"The bidirectional association between physical activity and sleep in middle-aged and older adults: a prospective study based on polysomnography" – SUPPLEMENTAL MATERIAL

Table S1. Beta-coefficients[a] (Standard error) of sleep outcomes and of changes in sleep parameters by continuous physical activity at baseline and change in physical activity during the follow-up.

PA at baseline (MET-minutes/week)	TST < 6h	SOL > 10 min	WASO > 60 min	Sleep efficiency < 80%	% TST in N1 < 10%	% TST in N2 < 65%	% TST in N3 < 10%	% TST in REM < 15%
Unadjusted model								
Continuous PA at baseline	-0.003 (0.005)	-0.003 (0.003)	-0.002 (0.003)	0.001 (0.003)	-0.003 (0.005)	0.0003 (004)	0.0002 (0.004)	0.0004 (0.004)
Continuous change in PA	0.004 (0.004)	0.002 (0.003)	0.002 (0.003)	0.001 (0.004)	-0.005 (0.004)	-0.005 (0.005)	0.004 (0.003)	-0.005 (0.003)
Model 1								
Continuous PA at baseline	-0.004 (0.005)	-0.003 (0.003)	-0.003 (0.003)	0.001 (0.003)	-0.0001 (0.004)	0.003 (0.004)	-0.0008 (0.004)	0.002 (0.003)
Continuous change in PA	0.003 (0.003)	0.002 (0.003)	0.001 (0.003)	0.0001 (0.004)	-0.005 (0.004)	-0.007 (0.005)	0.005 (0.003)	-0.006 (0.003)
Model 2								
Continuous PA at baseline	-0.007 (0.006)	-0.003 (0.003)	-0.004 (0.003)	0.0002 (0.003)	-0.001 (0.004)	0.003 (0.004)	0.001 (0.005)	0.003 (0.003)
Continuous change in PA	0.003 (0.003)	0.001 (0.003)	0.001 (0.003)	-0.0001 (0.004)	-0.005 (0.004)	-0.005 (0.006)	0.006 (0.003)	-0.005 (0.003)
	TST change	**SOL change**	**WASO change**	**Sleep efficiency change**	**% TST in N1 change**	**% TST in N2 change**	**% TST in N3 change**	**% TST in REM change**
Unadjusted model								
Continuous PA at baseline	-0.0006 (0.002)	-0.04 (0.04)	0.13 (0.08)	-0.02 (0.02)	0.002 (0.01)	-0.004 (0.02)	-0.008 (0.01)	0.009 (0.01)
Continuous change in PA	-0.001 (0.002)	0.005 (0.04)	0.05 (0.09)	-0.02 (0.02)	0.01 (0.01)	-0.009 (0.02)	-0.0003 (0.01)	-0.005 (0.01)
Model 1								
Continuous PA at baseline	-0.0006 (0.002)	-0.03 (0.04)	0.11 (0.09)	-0.02 (0.02)	-0.0008 (0.01)	0.007 (0.02)	-0.01 (0.01)	0.006 (0.01)
Continuous change in PA	-0.001 (0.002)	0.004 (0.04)	0.04 (0.09)	-0.01 (0.02)	0.02 (0.01)	-0.003 (0.02)	-0.006 (0.01)	-0.008 (0.01)
Model 2								
Continuous PA at baseline	-0.0006 (0.002)	-0.001 (0.04)	0.06 (0.09)	-0.01 (0.02)	-0.005 (0.01)	0.006 (0.02)	-0.01 (0.01)	0.01 (0.01)
Continuous change in PA	-0.001 (0.002)	-0.002 (0.04)	0.03 (0.09)	-0.01 (0.02)	0.02 (0.01)	-0.007 (0.02)	-0.003 (0.01)	-0.007 (0.01)

CI: confidence interval; **N1, N2, N3**: sleep stages; **PA**: physical activity; **REM**: rapid eye movement sleep stage; **RR**: relative risk; **SOL**: sleep onset latency; **TST**: total sleep time; **WASO**: wake after sleep onset.
[a] Beta-coefficients obtained with mixed-effect models adjusted by the covariates indicated for each model.
Model 1: Adjusted by age (y), sex (male *vs.* female), educational level (thru high-school *vs.* some college), marital status (married *vs.* not married), current smoker (no *vs.* yes), alcohol intake (drinks/week), follow-up time (y) and by the difference in time between physical activity and sleep information (y) at baseline.
Model 2: Adjusted by the same variables in Model 1 and by baseline BMI (kg/m^2), change in BMI over the follow-up (kg/m^2), self-rated health (excellent or very good *vs.* good, fair or poor), depression (no depression symptoms *vs.* depression symptoms or current use of antidepressants), baseline apnea-hypopnea index and Continuous Positive Airway Pressure use at baseline polysomnography.

Table S2. Beta-coefficients[a] (Standard error) of changes in physical activity by continuous values for sleep parameters at baseline and continuous changes in sleep parameters during the follow-up.

Sleep condition (exposure)	Continuous change in PA (MET-minutes/week)	Proportional change in PA (%)
TST (hours)		
Continuous TST at baseline	0.31 (1.39)	-22.6 (35.0)
Continuous change in TST	-0.56 (1.18)	-8.76 (29.8)
SOL (minutes)		
Continuous SOL at baseline	-0.002 (0.08)	-1.91 (2.09)
Continuous change in SOL	-0.002 (0.06)	0.19 (1.46)
WASO (minutes)		
Continuous WASO at baseline	-0.02 (0.03)	0.43 (0.83)
Continuous change in WASO	0.009 (0.03)	-0.28 (0.70)
Sleep efficiency (%)		
Continuous efficiency at baseline	0.09 (0.13)	-1.46 (3.30)
Continuous change in efficiency	-0.05 (0.11)	0.69 (2.87)
TST in N1 sleep (%)		
Continuous % in N1 at baseline	-0.35 (0.21)	0.88 (5.35)
Continuous change in % in N1	0.25 (0.19)	1.03 (4.74)
TST in N2 sleep (%)		
Continuous % in N2 at baseline	-0.02 (0.13)	-1.27 (3.41)
Continuous change in % in N2	-0.05 (0.13)	-2.72 (3.28)
TST in N3 sleep (%)		
Continuous % in N3 at baseline	0.11 (0.15)	-2.11 (3.84)
Continuous change in % in N3	-0.05 (0.19)	1.81 (4.77)
TST in REM (%)		
Continuous % in REM at baseline	0.17 (0.21)	6.60 (5.41)
Continuous change in % in REM	-0.10 (0.18)	2.57 (4.53)

CI: confidence interval; **N1, N2, N3**: sleep stages; **PA**: physical activity; **REM**: rapid eye movement sleep stage; **RR**: relative risk; **SOL**: sleep onset latency; **TST**: total sleep time; **WASO**: wake after sleep onset.

[a] Beta-coefficients obtained with mixed-effect models adjusted by age (y), sex (male *vs.* female), educational level (thru high-school *vs.* some college), marital status (married *vs.* not married), current smoker (no *vs.* yes), alcohol intake (drinks/week), follow-up time (y), difference in time between physical activity and sleep information (y) at baseline, baseline BMI (kg/m^2), change in BMI over the follow-up (kg/m^2), self-rated health (excellent or very good *vs.* good, fair or poor), depression (no depression symptoms *vs.* depression symptoms or current use of antidepressants), baseline apnea-hypopnea index and Continuous Positive Airway Pressure use at baseline polysomnography.