

## SUPPLEMENTARY DATA

**Supplementary Table S1.** Missing patterns among 810 participants with baseline assessment of sleep disturbances over 2 years

Baseline	6 months	12 months	18 months	24 months	N	Percent
X	X	X	X	X	511	63.09
X	X	X	X	.	43	5.31
X	X	X	.	X	41	5.06
X	X	X	.	.	39	4.81
X	X	.	X	X	3	0.37
X	X	.	X	.	4	0.49
X	X	.	.	X	19	2.35
X	X	.	.	.	50	6.17
X	.	X	X	X	3	0.37
X	.	X	X	.	2	0.25
X	.	X	.	X	2	0.25
X	.	X	.	.	7	0.86
X	.	.	X	X	7	0.86
X	.	.	.	X	18	2.22
X	.	.	.	.	61	7.53

X indicates that the assessment is completed

. indicates that the assessment is missing

**Supplementary Table S2. Overall Changes ( $\Delta$ ) in obesity measurements and energy expenditure from baseline to 6 months and from 6 months to 24 months according to sleep disturbance**

Outcomes	Not at all	Slight	Moderate	Great	P for trend
<b>0-6 months</b>					
$\Delta$ total fat (g)	-3877.76 (1108.26)	-2977.75 (1113.32)	-2316.05 (1258.05)	-2490.77 (1399.72)	<b>0.02</b>
$\Delta$ total lean (g)	-2187.36 (576.22)	-1946.20 (578.41)	-1360.08 (654.06)	-1531.17 (728.87)	<b>0.04</b>
$\Delta$ total fat mass (%)	-1.87 (0.77)	-1.27 (0.77)	-1.16 (0.87)	-0.97 (0.97)	<b>0.04</b>
$\Delta$ trunk fat (%)	-2.74 (1.02)	-1.85 (1.03)	-1.80 (1.17)	-1.74 (1.29)	<b>0.05</b>
<b>Δ Adipose tissue mass</b>					
$\Delta$ Deep subcutaneous	-0.88 (0.36)	-0.84 (0.33)	-0.66 (0.41)	-0.07 (0.44)	<b>0.05</b>
$\Delta$ Superficial	-1.25 (0.57)	-1.42 (0.54)	-0.71 (0.66)	-0.26 (0.74)	0.16
$\Delta$ Visceral	-0.76 (0.41)	-0.67 (0.38)	-0.70 (0.47)	-0.65 (0.49)	0.71
$\Delta$ Total	-2.00 (0.95)	-2.12 (0.90)	-1.30 (1.12)	-1.01 (1.22)	0.33
$\Delta$ REE	-12.79 (17.60)	3.36 (18.06)	-0.86 (21.72)	17.68 (25.24)	0.10
<b>6-24 months</b>					
$\Delta$ total fat (g)	549.05 (1069.48)	999.86 (1053.95)	2048.13 (1246.03)	2468.24 (1511.21)	<b>0.02</b>
$\Delta$ total lean (g)	530.64 (627.29)	392.77 (617.82)	386.55 (733.06)	441.88 (882.34)	0.70
$\Delta$ total fat mass(%)	0.33 (0.69)	0.66 (0.68)	1.60 (0.80)	1.62 (0.97)	<b>0.006</b>
$\Delta$ trunk fat (%)	0.22 (0.86)	0.57 (0.85)	1.83 (1.01)	2.12 (1.22)	<b>0.004</b>
<b>Δ Adipose tissue mass</b>					
$\Delta$ Deep subcutaneous	0.55 (0.32)	0.55 (0.33)	0.74 (0.40)	1.05 (0.60)	0.36
$\Delta$ Superficial	1.09 (0.47)	1.37 (0.48)	1.61 (0.61)	0.97 (0.89)	0.31
$\Delta$ Visceral	0.61 (0.33)	0.63 (0.34)	0.63 (0.41)	0.80 (0.62)	0.79
$\Delta$ Total	1.69 (0.76)	2.12 (0.76)	2.31 (0.97)	1.98 (1.43)	0.30
$\Delta$ REE	76.65 (27.15)	58.46 (28.71)	46.90 (34.09)	57.41 (42.96)	0.28
<b>6-24 months among successful weight losers (n=421)</b>					
$\Delta$ total fat (g)	-361.67 (1003.73)	-43.57 (1035.55)	1534.85 (1302.50)	3357.56 (1779.36)	<b>0.02</b>
$\Delta$ total lean (g)	429.94 (527.52)	203.38 (543.79)	466.91 (683.01)	1490.02 (951.17)	0.76
$\Delta$ total fat mass(%)	-0.48 (0.66)	-0.21 (0.68)	1.11 (0.85)	1.51 (1.17)	<b>0.01</b>
$\Delta$ trunk fat (%)	-0.39 (0.83)	-0.15 (0.86)	1.40 (1.07)	2.32 (1.48)	<b>0.02</b>
<b>Δ Adipose tissue mass</b>					
$\Delta$ Deep subcutaneous	0.44 (0.41)	0.42 (0.46)	0.60 (0.51)	1.07 (0.74)	0.48
$\Delta$ Superficial	1.90 (0.66)	2.17 (0.72)	2.33 (0.80)	2.26 (1.13)	0.31
$\Delta$ Visceral	0.47 (0.44)	0.63 (0.49)	0.56 (0.54)	0.64 (0.78)	0.57
$\Delta$ Total	2.68 (1.09)	3.24 (1.19)	3.24 (1.32)	3.28 (1.87)	0.32
$\Delta$ REE	30.53 (36.20)	30.03 (39.11)	19.94 (43.60)	43.01 (55.21)	0.96

