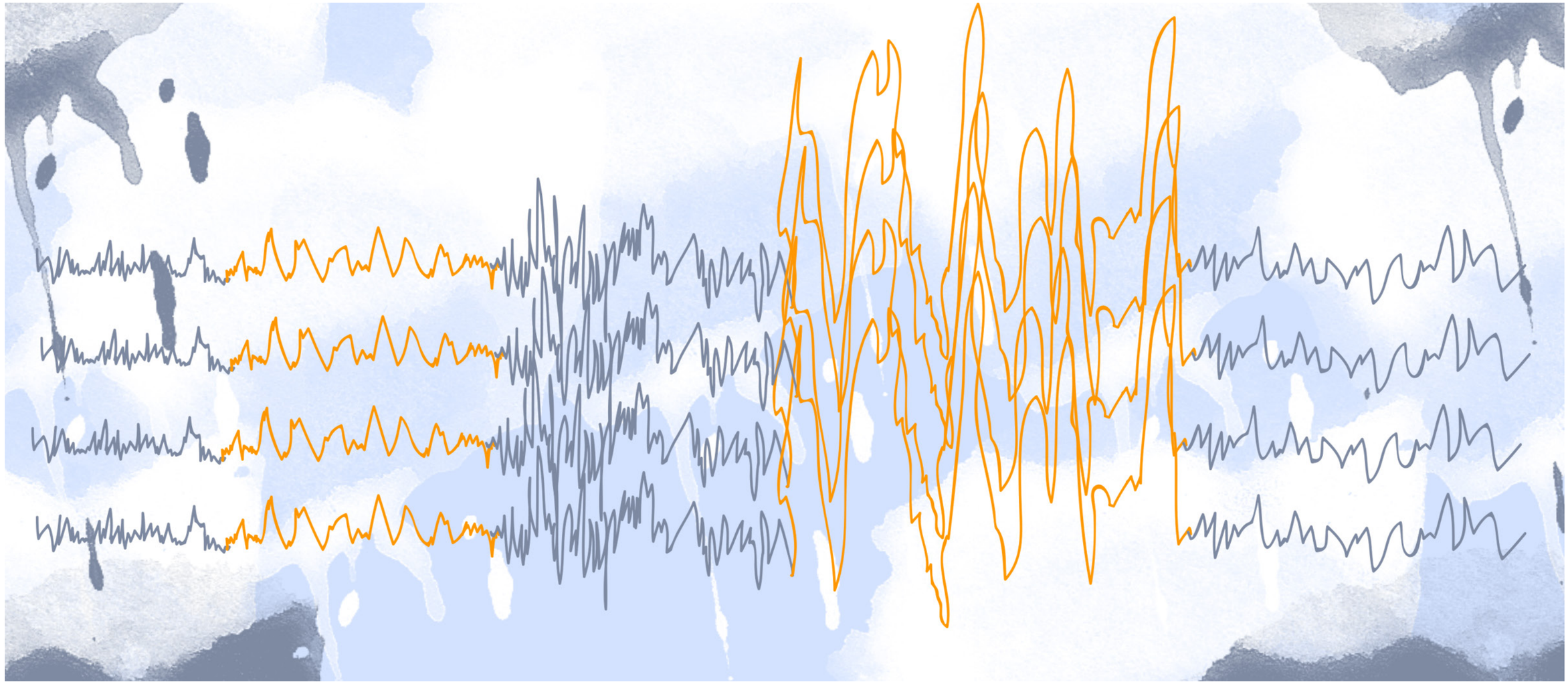
Sleep Basics



steven j. barnes

- Describe the tools commonly used in sleep research.
- Describe the various stages (including their defining characteristics) of a typical night of sleep.
- Describe the characteristics of REM sleep.

Learning Goals

What is this behaviour we spend so much time on?

Most of us will sleep well over 175,000 hours in our lifetimes. Do we really need this much? Do we need more?

Sleep Basics

What is this behaviour we spend so much time on?

Most of us will sleep well over 175,000 hours in our lifetimes. Do we really need this much? Do we need more?

Think of how much your life would change if you only slept 5 hours per night as opposed to 8:

