

Normative Values for the Sleep Study Report

Epworth Sleepiness Scale scores⁸:

- 0-5 Lower Normal Daytime Sleepiness
- 6-10 Higher Normal Daytime Sleepiness
- 11-12 Mild Excessive Daytime Sleepiness
- 13-15 Moderate Excessive Daytime Sleepiness
- 16-24 Severe Excessive Daytime Sleepiness

Normal sleep efficiency based on age (means):

<u>Age:</u>	<u>Efficiency</u>
37-54	78-94%
55-60	74-92%
61-70	68-93%
>70	69-89%

For normal sleep efficiency refer to the table above
 >80% normal
 <80% reduced (this does not apply to patients >70 years)
 <60% severely reduced or impaired

Spontaneous Arousals

Normal = please refer to the table
 >10 = mildly increased
 >20 = moderately increased
 >30 = severely increased

Awakening Index

>5 = elevated

Sleep Latency

0-5 minutes = severely abbreviated
 5-10 = rapid
 10-20 = normal

Sleep architecture in teens¹ and adults²

Males (means)

Age	13-15	16-19	20-29	30-36	37-53	55-60	61-70	>70
%N3	24	23	19-22	12-14	10-13	7-10	6-8	5-7
%R	27	22	27-29	22-24	19-20	18-20	18-19	17-19

Females (means)

Age	13-15	16-19	20-29	30-36	37-53	55-60	61-70	>70
%N3	22	23	18-20	14-16	13-16	15-19	15-19	16-19
%R	26	22	24-26	25-27	20-22	19-21	18-20	17-19

REM sleep Latency (minutes)^{3,4}

70-100 minutes = normal
<70 minutes = abbreviated
>120 minutes = delayed

Sleep Apnea in Adults

	AHI⁵	SaO₂
Mild	5-15/hr	85-89%
Moderate	15-30/hr	75-84%
Severe	>30/hr	<75%

Respiratory Disturbance Index (RDI)⁶

<20 events/hr = mildly elevated
20-40 events/hr = moderately elevated
40-60 events/hr = moderately to severely elevated
>60 events/hr = severely elevated

Apnea definition:

An apnea is scored when all of the following criteria are met:

1. There is a drop in airflow by 90% or more of the baseline
2. The duration of the event lasts at least 10 seconds
3. At least 90% of the event's duration meets the amplitude criteria

Hypopnea definition (criteria A):

A hypopnea is scored when all of the following criteria are met:

1. The nasal pressure signal drops by 30% or more of the baseline
2. The duration of the event lasts at least 10 seconds
3. There is a 3% (or more) oximeter desaturation from the pre-event baseline, or the event is associated with an arousal
4. At least 90% of the duration of the event demonstrates the reduction in airflow

Respiratory effort related arousal (RERA):

A RERA is scored when all of the following criteria are met:

1. There is a sequence of breaths lasting at least 10 seconds, characterized by increased respiratory effort, or flattening of the nasal pressure waveform leading to an arousal.
2. A respiratory event is seen which does not meet the amplitude and/or desaturation criteria for hypopnea (as outlined above) but which does cause an arousal.

Oxygen Desaturation

Desaturations down to between 80-89% = mild

Desaturations down to between 70-79%= moderate

Desaturations down to below 70%=severe

Periodic Leg Movement Index (PLMI)

<5 events/hour = normal

5-25 events/hour = mildly elevated

26-50 events/hour = moderately elevated

>50 events/hour = severely elevated

PLM Arousal Index

<10 events/hour = normal

>10 events/hour = elevated

>25 events/hour = severely elevated

Sleep Micro-architecture⁶

Alpha ratings:

1. <20% of NREM sleep occupied by alpha
2. 20-40% of NREM sleep occupied by alpha
3. 40-60% of NREM sleep occupied by alpha
4. 60-80% of NREM sleep occupied by alpha
5. >80% of NREM sleep occupied by alpha

Multiple Sleep Latency Test (MSLT)⁷

Mean sleep latency of 10 to 20 minutes = normal

Mean sleep latency of ≤ 5 minutes = pathologic sleepiness

Mean sleep latency of 5-8 minutes = moderate sleepiness (*not typically in the narcoleptic range*)

Mean sleep latency of 8-10 minutes = mild sleepiness ("grey zone") (*not classifiable as pathologic*)

In the appropriate clinical context, the finding of 2 or more intrusions of REM sleep and a mean sleep latency of less than 5 minutes is consistent with a diagnosis of Narcolepsy syndrome.

Maintenance of Wakefulness Test (MWT)

There is a paucity of data on the normative ranges for MWT which must be interpreted in the clinical context.

Interpretation:

1. The sleep onset is defined as the first epoch of greater than 15 seconds of cumulative sleep in a 30 second epoch and the trials are ended after 40 minutes if no sleep occurs, or after unequivocal sleep, defined as 3 consecutive epochs of stage 1 sleep or one epoch of any other stage of sleep. The AASM suggests that a mean sleep latency below 8 minutes is abnormal and mean sleep latency of 8-40 minutes is of uncertain significance and must be interpreted within the clinical and occupational context.
2. The mean latency in normal volunteers is 30.4 ± 11.20 minutes.

References:

1. Grigg-Damberger M, Gozal D, Marcus CL, et al. J Clin Sleep Med; 3(2):201-40, 2007.
2. Redline S, et al. the effects of age, sex, ethnicity and sleep-disordered breathing on sleep architecture. Arch Intern Med. 164:406-418, 2004.
3. Carskadon M and Dement W. Normal human sleep (pages 21 & 28) In: Principles and Practices of Sleep Medicine; Kryger, Roth, Dement, 5th Edition, 2011.
4. Keenan S, Hirshkowitz M. Monitoring and staging human sleep (page 1608). In: Principles and Practices of Sleep Medicine; Kryger, Roth, Dement, 5th Edition, 2011.
5. Fleetham J, Najib A, Bradely D, et al. Diagnosis and treatment of sleep disordered breathing in adults. Can Respir J; 13(7), 2006.
6. MacFarlane JG, Moldofsky H. Technical considerations and scoring criteria for alpha-EEG and periodic EEG phenomena (page 1430). In: Principles and Practices of Sleep Medicine; Kryger, Roth, Dement, 5th Edition, 2011.
7. Sullivan SS, Kushida CA. Multiple Sleep Latency Test and Maintenance of Wakefulness Test. Chest 134; 854-861, 2008.

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8. M. W. Johns. 2019. The Epworth Sleepiness Scale. [ONLINE] Available at: <http://epworthsleepinessscale.com/about-the-ess/>. [Accessed 5 March 2019].

Nb: all other values listed in this document are taken from:

1. The International Classification of Sleep Disorders, Revised (2001) Diagnostic and Coding Manual.
2. The International Classification of Sleep Disorders, 2nd Edition (2005) Diagnostic and Coding Manual.
3. Sleep Medicine Practice Guidelines of the College of Physicians & Surgeons of Ontario (CPSO), 3rd Edition, September 2010 (Revised January 2011):
<http://www.cpso.on.ca/uploadedFiles/policies/guidelines/facilities/Sleep.pdf>