MULTIPLE SLEEP LATENT TEST (MSLT) Manual of Operations for NSRR

1) GENERAL OVERVIEW

9/1/1989: Research MSLT's started

8/7/2001: Started to do some Clinical MSLTs in addition to the Research MSLTs

9/6/2003: No longer doing Research MSLTs, only Clinical MSLT's

12/11/2001 - 7/1/2004: A special subset of individuals with subject Id's starting with the letter "N" were invited to participate in the overnight study and clinical MSLT. These individuals were identified according to their responses on SURVEY 3 that pertained to traditional Narcolepsy symptoms, who had not previously participated in the sleep cohort study.

2) RECORDING PROCEDURES, SCORING CRITERIA AND PROTOCOL FOR RESEARCH AND CLINICAL MSLT

BEGINNING OF THE TEST

- Starting Time:
  - The **research** MSLT protocol begins at approximately 9:00 am, with four naps at two-hour intervals.
  - The **clinical** MSLT protocol occurs on the morning after an overnight polysomnography (PSG). The clinical study begins approximately 2 hours after morning wake-up, with four to five naps at two-hour intervals. The clinical study ends after four naps if there is no Sleep-Onset REM Period (SOREM), or if there are two or more naps with SOREM. A fifth nap is performed if there is one nap with SOREM, or uncertainty about SOREM in any of the naps.
- Subject should remove shoes, loosen constricting clothing, and be hooked up in bed 5 minutes before scheduled start of test.
- Have subject complete subjective rating of sleepiness.
- Perform physiological calibrations - EC, EO, look left, look right, look up, look down, blink, clench teeth, entering the corresponding annotations as they occur.
- Encourage subject to assume a comfortable position for falling asleep. (NOTE: This is done ***before*** test instructions are given.)
- The following instruction is repeated **verbatim** for every MSLT:
  - **"Please lie still, keep your eyes closed, and try to fall asleep if you can. I will let you know when the test is over."**
- Immediately after instructions are given, lights are turned off, signaling the start of the test, from which time (zero) sleep latency is calculated. Enter annotation for lights out when lights out occurs, making every effort to place at the beginning of an epoch.

ENDING A TEST

The **research** MSLT is terminated 20 minutes after lights-out:

if there has been no sleep,

OR after three consecutive epochs of Stage 1 sleep,

OR after the first epoch of another sleep stage.

The **clinical** MSLT ends 15 minutes after the first epoch of sleep, or after 20 minutes from lights out if sleep has not occurred within that time.

The sleep tech recording the clinical MSLT determines sleep onset by scoring "on the fly", continuing until there is an epoch of unequivocal Stage 1 sleep, from which point the recording continues for 15 minutes. This sleep onset latency may decrease when reviewing and scoring the naps retrospectively but ensures that the nap does not end prematurely.

Stage 1 sleep defined:

A relatively low voltage, mixed frequency EEG with a prominence of activity in the 2-7 cps range. Stage 1 is characterized by the presence of slow eye movements, each of several seconds duration, which are usually most prominent during the early portions of the stage. Rapid eye movements are absent.

The transition from a low voltage waking record to Stage 1 is characterized by a generalized slowing of the EEG. The transition from an alpha record to Stage 1 is characterized by a decrease in the amount, amplitude, and frequency of alpha activity.

When the amount of record characterized by alpha activity combined with low voltage activity drops to less than 50% of the epoch and is replaced by relatively low voltage, mixed frequency activity, the epoch is scored as Stage 1.

MEASURING LATENCIES

Sleep latency is measured as the elapsed time from lights-out to the first epoch scored as sleep using a 30-sec scoring epoch. This criterion is reached when sleep occupies > 50% of any 30-sec epoch.

Sleep onset is determined using the standard sleep stage criteria. In cases where there is no clear slowing in the central derivations for $\geq$ 15 sec., the occipital derivations should be compared with the centrals to determine the percentage of sleep in an epoch.

Latency to SOREM is measured beginning with the first epoch after the epoch of sleep onset.

QUALITY ASSURANCE

A technical evaluation of the recording will be done by the lab manager prior to scoring based on the following criteria:

1. The record is clearly annotated with lights-out, lights-on, and any other information that affects scoring.
2. The recording was not terminated prematurely (e.g., before the onset of sleep).
3. The recording does not contain excessive amounts of artifact which would make the record un-scoreable and that a sufficient number of attempts were made to alleviate artifact when possible.