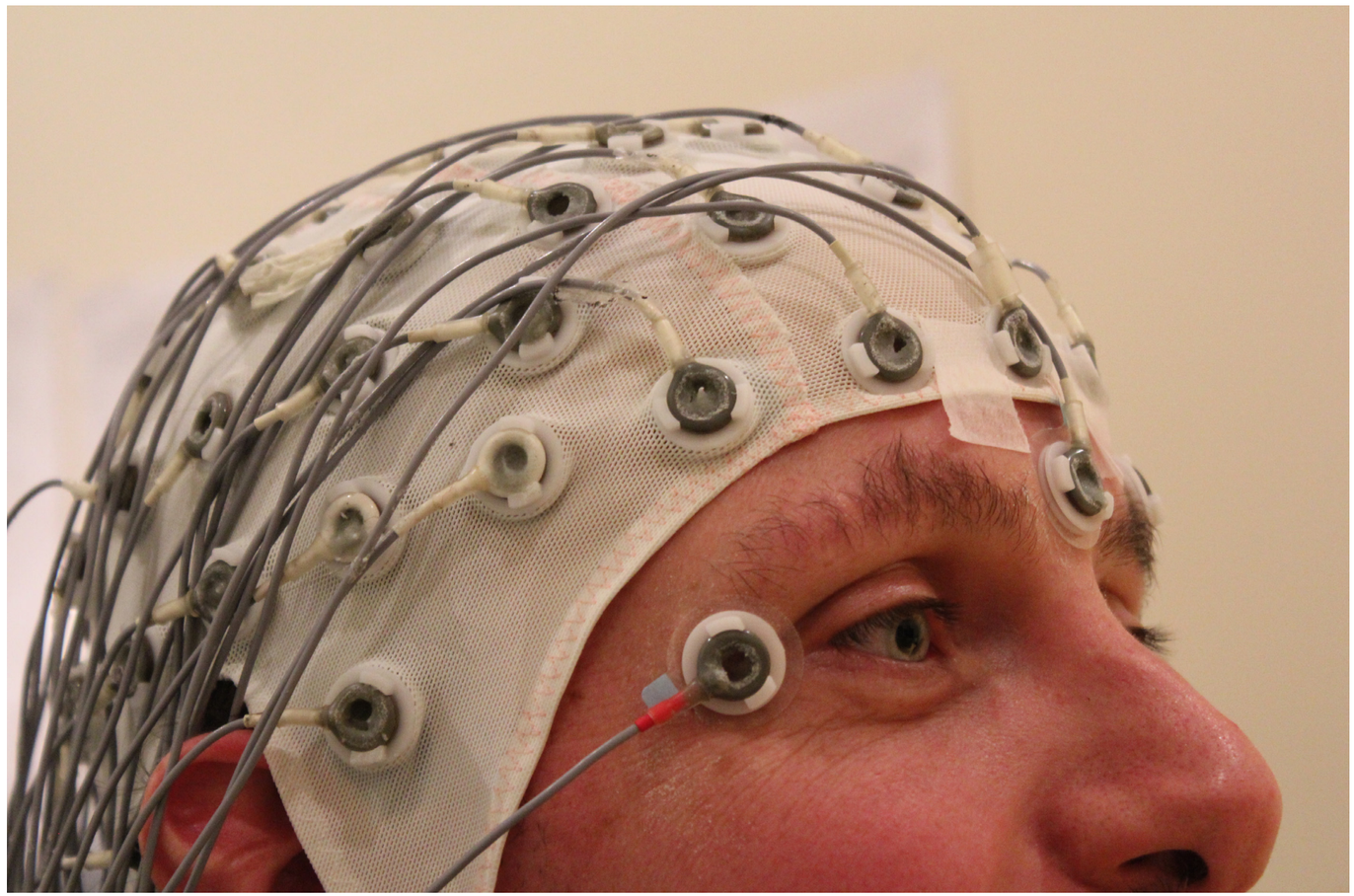
You would have an extra 21 hours awake per week, 10,952 hours (> 1 year) each decade.

Sleep Basics

Measuring Sleep

Three common tools for the psychophysiological study of sleep:

1. Electroencephalogram (EEG)
2. Electrooculogram (EOG)
3. Electromyogram (EMG)



Sleep Basics

Classic Sleep Stages

Lying in bed awake.

