**Supplementary Table 1:** Descriptive characteristics of the sample.

|  |  |
| --- | --- |
| **Characteristics** | **Mean (SD)** |
| Sex, n (%) |  |
| Male | 44 (51.2) |
| Female | 42 (48.8) |
| Age (years) | 34.6 (10.8) |
| Height (centimetres) | 169.4 (9.2) |
| Weight (kg) | 72.5 (14.0) |
| BMI (kg/m2) | 25.1 (3.7) |

**Supplementary Table 2:** Agreement between outputs (m*g*) from GENEActiv (GA) and ActiGraph (AG) placed on the non-dominant wrist, dominant wrist and waist according to activities and MET values of activities performed.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **GA – AG non-dominant** | |  | **AG dominant – AG non-dominant** | |  | **AG dominant – AG waist** | |  | **AG non-dominant – AG waist** | |
| **Protocol** | **Mean difference (95% LA)** | **CCC**  **(95% CI)** |  | **Mean difference (95% LA)** | **CCC**  **(95% CI)** |  | **Mean difference (95% LA)** | **CCC**  **(95% CI)** |  | **Mean difference (95% LA)** | **CCC**  **(95% CI)** |
| ***Activities*** |  |  |  |  |  |  |  |  |  |  |  |
| Lying down | -0.3  (-9.3; 8.6) | 0.28  (0.12 - 0.43) |  | -1.2  (-11.1; 8.6) | 0.10  (0.01 - 0.28) |  | -13.1  (-28.0; 1.7) | 0.01  (0.00 - 0.02) |  | -12.2  (-29.2; 4.8) | 0.00  (0.00 - 0.06) |
| Sitting | 6.5  (-1.7; 15.0) | 0.44  (0.33 - 0.56) |  | 3.4  (-8.5; 15.3) | 0.37  (0.22 - 0.53) |  | 2.5  (-19.2; 24.2) | 0.17  (0.08 - 0.35) |  | -0.9  (-21.2; 19.4) | 0.17  (0.00 - 0.17) |
| Standing | -3.1  (-18.6; 12.4) | 0.44  (0.26 - 0.62) |  | -1.4  (-22.6; 19.8) | 0.05  (0.01 - 0.26) |  | 2.9  (-15.3; 21.0) | 0.03  (0.01 - 0.10) |  | 4.0  (-12.4; 20.4) | 0.16  (0.01 - 0.32) |
| Circuit | 10.8  (-0.7; 22.3) | 0.57  (0.47 - 0.68) |  | 11.6  (-19.7; 42.8) | 0.20  (0.04 - 0.35) |  | 38.8  (12.7; 64.8) | 0.01  (0.00 - 0.02) |  | 27.2  (0.9; 53.5) | 0.02  (0.00 - 0.04) |
| Slow walking | 16.8  (-6.1; 39.7) | 0.68  (0.59 - 0.78) |  | 6.0  (-24.7; 36.7) | 0.68  (0.56 - 0.79) |  | 5.7  (-28.8; 40.3) | 0.43  (0.29 - 0.57) |  | -0.6  (-35.1; 33.8) | 0.44  (0.29 - 0.60) |
| Brisk walking | 44.5  (-10.3; 99.3) | 0.73  (0.65 - 0.81) |  | 18.5  (-95.7; 132.8) | 0.54  (0.40 - 0.69) |  | 29.9  (-97.1; 156.8) | 0.22  (0.11 - 0.33) |  | 14.1  (-92.6; 120.7) | 0.20  (0.05 - 0.35) |
| Step | 36.0  (-12.3; 84.3) | 0.80  (0.73 - 0.87) |  | 16.8  (-67.6; 101.2) | 0.68  (0.57 - 0.79) |  | 28.7  (-74.5; 131.9) | 0.28  (0.17 - 0.39) |  | 11.8  (-83.0; 106.6) | 0.35  (0.22 - 0.47) |
| Running | 35.1  (-108.9; 179.1) | 0.89  (0.84 - 0.94) |  | 28.7  (-183.3; 240.6) | 0.74  (0.63 - 0.84) |  | 235.9  (-24.7; 496.6) | 0.11  (0.06 - 0.17) |  | 206.2  (-67.7; 480.2) | 0.12  (0.05 - 0.19) |
| Intermittent running | 60.4  (-122.0; 242.8) | 0.87  (0.79 - 0.94) |  | 77.9  (-218.3; 374.3) | 0.70  (0.56 - 0.83) |  | 377.5  (-3.2; 758.3) | 0.08  (0.03 - 0.13) |  | 304.6  (-54.0; 663.2) | 0.09  (0.02 - 0.16) |
| ***Intensities based on MET values*** |  |  |  |  |  |  |  |  |  |  |  |
| <1.5 METs | 1.0  (-13.0; 15.0) | 0.66  (0.58 - 0.75) |  | 0.2  (-16.8; 17.1) | 0.59  (0.50 - 0.68) |  | -2.1  (-28.4; 24.2) | 0.16  (0.04 - 0.27) |  | -2.6  (-26.7; 21.5) | 0.11  (0.01 - 0.23) |
| 1.5 - 2.9 METs | 11.5  (-4.6; 27.5) | 0.83  (0.79 - 0.88) |  | 9.2  (-19.0; 37.4) | 0.77  (0.70 - 0.83) |  | 22.7  (-20.0; 65.4) | 0.48  (0.39 - 0.57) |  | 13.5  (-24.7; 51.8) | 0.62  (0.54 - 0.71) |
| 3.0 - 5.9 METs | 34.5  (-17.2; 86.1) | 0.90  (0.87 - 0.92) |  | 12.7  (-89.5; 114.8) | 0.89  (0.86 - 0.93) |  | 29.3  (-103.7; 162.3) | 0.69  (0.64 - 0.74) |  | 17.5  (-125.0; 159.9) | 0.69  (0.63 - 0.74) |
| ≥6 METs | 45.5  (-101.0; 192.0) | 0.94  (0.92 - 0.96) |  | 44.1  (-180.4; 268.7) | 0.89  (0.86 - 0.93) |  | 234.7  (-140.7; 610.1) | 0.35  (0.29 - 0.41) |  | 192.9  (-148.1; 534.0) | 0.41  (0.34 - 0.47) |

