

Supplementary Information

The impact of frequent napping and nap practice on sleep-dependent memory in humans

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SUPPLEMENTARY TABLES

Supplementary Table 1. Sample characteristics.

	Visit 1 Baseline	Nap Practice	Nap Restriction
NAP+	N=26 (16 F) Age=21.0 ± 2.4 yrs ESS=5.9 ± 1.9 rMEQ=14.7 ± 3.6	N=11 (7 F) Age=20.8 ± 2.3 yrs ESS=6.2 ± 2.1 rMEQ=14.5 ± 3.6	N=9 (6 F) Age=20.9 ± 2.3 yrs ESS=6.0 ± 2.3 rMEQ=15.2 ± 3.7
NAP-	N=22 (13 F) Age=22.4 ± 3.7 yrs ESS=6.1 ± 1.8 rMEQ=14.1 ± 3.6	N=10 (7 F) Age=22.9 ± 3.7 yrs ESS=5.9 ± 2.2 rMEQ=14.1 ± 3.5	N=10 (5 F) Age=22.6 ± 3.8 yrs ESS=6.3 ± 1.7 rMEQ=14.2 ± 3.6
Wake	N=21 (13 F) Age=19.1 ± 1.2 yrs ESS=6.6 ± 2.5 rMEQ=12.7 ± 3.1	--	--

Visit 1 baseline data are for all participants included in the Visit 1 baseline analyses; Nap Practice and Restriction columns are the participants who completed all three visits. ESS = Epworth Sleepiness Scale; rMEQ = reduced Morningness-Eveningness Questionnaire. Values (except *N*) are *M* ± *SD*.

Supplementary Table 2. Visit 1 nap polysomnography sleep variables.

	NAP+	NAP-	Statistic
TST (min)	82.9 (18.6)	82.3 (17.9)	$t_{46}=-0.11, p=.91$
Stage 1 (min)	8.0 (5.0)	7.2 (4.1)	$t_{46}=-0.58, p=.57$
Stage 2 (min)	41.1 (14.4)	37.5 (12.0)	$t_{46}=-0.91, p=.37$
SWS (min)	20.4 (10.9)	24.8 (3.7)	$t_{46}=1.04, p=.31$
REM (min)	13.5 (9.8)	12.8 (2.4)	$t_{46}=-0.24, p=.82$
SL (min)	7.4 (8.9)	5.3 (0.87)	$t_{46}=-1.03, p=.31$
WASO (min)	12.9 (15.3)	13.5 (3.9)	$t_{46}=0.12, p=.91$
SE (%)	80.2 (19.1)	81.7 (4.0)	$t_{46}=0.28, p=.78$

TST = total sleep time; SWS = slow wave sleep; REM = rapid eye movement; SL = sleep latency; WASO = wake after sleep onset; SE = sleep efficiency. Values are M (SD).

Supplementary Table 3. Visit 1 prior night's sleep actigraphy variables.

	NAP+	NAP-	Statistic
TST (min)	370.4 (50.6)	389.7 (47.2)	$t_{41}=1.28, p=.21$
SL (min)	13.1 (12.3)	8.1 (12.3)	$t_{41}=-1.33, p=.19$
WASO (min)	57.2 (30.2)	61.2 (30.9)	$t_{41}=0.43, p=.67$
SE (%)	84.1 (7.2)	85.0 (6.8)	$t_{41}=0.43, p=.67$

These are data from one night prior to Visit 1. There were no differences between groups for any actigraphy variable. TST = total sleep time; SL = sleep latency; WASO = wake after sleep onset; SE = sleep efficiency. Values are $M (SD)$.

Supplementary Table 4. Weekly nighttime sleep in each group across the five-week study.

	Practice					Restriction				
	BL	W1	W2	W3	W4	BL	W1	W2	W3	W4
NAP+										
TST (min)	386.0 (32.9)	379.9 (48.3)	376.6 (36.8)	375.3 (48.4)	388.4 (44.1)	362.3 (30.2)	357.8 (47.4)	387.9 (42.6)	379.7 (52.6)	379.0 (27.5)
SL (min)	9.1 (6.2)	14.6 (7.3)	9.0 (5.4)	12.6 (12.7)	10.6 (5.6)	15.7 (8.2)	14.0 (9.6)	10.9 (7.4)	14.1 (15.4)	18.8 (14.3)
WASO (min)	56.7 (18.7)	53.5 (11.1)	51.1 (11.9)	51.0 (19.6)	52.4 (13.0)	81.4 (30.0)	89.4 (47.8)	80.4 (15.5)	79.5 (23.7)	78.4 (19.2)
SE (%)	85.6 (4.8)	84.7 (2.8)	86.5 (2.4)	84.7 (6.5)	85.9 (3.1)	78.9 (6.4)	77.8 (10.4)	80.8 (3.4)	80.1 (6.6)	79.3 (4.9)
NAP-										
TST (min)	410.2 (37.1)	396.3 (60.7)	398.6 (34.1)	386.2 (45.7)	393.7 (52.7)	406.7 (32.5)	399.1 (44.4)	395.7 (46.4)	382.8 (39.2)	388.7 (39.9)
SL (min)	10.1 (7.5)	8.0 (8.1)	6.8 (5.0)	10.4 (8.8)	11.6 (10.1)	11.0 (7.2)	9.6 (3.9)	12.5 (6.8)	12.3 (13.7)	10.6 (6.2)
WASO (min)	56.0 (11.5)	61.9 (15.2)	59.6 (17.0)	58.2 (17.0)	62.8 (17.2)	65.2 (23.6)	63.9 (27.7)	60.7 (17.3)	63.3 (23.1)	67.3 (18.6)
SE (%)	86.2 (2.1)	84.7 (3.0)	85.9 (3.2)	84.7 (3.4)	84.2 (3.4)	84.3 (5.2)	84.3 (5.7)	84.4 (4.6)	83.4 (5.2)	83.3 (5.0)