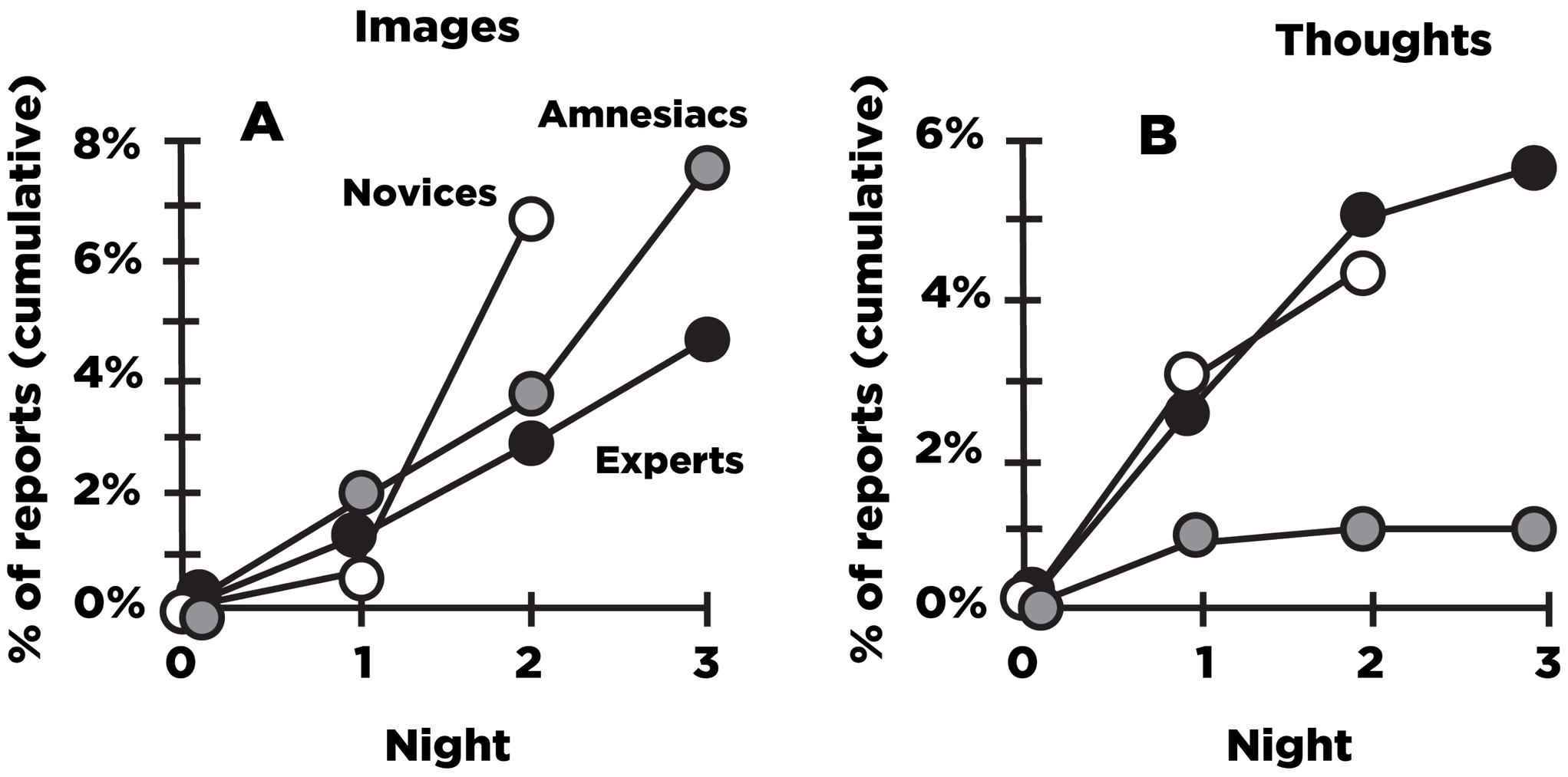
Sleep Basics

Classic Sleep Stages

Once your eyes shut and you prepare to go to sleep, alpha waves (brief bursts of 8-12 Hz EEG waves) begin to appear.

Sleep Basics

Hypnagogia



adapted from Stickgold et al., 2000

Sleep Basics

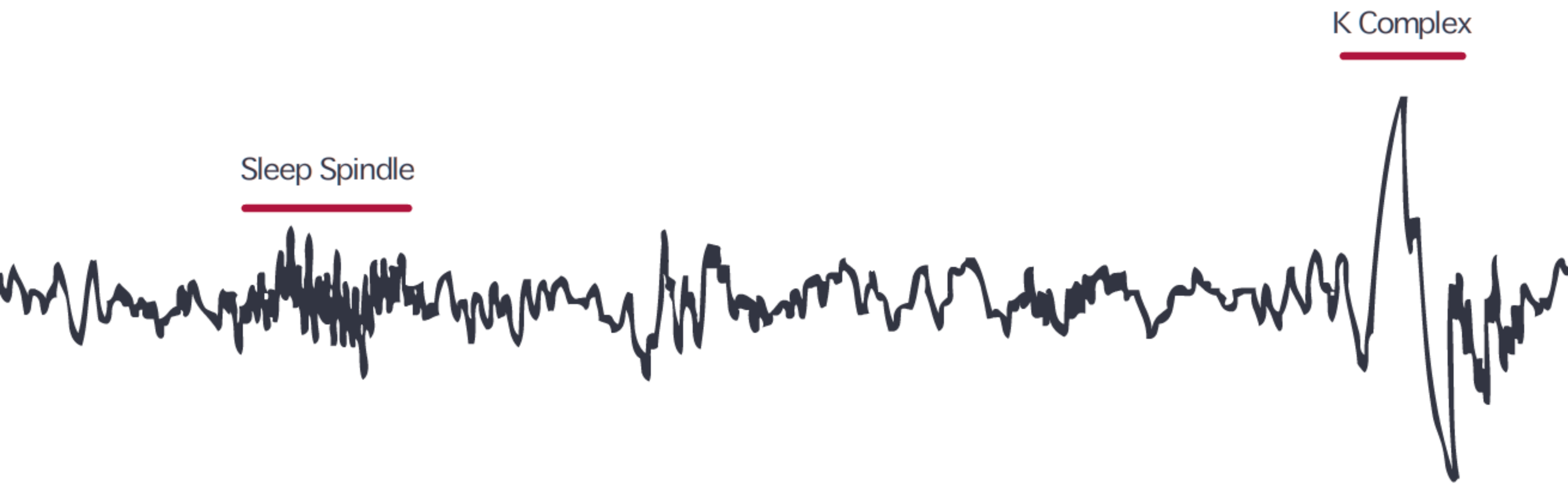
Classic Sleep Stages

Theta Waves

Then you enter stage 1 sleep:
slightly slower signal than alert wakefulness; appearance of theta waves (3-7 Hz).