SCORING PROCEDURES

Scoring of MSLTs is done by two individual scorers (one of which is the lab manager) who have been qualified to do scoring based on a minimum of 50 scored records. Clinical MSLTs are scored by the recording technologist and the Lab Manager.

Each study is scored individually without knowledge of the results of the other scorer, recording sleep onset for each nap on a separate scoring sheet.

The scorers will make comments on the scoring sheet to provide information when further review is necessary.

The individual scores are compared, and the final scores and latency recorded on the data sheet using the following criteria:

1. If the scores differ by ≤ 2 min., the scores are averaged.

2. If the scores differ by > 2 min., the scorers confer with each other and try to come to an agreement, with the lab manager being the arbiter when no agreement can be reached.

For the clinical MSLT, REM is determined based on R&K scoring guidelines. When a SOREM is detected within the 15 minutes following sleep onset, every effort is made to be in agreement on sleep onset and consequently REM latency. If the difference between sleep latencies is less than 2 minutes, then the two subsequent REM latencies are averaged, and the mean REM latency recorded on the data sheet with a comment made that the value is the mean REM latency.

The final scores, mean latency, and occurrence of SOREM are recorded on the data sheet and are initialed by the person confirming the scores.

In most cases the scorer who completes the data sheet puts his/her scores in Column 1 and the other scorer's sleep latencies in Column 2.

The scorers will make comments on the data sheet to document by which criteria the scores were determined.

EDF CHANNEL LABELS (MSLT):

Grass Comet Lab Based System (2009-present)

edf channel #	channelName	type	input1	input2	samplingRate	lowFilter	HighFilter	Comment
1	LEOG_M2	EOG	LEOG	M2	200	0.3	35	
2	REOG_M1	EOG	REOG	M1	200	0.3	35	
3	C3-M2	EEG	C3	M2	200	0.3	35	
4	C4-M1	EEG	C4	M1	200	0.3	35	
5	O1-M2	EEG	O1	M2	200	0.3	35	
6	O2-M1	EEG	O2	M1	200	0.3	35	
7	Chin1-Chin2	EMG	Chin1	Chin2	200	10	70	Chin3 also collected and re-referenced when needed
8	EKG1-EKG2	EKG	EKG1	EKG2	200	0.3	35	

Grass Heritage System (2000-2009)

edf channel #	channelName	type	input1	input2	samplingRate	lowFilter	HighFilter	Comment
1	L EOG	EOG	LEOG	A2	100	0.3	30	
2	R EOG	EOG	REOG	A1	100	0.3	30	
3	L CENT	EEG	C3	A2	100	0.3	30	
4	R CENT	EEG	C4	A1	100	0.3	30	
5	L OCC	EEG	O1	A2	100	0.3	30	
6	R OCC	EEG	O2	A1	100	0.3	30	
7	Chin EMG	EMG	EMG 1	EMG 2	100	10	30	EMG 3 also collected and re-referenced when needed
8	ECG	EKG	ECG1	ECG2	100	3	30	

3) DATA ENTRY FORMS

- **A)** In Lab Questionnaire before the MSLT
- **B)** Sleep Log the week before the MSTL – one version for Research MSLT and one version for Clinical MSLT because they represent different days. Reminder that the Clinical MSLT happens after an overnight PSG and so there is no diary data that day.
- **C)** Stanford Sleepiness Scale
- **D)** MSLT Technician Data Sheet

A) In Lab Questionnaire before the MSLT

Scor Sleep Research Laboratory

Multiple Sleep Latency Test

Questionnaire

(Oracle Data Table: MSLT)

ID # (Subj_id)

1) At what time did you go to sleep and wake up over the last two days?

Last night: bedtime0 This morning: waketime0

Night before last: bedtime1 Yesterday morning: waketime1

2) Was your nights sleep as usual?