These data were computed by first averaging nightly actigraphy data by week (BL, W1, W2, etc.) within each participant, then averaging those values across participants within the four groups. Only data from participants who completed all three visits are included in this table. The *N* included in each cell varies and may not represent the same subset of participants since actigraphs frequently malfunctioned. For example, participant 5 might be missing data for W1, and participant 8 is missing data for W3. For this reason, we did not calculate inferential statistics for these data; this table is meant to be purely descriptive. TST = total sleep time; SL = sleep latency; WASO = wake after sleep onset; SE = sleep efficiency. Values are *M* (*SD*).

Supplementary Table 5. Nap polysomnography sleep variables across three visits.

	Visit 1		Visit 2		Visit 3	
	Practice	Restriction	Practice	Restriction	Practice	Restriction
NAP+						
TST (min)	87.2 (16.9)	86.5 (9.1)	91.6 (11.7)	78.4 (26.6)	91.0 (16.0)	93.6 (4.9)
Stage 1 (min)	6.4 (4.0)	10.6 (5.5)	6.3 (4.2)	10.3 (7.7)	5.6 (4.2)	11.5 (6.2)
Stage 2 (min)	40.4 (12.2)	45.4 (9.1)	38.0 (14.3)	41.9 (14.0)	37.1 (17.8)	45.3 (17.2)
SWS (min)	23.3 (11.7)	16.6 (9.6)	26.0 (12.9)	11.7 (10.4)	28.7 (16.6)	21.8 (17.7)
REM (min)	17.1 (6.8)	13.9 (12.1)	21.2 (14.3)	14.6 (8.4)	19.5 (12.0)	15.0 (8.9)
SL (min)	4.4 (4.2)	7.3 (4.8)	5.3 (9.2)	2.6 (2.1)	1.4 (1.4)	3.2 (2.4)
WASO (min)	8.1 (17.2)	15.5 (13.1)	4.0 (4.9)	12.8 (14.5)	6.8 (11.0)	7.2 (5.4)
SE (%)	87.3 (18.0)	79.3 (12.3)	90.8 (11.0)	80.4 (25.7)	91.3 (13.4)	90.2 (5.6)
NAP-						
TST (min)	83.0 (20.1)	80.4 (18.1)	92.6 (10.5)	82.7 (22.8)	83.4 (26.9)	84.2 (19.7)
Stage 1 (min)	6.8 (3.4)	7.9 (4.9)	6.8 (3.4)	4.9 (2.5)	7.0 (4.0)	7.6 (3.4)
Stage 2 (min)	36.8 (13.8)	37.4 (11.3)	41.6 (14.0)	44.8 (15.1)	42.8 (17.1)	44.2 (17.8)
SWS (min)	28.8 (17.5)	20.2 (17.9)	26.8 (19.7)	19.7 (18.6)	17.7 (13.3)	21.7 (18.4)
REM (min)	10.6 (9.3)	14.9 (13.7)	17.4 (9.6)	13.4 (12.5)	16.0 (9.9)	10.8 (9.0)
SL (min)	4.0 (3.0)	6.7 (5.0)	5.2 (4.7)	4.7 (2.3)	4.2 (7.2)	7.8 (9.2)
WASO (min)	12.0 (17.5)	16.3 (21.4)	5.6 (6.8)	10.8 (10.8)	11.3 (20.4)	10.5 (11.6)
SE (%)	83.6 (18.8)	78.5 (21.4)	89.7 (9.2)	82.6 (17.2)	84.4 (27.0)	81.9 (18.1)

Only data from participants who completed all three visits are included in this table. One nap+ participant in the Practice group did not have PSG data recorded during Visit 2 due to technical failure. TST = total sleep time; SWS = slow wave sleep; REM = rapid eye movement; SL = sleep latency; WASO = wake after sleep onset; SE = sleep efficiency. Values are *M* (*SD*).