Sleep Basics

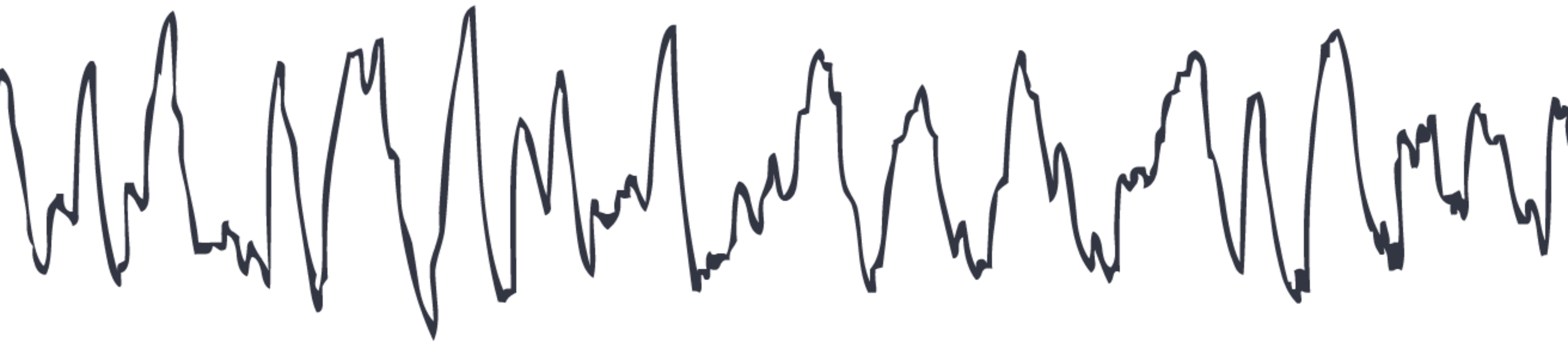
Classic Sleep Stages



Then you enter stage 2 sleep:
slightly higher amplitude and has sleep spindles and K complexes.

Sleep Basics

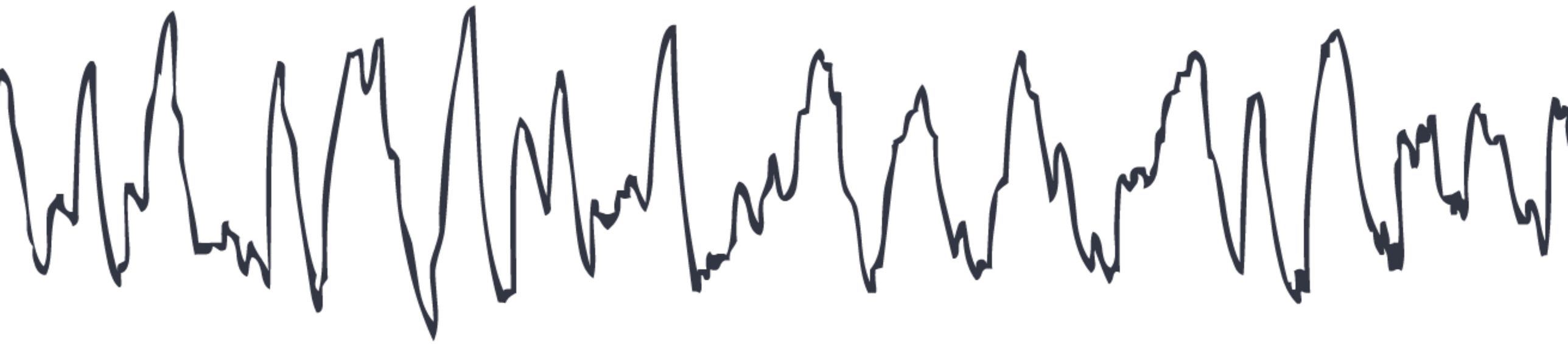
Classic Sleep Stages



Then stage 3: Characterized by increasing presence of delta waves (largest and slowest EEG waves: 0-3 Hz).
Then stage 4: Mostly delta waves.