Last Night: (SLQ1)

a. __1__ Much Better
b. __2__ A little better
c. __3__ As usual
d. __4__ A little worse
e. __5__ Much worse

Night Before Last: (SLQ2)

a. __1__ Much Better
b. __2__ A little better
c. __3__ As usual
d. __4__ A little worse
e. __5__ Much worse

3) Are you feeling any discomfort today? ____ Yes _____ No (discomfort)

4) Did you have any coffee or other stimulants this a.m.? ___ Yes _____ No
(precoffee)

5) Will you be able to go until 4:30 p.m. today without having any coffee or drinks containing caffeine and/or without smoking cigarettes ½ hour before each nap? _____Yes _____ No
(postcoffee)

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B) Sleep Log the week before the MSTL – one version for Research MSLT and one version for Clinical MSLT because they represent different days. Reminder that the Clinical MSLT happens after an overnight PSG, so there is no diary data that day.

Research MSLT Sleep log (Table: MSLT) ID (Subj_id)

We would like to get an idea of your "normal" sleeping pattern to help us interpret your nap study. Please complete this sleep log for the week before your nap study. (Or as much as you can manage.)

Day	Example: Sunday August 12						
Time you work up	7:00 am	(waketime6)	(waketime5)	(waketime4)	(waketime3)	(waketime2)	(waketime1)
Any naps?	Yes	(naps_yn6)	(naps_yn5)	(naps_yn4)	(naps_yn3)	(naps_yn2)	(naps_yn1)
Time spent napping	30 minutes	(naptime6)	(naptime5)	(naptime4)	(naptime3)	(naptime2)	(naptime1)
Time you went to sleep	11:45 pm	(bedtime5)	(bedtime4)	(bedtime3)	(bedtime2)	(bedtime1)	(bedtime0)

Clinical MSLT Sleep log (Table: MSLT) ID (Subj_id)

We would like to get an idea of your "normal" sleeping pattern to help us interpret your nap study. Please complete this sleep log for the week before your nap study. (Or as much as you can manage.)

Day	Example: Sunday August 12						
Time you work up	7:00 am	(waketime7)	(waketime6)	(waketime5)	(waketime4)	(waketime3)	(waketime2)
Any naps?	Yes	(naps_yn7)	(naps_yn6)	(naps_yn5)	(naps_yn4)	(naps_yn3)	(naps_yn2)
Time spent napping	30 minutes	(naptime7)	(naptime6)	(naptime5)	(naptime4)	(naptime3)	(naptime2)
Time you went to sleep	11:45 pm	(bedtime6)	(bedtime5)	(bedtime4)	(bedtime3)	(bedtime2)	(bedtime1)

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C) Stanford Sleepiness Scale

CLINICAL MSLT/STANFORD SLEEPINESS SCALE **ID#** _subj_id__

(Table: MSLT) (Red indicates clinical_mslt only)

We would like you to rate how sleepy you feel right now. The scale ranges from 1 to 7, with 7 being the most sleepy. Please read the entire scale below and *check the level that best describes your current state of sleepiness:*

First Trial/Time: __ sleepy1 _____

1 ____ feeling active and vital; alert; wide awake

2 ____ could function at a high level, but not quite at peak; able to concentrate

3 ____ relaxed, awake, responsive, but not at full alertness

4 ____ a little foggy, not at peak, let down

5 ____ fogginess, beginning to lose interest in staying awake; slowed down

6 ____ sleepiness; prefer to be lying down; fighting sleep; woozy

7 ____ almost in reverie; sleep onset soon; losing struggle to remain awake

Second Trial/Time: __ sleepy2 _____

1 ____ feeling active and vital; alert; wide awake

2 ____ could function at a high level, but not quite at peak; able to concentrate

3 ____ relaxed, awake, responsive, but not at full alertness

4 ____ a little foggy, not at peak, let down

5 ____ fogginess, beginning to lose interest in staying awake; slowed down

6 ____ sleepiness; prefer to be lying down; fighting sleep; woozy

7 ____ almost in reverie; sleep onset soon; losing struggle to remain awake

Third Trial/Time: __ sleepy3 _____

1 ____ feeling active and vital; alert; wide awake

2 ____ could function at a high level, but not quite at peak; able to concentrate

3 ____ relaxed, awake, responsive, but not at full alertness

4 ____ a little foggy, not at peak, let down

5 ____ fogginess, beginning to lose interest in staying awake; slowed down

6 ____ sleepiness; prefer to be lying down; fighting sleep; woozy

7 ____ almost in reverie; sleep onset soon; losing struggle to remain awake

Fourth Trial/Time: __ sleepy4 _____

1 ____ feeling active and vital; alert; wide awake

2 ____ could function at a high level, but not quite at peak; able to concentrate