Data are least square means (SE). Tests for linear trend across categories of sleep disturbance were performed by modeling an ordinal variable for each sleep category

Generalized Linear Model adjusted for age, gender, ethnicity, diet, BMI, physical activity score and the respective variable at previous assessment

**Supplementary Table S3. Weight loss outcomes after respectively accounting for each mediator from 0-6 months using new sleep disturbance category (n=648)**

Effects	B (SE)*	
<b>Total effect sleep disturbance → weight loss</b>	<b>-1.63 (0.34)</b>	
<b>Through mediation variables (analyzed respectively)</b>	<b>Direct effect B (SE)*</b>	<b>Indirect effect through mediators B ( SE)*†</b>
<b>Food Craving Index</b>		
_Craving carbohydrates/starches	<b>-1.51 (0.34)</b>	<b>-0.11 (0.06)</b>
_Craving fast-food fats	<b>-1.54 (0.34)</b>	<b>-0.08 (0.05)</b>
_Craving fruits and vegetables	<b>-1.58 (0.34)</b>	-0.04 (0.04)
_Craving high fat foods	<b>-1.60 (0.34)</b>	-0.03 (0.04)
_Craving sweets	<b>-1.54 (0.34)</b>	<b>-0.09 (0.06)</b>
_FCI total score	<b>-1.50 (0.34)</b>	<b>-0.13 (0.06)</b>
<b>Appetite</b>		
_Craving	<b>-1.51 (0.34)</b>	<b>-0.12 (0.06)</b>
_Fullness	<b>-1.58 (0.34)</b>	-0.04 (0.04)
_Prospective consumption	<b>-1.57 (0.34)</b>	<b>-0.06 (0.04)</b>
_Hunger	<b>-1.49 (0.34)</b>	<b>-0.14 (0.07)</b>
_Total appetite score	<b>-1.41 (0.34)</b>	<b>-0.21 (0.08)</b>
<b>Three Factor Eating Questionnaire</b>		
_Cognitive Restraint of Eating Subscale	<b>-1.43 (0.32)</b>	-0.20 (0.12)
_Disinhibition Subscale	<b>-1.18 (0.33)</b>	<b>-0.44 (0.12)</b>
_Hunger Subscale	<b>-1.28 (0.34)</b>	<b>-0.34 (0.10)</b>
FCI total score + Appetite score+ Three Factor Eating Questionnaire	<b>-1.04 (0.32)</b>	<b>-0.58 (0.17)</b>