Sleep Basics

Classic Sleep Stages

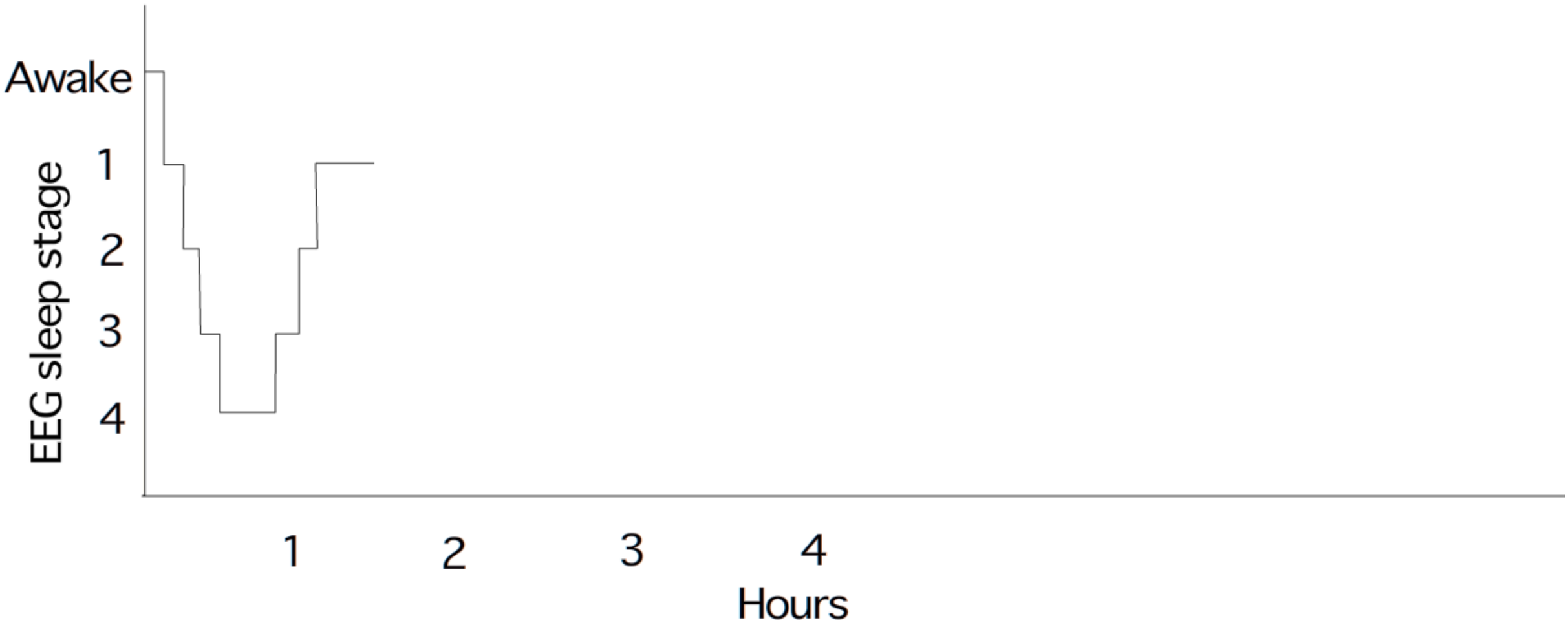


Then stage 3: Characterized by increasing presence of delta waves (largest and slowest EEG waves: 0-3 Hz).
Then stage 4: Mostly delta waves.
Collectively known as Slow Wave Sleep

Sleep Basics

Classic Sleep Stages

Once you reach stage 4, you stay there for some time and then cycle back through the stages: 4 -> 3 -> 2 ->1.

