

Table S1. Compositional Linear Models Showing the Association between Time Spent in Different Physical behaviours And Metabolic Biomarkers: Alternative definitions of sleep.

	Sleep	Sitting	Standing	Stepping	Model fit (R ²)
Model 2a					
Fasting glucose	1.02 (0.96; 1.08)	0.99 (0.93; 1.05)	1.03 (0.99; 1.07)	0.96 (0.92; 1.00)	0.01
Fasting insulin	1.02 (0.96; 1.08)	1.15 (0.91; 1.45)	0.98 (0.79; 1.22)	0.87 (0.70; 1.08)	0.14
Two-hour glucose	0.99 (0.86; 1.14)	1.07 (0.95; 1.21)	1.13† (1.02; 1.24)	0.84** (0.76; 0.93)	0.06
Two-hour insulin	1.12 (0.67; 1.86)	1.31 (0.87; 1.98)	1.14 (0.79; 1.65)	0.61* (0.43; 0.86)	0.10
HOMA-IS	1.03 (0.75; 1.41)	1.36 (1.06; 1.76)	1.11 (0.87; 1.40)	0.58 (0.65; 1.05)	0.14
Matsuda-ISI	1.00 (0.68; 1.48)	0.77 (0.57; 1.03)	0.93 (0.71; 1.23)	1.40† (1.07; 1.85)	0.12
Model 2b					
Fasting glucose	1.01 (0.97; 1.52)	1.00 (0.96; 1.04)	1.03 (0.99; 1.07)	1.03 (0.99; 1.07)	0.01
Fasting insulin	1.03 (0.81; 1.30)	1.16 (0.97; 1.39)	0.97 (0.78; 1.20)	0.85 (0.69; 1.06)	0.15
Two-hour glucose	0.99 (0.88; 1.11)	1.11† (1.02; 1.19)	1.12† (1.01; 1.23)	0.83** (0.75; 0.91)	0.07
Two-hour insulin	1.14 (0.75; 1.72)	1.36 (1.00; 1.87)	1.11 (0.76; 1.60)	0.58* (0.41; 0.82)	0.11
HOMA-IS	1.04 (0.81; 1.34)	1.17 (0.96; 1.43)	1.00 (0.79; 1.26)	0.81 (0.62; 1.00)	0.14
Matsuda-ISI	0.98 (0.72; 1.34)	0.74† (0.59; 0.94)	0.95 (0.72; 1.25)	1.46* (1.11; 1.92)	0.13

Results for each physical behaviour represent the association for time spent in each movement behavior relative to all other behaviours. Adjusted for age, sex, ethnicity, smoking status, β -blocker use, statin use, family history of diabetes and BMI. Significance levels: $p < 0.0001 = ***$, $p < 0.001 = **$, $p < 0.01 = *$, $p < 0.05 = \dagger$

Table S2. Compositional Linear Models Showing the Association between Time Spent in Different Physical behaviours And Markers of Insulin Sensitivity: Short Sleepers vs Long Sleepers.

	Sleep	Sitting	Standing	Stepping	Model fit (R ²)
Model 3a					
Short Sleepers					
HOMA-IS	1.31	0.85	0.84	1.01	0.01
(95% CI)	(0.63; 2.71)	(0.52; 1.39)	(0.58; 1.21)	(0.72; 1.41)	
Matsuda-ISI	1.21	0.82	0.77	1.31	0.06
(95% CI)	(0.52; 2.81)	(0.46; 1.45)	(0.50; 1.19)	(0.87; 1.98)	
Model 3b					
Long Sleepers					
HOMA-IS	0.81	0.82	1.14	1.31	0.21
(95% CI)	(0.38; 1.71)	(0.49; 1.36)	(0.78; 1.65)	(0.94; 1.83)	
Matsuda-ISI	0.85	0.74	1.04	1.52†	0.20
(95% CI)	(0.37; 1.98)	(0.42; 1.31)	(0.68; 1.60)	(1.05; 2.21)	

Results for each physical behaviour represent the association for time spent in each movement behavior relative to all other behaviours. Adjusted for age, sex, ethnicity, smoking status, β -blocker use, statin use, family history of diabetes and BMI. Significance levels: $p < 0.0001 = ***$, $p < 0.001 = **$, $p < 0.01 = *$, $p < 0.05 = †$

Table S3. Traditional Isotemporal Substitutions.

	Standing Sitting	to <i>p</i> value	Stepping sitting	to <i>p</i> value	Stepping standing	to <i>p</i> value
Model 4						
HOMA-IS	0.99	0.294	0.91	0.002	0.92	0.030
(95% CI)	(0.96; 1.01)		(0.85; 0.97)		(0.85; 0.99)	
Matsuda-ISI	0.99	0.481	0.86	<0.001	0.87	0.002
(95% CI)	(0.96; 1.02)		(0.80; 0.93)		(0.80; 0.95)	
Model 5						
HOMA-IS	0.99	0.546	0.95	0.078	0.96	0.206
(95% CI)	(0.97; 1.02)		(0.89; 1.01)		0.89; 1.03)	
Matsuda-ISI	0.99	0.786	0.89	0.002	0.90	0.012
(95% CI)	(0.98; 1.04)		(0.83; 0.96)		(0.82; 0.98)	
	Sitting to standing	<i>P</i> value	Sitting to stepping	<i>P</i> value	Standing to stepping	<i>P</i> value
Model 4						
HOMA-IS	1.01	0.294	1.10	0.002	1.09	0.030
(95% CI)	(0.99; 1.04)		(1.04; 1.17)		(1.01; 1.17)	
Matsuda-ISI	1.01	0.481	1.16	<0.001	1.15	0.002
(95% CI)	(0.98; 1.04)		(1.08; 1.24)		(1.05.; 1.25)	
Model 5						
HOMA-IS	1.01	0.546	1.06	0.078	1.05	0.206
(95% CI)	(0.98; 1.03)		(0.99; 1.12)		(0.97; 1.13)	
Matsuda-ISI	1.00	0.786	1.12	0.002	1.12	0.012
(95% CI)	(0.98; 1.03)		(1.04; 1.20)		(1.02; 1.21)	

Model 1 adjusted for age, sex, ethnicity, smoking status, beta-blocker use, statin use and family history of type 2 diabetes. Model 2 additionally adjusted BMI.