Table S1. BMI, body fat and waist circumference at baseline and intervention outcome visit and at post-intervention follow-up. VO₂max (ml/kg/min) at baseline and intervention outcome visit.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | **Baseline** | **Intervention outcome visit** |  | **Post-intervention Follow-up** |  |
| *Physiological parameters* |  |  | ***p*** |  | ***p*** |
| BMI (kg/m²) | 35.1 ± 2.8 | 34.8 ± 2.8 | 0.426 | 34.8 ± 2.8 | 0.694 |
|  | (33.5, 36.3) | (33.4, 36.2) |  | (33.4, 36.3) |  |
| Body fat (%) | 34.0 ± 3.2 | 33.3 ± 3.8 | 0.301 | 33.7 ± 3.5 | 0.911 |
|  | (31.8, 35.5) | (31.3, 35.30) |  | (31.9, 35.4) |  |
| Waist circumference (cm) | 118.5 ± 1.1 | 118.1 ± 1.1 | 0.999 | 118.2 ± 1.1 | 0.999 |
|  | (115.1, 122.2) | (114.3, 121,9) |  | (114.8, 121.6) |  |
| VO₂max (ml/kg/min) | 27.9 ± 4.1 | 29.4 ± 5.1 | **0.001** | X |  |
|  | (25.9, 29.9) | (27.0, 31.8) |  |  |  |

Repeated-measures analysis of variance (ANOVA) (BMI, body fat and waist circumference variables) at baseline and intervention outcome visit and at post-intervention follow-up and paired-sample t-test (VO₂max) at baseline and intervention outcome visit.

BMI = body mass index

VO₂max = maximum rate of oxygen consumption during incremental exercise

Data are displayed as mean ± standard deviation (CI).

P < 0.05 taken to indicate significance.

Table S2-a. GEE models for physical activity characteristics predicting sleep characteristics.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outcome:** | **Sleep onset** | | | **Sleep duration (min)** | | | | **Wake after sleep onset (min)** | | | | **Sleep efficiency (%)** | | | |
|  | b (95% CI) | *p* | | b (95% CI) | | *p* | | b (95% CI) | | | *p* | b (95% CI) | | | *p* |
| **Acceleration (m*g*)** | **-0.090** | **0.027** | | -0.021 | | 0.635 | | **0.131** | | | **0.001** | -0.041 | | | 0.191 |
|  | (-0.169, -0.010) |  | | (-0.109, 0.066) | |  | | (0.053, 0.208) | | |  | (-0.103, 0.021) | | |  |
| **M30CONT (m*g*)** | -0.020 | 0.637 | | -0.057 | | 0.246 | | **0.115** | | | **0.001** | 0.006 | | | 0.751 |
|  | (-0.101, 0.062) |  | | (-0.153, 0.039) | |  | | (0.048, 0.182) | | |  | (-0.031, 0.020) | | |  |
| **MVPA (min)** | **-0.087** | **0.001** | | -0.032 | | 0.345 | | **0.106** | | | **0.001** | 0.049 | | | 0.487 |
|  | (-0.138, 0.035) |  | | (-0.098, 0.034) | |  | | (0.050, 0.162) | | |  | (-0.089, 0.187) | | |  |
| **Light (min)** | 0.051 | 0.477 | | -0.053 | | 0.106 | | -0.075 | | | 0.084 | -0.037 | | | 0.335 |
|  | (-0.089, 0.190) |  | | (-0.117, 0.011) | |  | | (-0.160, 0.010) | | |  | (-0.112, 0.038) | | |  |
| Table S2-b. GEE models for sleep characteristics predicting physical activity characteristics. | | | | | | | | |  |  | |  |  |  | | |
| **Outcome:** | **Acceleration (m*g*)** | | | | **Most active 30 min (m*g*)** | | | **MVPA (min)** | | | | **Light (min)** | |  | | |
|  | b (95% CI) | | *p* | | b (95% CI) | | *p* | b (95% CI) | | *p* | | b (95% CI) | | *p* | | |
| **Sleep onset** | **-0.152** | | **0.006** | | **-0.180** | | **0.002** | **-0.066** | | **0.037** | | -0.054 | | 0.475 | | |
|  | (-0.259, -0.044) | |  | | (-0.297, -0.064) | |  | (-0.128, -0.004) | |  | | (-0.203, 0.094) | |  | | |
| **Sleep duration (min)** | -0.078 | | 0.169 | | -0.070 | | 0.141 | **-0.132** | | **0.001** | | **-0.016** | | **0.001** | | |
|  | (-0.189, 0.033) | |  | | (-0.164, 0.023) | |  | (-0.198, -0.066) | |  | | (-0.242, -0.078) | |  | | |
| **WASO (min)** | **0.269** | | **0.001** | | **0.206** | | **0.001** | **0.249** | | **0.001** | | -0.028 | | 0.547 | | |
|  | (0.185, 0.353) | |  | | (0.127, 0.291) | |  | (0.159, 0.339) | |  | | (-0.117, 0.062) | |  | | |
| **Sleep efficiency (%)** | **-0.250** | | **0.001** | | **-0.262** | | **0.001** | **-0.237** | | **0.001** | | 0.074 | | 0.118 | | |
|  | (-0.337, -0.164) | |  | | (-0.336, -0.189) | |  | (-0.297, -0.177) | |  | | (-0.019, 0.168) | |  | | |