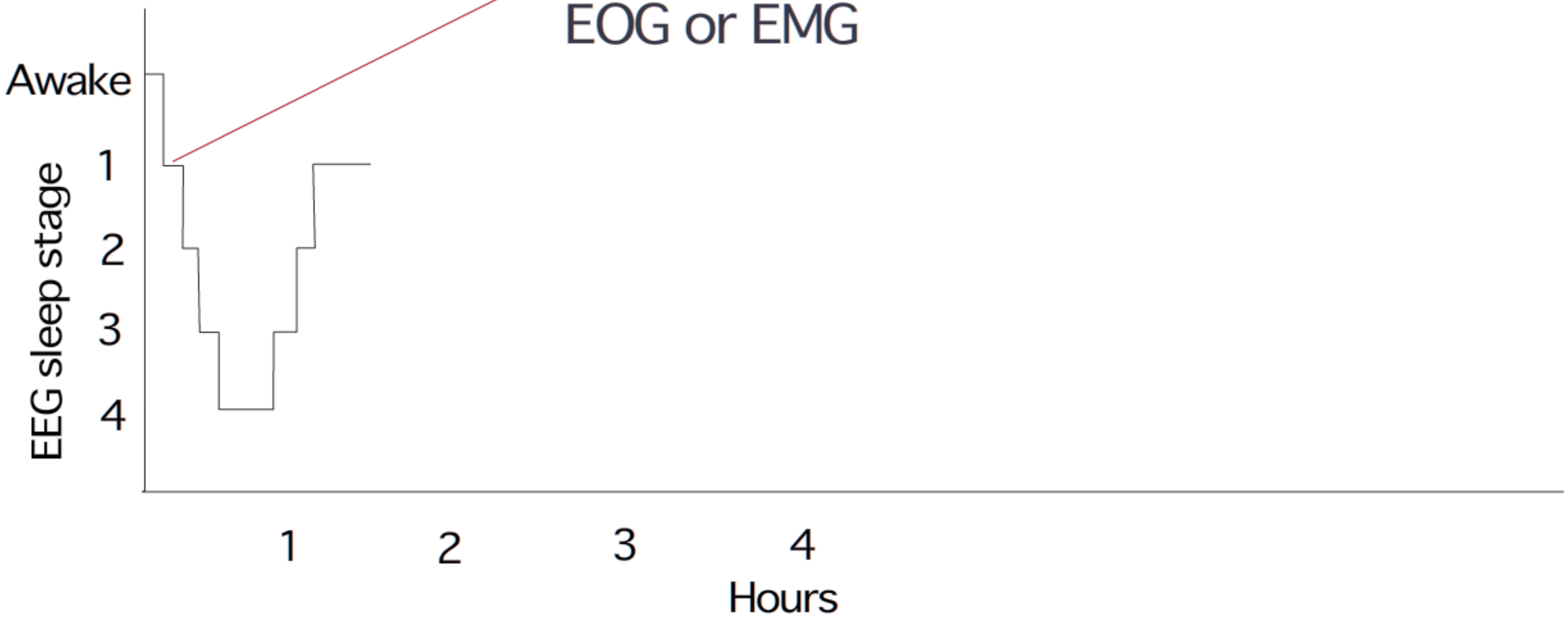


Sleep Basics

Classic Sleep Stages

Once you reach stage 4, you stay there for some time and then cycle back through the stages: 4 -> 3 -> 2 ->1.

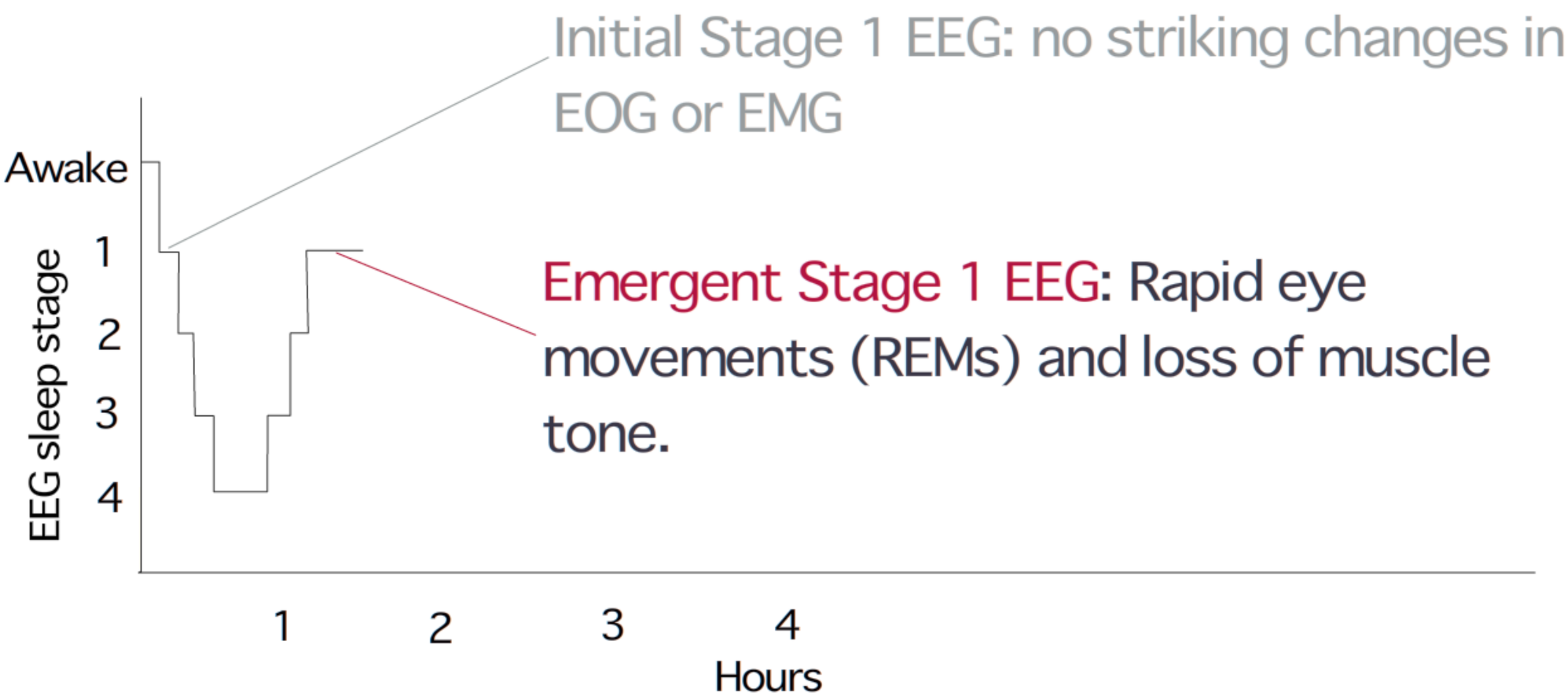
Initial Stage 1 EEG: no striking changes in EOG or EMG