\* Adjusted for age, gender, ethnicity, diet, physical activity score and baseline BMI. Sleep disturbance is coded as an ordinal variable (0, 1, 2), indicating no, slight or moderate, and great sleep disturbance

† Indirect effect calculated through bootstrap. Standard errors (SE) are reported. Bold type refers to statistically significant mediation effects with 95% confidence

FCI Food craving index

**Supplementary Table S4. Spearman Rank Correlation among behavioral and psychological factors at 6 months**

	Craving carbohydrates/starches	Craving fast-food fats	Craving fruits and vegetables	Craving high fat foods	Craving sweets	FCI total score	Craving	Fullness	Prospective consumption	Hunger	Total appet score
ing carbohydrate	1.00	0.46***	0.66***	0.58***	0.43***	0.86***	0.21***	-0.09*	0.07	0.14***	0.20*
ching fast-fats		0.46***	1.00	0.23***	0.57***	0.49***	0.67***	0.25***	-0.12**	0.18***	0.20***
ing fruits			0.66***	0.23***	1.00	0.39***	0.21***	0.67***	0.07	-0.03	0.005
etables										0.07	0.06
ing high foods				0.58***	0.57***	0.39***	1.00	0.42***	0.77***	0.19***	-0.05
ing sweets					0.43***	0.49***	0.21***	0.42***	1.00	0.71***	0.39***
total e						0.86***	0.67***	0.67***		0.30***	-0.12**
ing							0.21***	0.25***	0.07	0.30***	1.00
ness								-0.09*	-0.12**	-0.17***	-0.17***
pective consumption									-0.05	-0.12**	0.22***
ger									-0.05	0.24***	0.72*
al appetit e										-0.36***	-0.55*
nitive restraint of											0.46*
ng scale											
inhibition scale											0.40*
nger scale											

Values were adjusted for age, gender, ethnicity, diet, physical activity score and baseline BMI.

\* $P<0.05$ ;

\*\* $P<0.01$ ;

\*\*\* $P<0.001$



ID# \_\_\_\_\_

Date: \_\_\_\_\_

**Visit:**

- Month 6   
Month 12   
Month 18   
Month 24

## Symptoms Checklist

We want to know how you felt since last visit. Please indicate the extent to which you experienced the following from last visit till now. Check the appropriate box on the right-hand side of the page.

	NOT AT ALL	SLIGHT AMOUNT	MODERATE AMOUNT	GREAT AMOUNT
<b>To what extent did you feel:</b>				
1. Energetic				
2. Sluggish/Tired				
<b>To what extent did you have any trouble with:</b>				
3. Bad Breath				
4. Constipation				
5. Diarrhea				
6. Dizziness				
7. Drowsiness				
8. Dry Mouth				
9. Dry Skin				
10. Feeling Cold				
11. Feeling Sad/Blue				
12. Feeling Tense				
13. Forgetfulness / poor memory				
14. Headache				
15. Light Headedness				
16. Metallic Taste				
17. Nervousness				
18. Nausea				
19. Shortness of Breath				
20. Sleep Disturbance (trouble falling asleep or staying awake at night)				
21. Stomach Pain				
22. Weakness/Fatigue				
23. Painful Urination				
24. Leg Cramps				
25. Hair Loss				
26. Heart Palpitations				

27. Other symptoms (specify):\_\_\_\_\_

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ID# \_\_\_\_\_

**Tobacco Usage**

28. Do you currently smoke cigarettes?..... Yes  1  
No  2

If yes, how many cigarettes do you smoke per day?..... \_\_\_\_\_ cigarettes

29. Do you currently smoke a cigar / pipe?..... Yes  1  
No  2

If yes, how many cigars / pipefuls of tobacco do you smoke per day?..... \_\_\_\_\_  
cigars / pipefuls  
of tobacco

Reviewed by (staff ID):\_\_\_\_\_

Entered by (staff ID):\_\_\_\_\_