3 ____ relaxed, awake, responsive, but not at full alertness

4 ____ a little foggy, not at peak, let down

5 ____ fogginess, beginning to lose interest in staying awake; slowed down

6 ____ sleepiness; prefer to be lying down; fighting sleep; woozy

7 ____ almost in reverie; sleep onset soon; losing struggle to remain awake

Fifth Trial/Time: __ sleepy5 _____

1 ____ feeling active and vital; alert; wide awake

2 ____ could function at a high level, but not quite at peak; able to concentrate

3 ____ relaxed, awake, responsive, but not at full alertness

4 ____ a little foggy, not at peak, let down

5 ____ fogginess, beginning to lose interest in staying awake; slowed down

6 ____ sleepiness; prefer to be lying down; fighting sleep; woozy

7 ____ almost in reverie; sleep onset soon; losing struggle to remain awake

During the day today did you take any over-the-counter or prescription drugs? YES NO
(mslt_drugs_yn)

If yes, please list the name of each one: ____ (available upon request) _____

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D) MSLT Technician Data Sheet

Multiple Sleep Latency Test-Data sheet (TABLE: MSLT)

(Those items in RED are only gathered during a clinical MSLT)

ID# ____SUBJ_ID ___ Recorded by: _____

Date: __MSLT_DATE _____ Scorers: _____/_____

CLINICAL_MSLT {= Y if clinical MSLT, = N if research MSLT}

Volunteers are monitored during four twenty minute opportunities to sleep, at approximately two hour intervals. For each nap, the volunteer is allowed 20 minutes to fall asleep. The trial is ended when either of the following occur:

1) 15 minutes after the 1st epoch of sleep (clinical); or;

1) 3 epochs of continuous stage 1 or 1 epoch of any other sleep stage (research); or;

2) the end of minute 20, even if no sleep occurred.

Nap time	Sleep Latency (minute to sleep onset) Scorer 1	Scorer 2	Latency to REM	Epoch#	Did volunteer report sleep? (If yes, how long to sleep onset?)
nap1_time	nap1_sl1	nap1_sl2	nap1_rem	not entered	nap1_sleep (Y/N)
nap2_time	nap2_sl1	nap2_sl2	nap2_rem	not entered	nap2_sleep (Y/N)
nap3_time	nap3_sl1	nap3_sl2	nap3_rem	not entered	nap3_sleep (Y/N)
nap4_time	nap4_sl1	nap4_sl2	nap4_rem	not entered	nap4_sleep (Y/N)
nap5_time	nap5_sl5	nap5_sl2	nap5_rem	not entered	nap5_sleep (Y/N)

(If during nap1-nap4 there is no occurrence of a latency to REM, nap5 will not be conducted)

Sum of Sleep Latencies: _____

Mean Sleep Latency: _____

Data confirmed by: _____

Comments: _____

_____

(The following items in RED were only gathered during a clinical MSLT.)

Nap1 Nap2 Nap3 Nap4 Nap5

Indicate Y or N

Smoked cigarettes?

nap1_smoke_yn nap2_smoke_yn nap3_smoke_yn nap4_smoke_yn nap5_smoke_yn

If yes, enter time:

nap1_smoke_time nap2_smoke_time nap3_smoke_time nap4_smoke_time nap5_smoke_time

nap1_smoke_time2 nap2_smoke_time2 nap3_smoke_time2 nap4_smoke_time2 nap5_smoke_time2

nap1_smoke_time3 nap2_smoke_time3 nap3_smoke_time3 nap4_smoke_time3 nap5_smoke_time3

nap1_smoke_time4 nap2_smoke_time4 nap3_smoke_time4 nap4_smoke_time4 nap5_smoke_time4

Drank caffeine?

nap1_caffeine_yn nap2_caffeine_yn nap3_caffeine_yn nap4_caffeine_yn nap5_caffeine_yn

If yes, enter #cups:

nap1_caffeine_cups nap2_caffeine_cups nap3_caffeine_cups nap4_caffeine_cups nap5_caffeine_cups

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