Sleep Basics

Classic Sleep Stages

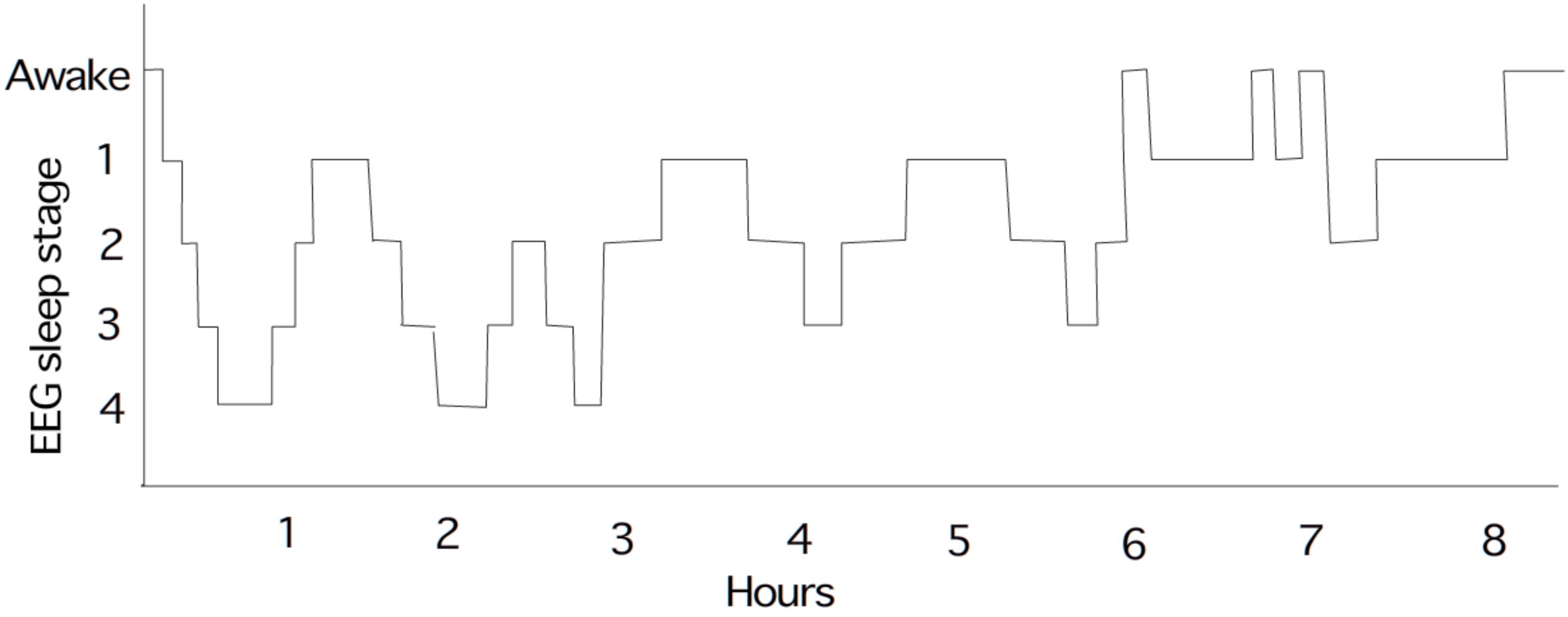
Once you reach stage 4, you stay there for some time and then cycle back through the stages: 4 -> 3 -> 2 ->1.



Sleep Basics

Classic Sleep Stages

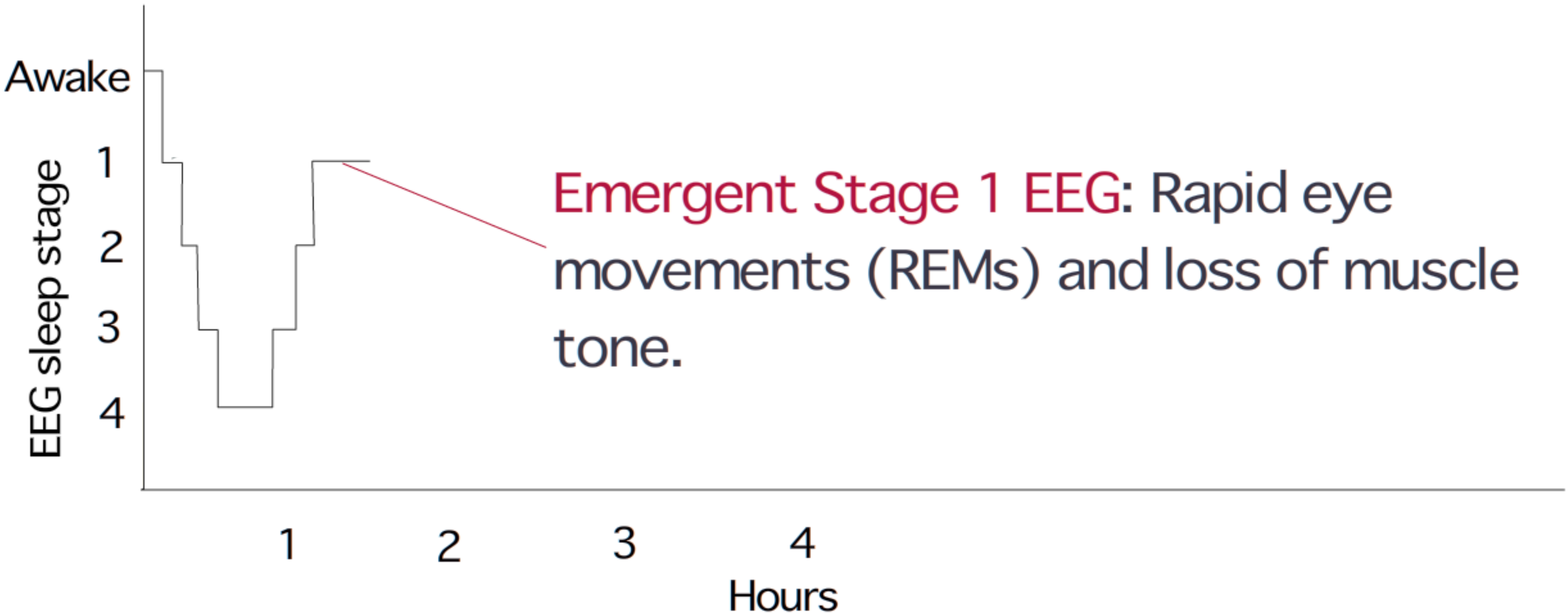
The rest of your sleep time is spent going back and forth between the various stages of sleep.