Data are displayed as beta-coefficients (CI). P < 0.05 taken to indicate significance. BMI = body mass index

Physical activity and sleep variables are log transformed. M30CONT = most active continuous 30 minutes

Beta-coefficients should be interpreted as the proportion SD change in Y for a one SD change in X. MVPA = moderate-to-vigorous activity

Covariates: age, BMI, intervention period WASO = wake after sleep onset

Table S3. GEE models for the interaction between timing and the magnitude of most active 30 minutes (morning>8 h before bedtime; afternoon=4–8 h before bedtime; or evening<4 h before bedtime) during the day predicting sleep characteristics.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Outcome:** | **Sleep onset** | | **Wake after sleep onset (min)** | |
|  | b (95% CI) | *p* | b (95% CI) | *p* |
| **Morning** | 0.022  (-0.058, 0.102) | 0.595 | **0.150**  (0.090, 0.211) | **0.001** |
| **Afternoon** | **-0.083**  (-0.155, -0.010) | **0.025** | **0.167**  (0.104, 0.230) | **0.001** |
| **Evening** | **0.437**  (0.169, 0.704) | **0.001** | 0.026  (-0.249, 0.302) | 0.852 |

Data are displayed as beta-coefficients (CI). P < 0.05 taken to indicate significance.

Physical activity and sleep variables are log transformed.

Beta-coefficients should be interpreted as the proportion SD change in Y for a one SD change in X.

Covariates: age, BMI

BMI = body mass index

Table S4-a. Interaction terms for physical activity characteristics and the intervention period.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Outcome:** | **Sleep onset** | **Sleep duration (min)** | **WASO (min)** | **Sleep efficiency (%)** |
|  | *p* | *p* | *p* | *p* |
| **Acceleration (m*g*)\*IP** | 0.511 | 0.909 | 0.171 | 0.107 |
|  |  |  |  |  |
| **M30CONT(m*g*)\*IP** | 0.211 | **0.001** | **0.001** | 0.750 |
|  |  |  |  |  |
| **MVPA (min)\*IP** | 0.082 | 0.082 | 0.197 | 0.175 |
|  |  |  |  |  |
| **Light (min)\*IP** | 0.443 | 0.350 | 0.094 | 0.453 |

Table S4-b. Interaction terms for sleep characteristics and the intervention period.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Outcome:** | **Acceleration (m*g*)** | **Most active 30 min (m*g*)** | **MVPA (min)** | **Light (min)** |
|  | *p* | *p* | *p* | *p* |
| **Sleep onset\*IP** | 0.219 | 0.923 | **0.001** | **0.001** |
|  |  |  |  |  |
| **Sleep duration (min)\*IP** | 0.258 | 0.362 | **0.001** | **0.012** |
|  |  |  |  |  |
| **WASO (min)\*IP** | 0.105 | 0.903 | 0.893 | **0.001** |
|  |  |  |  |  |
| **Sleep efficiency (%)\*IP** | 0.348 | 0.259 | 0.075 | **0.001** |

Covariates: age, BMI

BMI = body mass index

IP = intervention period

M30CONT = most active 30 minutes

MVPA = moderate-to-vigorous activity

WASO = wake after sleep onset