Sleep Basics

REM Sleep

REM sleep: Sleep associated with emergent Stage 1 EEG.



Characteristics of REM Sleep

Rapid eye movements

Sleep Basics

Characteristics of REM Sleep

Rapid eye movements

Loss of muscle tone

Sleep Basics

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Rapid eye movements
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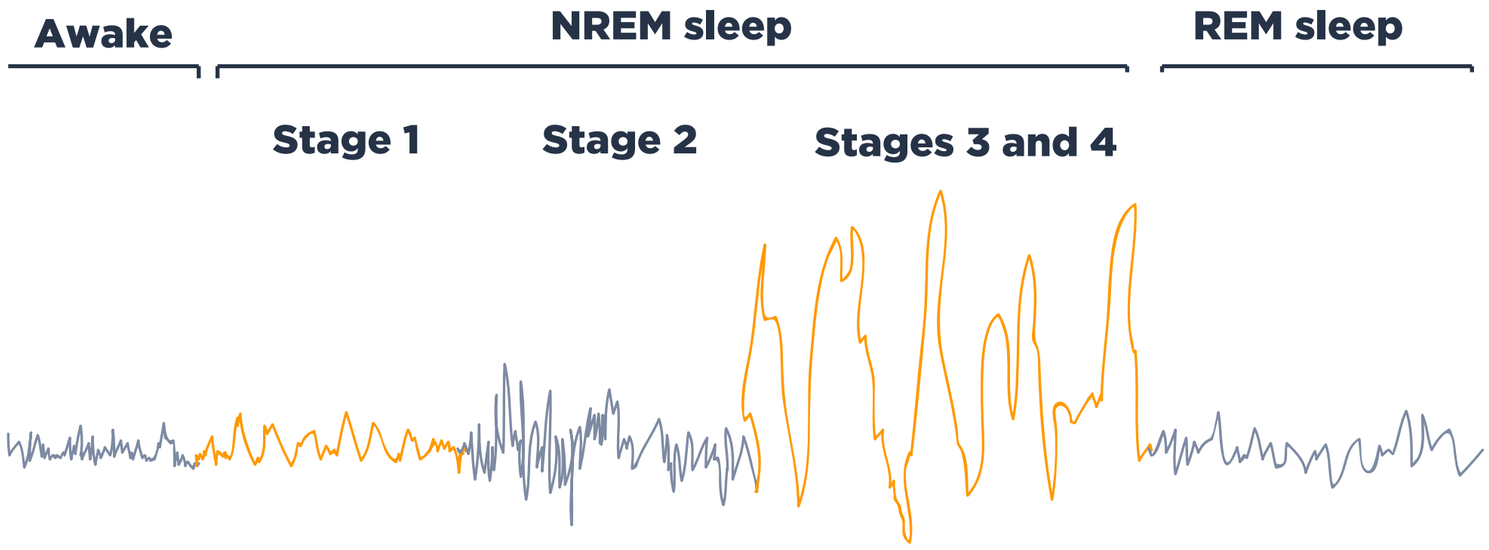
Low amplitude, high-frequency EEG (similar to waking)

Characteristics of REM Sleep

Rapid eye movements
Loss of muscle tone
Low amplitude, high-frequency EEG (similar to waking)
Activity increases to waking levels in many brain structures.
General increase in autonomic nervous system activity.
Some muscle activity.
Some degree of clitoral or penile erection.

Sleep Stage Terminology

REM sleep: Sleep associated with emergent Stage 1 EEG.
Non-REM (NREM) sleep: Sleep associated with all other stages.
Slow-wave sleep: Stages 3 and 4 (named after the slow delta waves that characterize these stages).



Sleep Basics

Characteristics of REM Sleep

Rapid eye movements
Loss of muscle tone
Low amplitude, high-frequency EEG
Activity increases to waking levels in many brain structures.
General increase in autonomic nervous system activity.
Some muscle activity.
Some degree of clitoral or penile erection.
Dreaming