LA: limits of agreement; CCC: Lin’s Concordance Correlation Coefficient

**Supplementary Table 3:** Mean bias and predictive equations for mean bias and 95% limits of agreement corrected for acceleration levels.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Comparison** | **Mean bias**  **(95% Limits of Agreement)**  **m*g*** | **Correlation between difference and mean acceleration** | **Equation for corrected mean bias**  **m*g*** | **Equation for corrected lower limit**  **m*g*** | **Upper limit**  **m*g*** |
| GA (non-dominant) – AG (non-dominant) | 21.3 (-60.9; 103.7) | 0.42 | 8.46 + 0.07 m*g* | -10.4 + (-0.06 m*g*) | 27.4 + 0.21 m*g* |
| AG (dominant) – AG (non-dominant) | 15.2 (-108.6; 139.0) | 0.30 | 1.41 + 0.08 m*g* | -11.6 + (-0.28 m*g*) | 14.4 + 0.43 m*g* |
| AG (dominant) – AG (waist) | 65.0 (-200.8; 330.8) | 0.88 | -27.63 + 0.60 m*g* | -83.6 + 0.23 m*g* | 28.4 + 0.97 m*g* |
| AG (non-dominant) – AG (waist) | 50.5 (-184.9; 286.0) | 0.84 | -27.45 + 0.52 m*g* | -78.1 + 0.13 m*g* | 23.1 + 0.91 m*g* |

GA: GENEActiv; AG: ActiGraph



**Supplementary Figure 1**: Box and whisker plot of the distribution of the relative mean differences between acceleration outputs (m*g*) during each activity performed.

Chart, line chart

Description automatically generated

**Supplementary Figure 2:** ROC area for definition of sedentary time using similar approach used by Hildebrand et al 2016. Sedentary behaviours (lying and sitting) were compared with non-sedentary activities (standing, slow walking brisk walking, running).

**Supplementary Table 4:** Alternative thresholds for sedentary time based on similar approach used by Hilderbrand et al 2016 a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Threshold in m*g*** | **Sensitivity** | **Specificity** | **AUC** |
| GE non-Dominant | 45 | 75 | 87 | 0.87 |
| AG Non-dominant | 12 | 88 | 91 | 0.90 |
| AG Dominant | 26 | 76 | 99 | 0.88 |
| AG waist | 40 | 75 | 99 | 0.87 |

a Sedentary behaviours (lying and sitting) were compared with non-sedentary activities (standing, slow walking brisk walking, running).

**Supplementary Table 5:** Regression equations developed for the prediction of MET values based on acceleration outputs from GENEActiv (GA) and ActiGraph (AG).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | GA non-dominant | AG non-dominant | AG dominant | AG waist |
| **Equation 1** |  |  |  |  |
| α (95%CI) | 1.812 (1.689 to 1.936) | 1.938 (1.815 to 2.060) | 1.883 (1.766 to 2.001) | 1.514 (1.418 to 1.610) |
| β (95%CI) | 0.011 (0.010 to 0.012) | 0.012 (0.011 to 0.013) | 0.011 (0.010 to 0.012) | 0.020 (0.019 to 0.021) |
| MET | 1.812 + 0.011 m*g* | 1.938 + 0.012 m*g* | 1.883 + 0.011 m*g* | 1.514 + 0.020 m*g* |
| Adjusted R2 | 76.1 | 73.7 | 74.0 | 84.2 |
| **Equation 2** |  |  |  |  |
| α (95%CI) | 1.898 (1.767 to 2.030) | 2.032 (1.900 to 2.163) | 2.012 (1.885 to 2.139) | 1.533 (1.428 to 1.638) |
| β (95%CI) | 0.011 (0.010 to 0.012) | 0.011 (0.010 to 0.012) | 0.010 (0.009 to 0.011) | 0.020 (0.019 to 0.021) |
| MET | 1.898+ 0.011 m*g* | 2.032 + 0.011m*g* | 2.012 + 0.010 m*g* | 1.533 + 0.020 m*g* |
| Adjusted R2 | 80.4 | 78.3 | 77.9 | 86.4 |
| **Equation 3** |  |  |  |  |
| α (95%CI) | 1.260 (1.152 to 1.368) | 1.363 (1.256 to 1.471) | 1.351 (1.242 to 1.461) | 1.117 (1.010 to 1.224) |
| β1 (95%CI) | 0.020 (0.019 to 0.021) | 0.022 (0.021 to 0.023) | 0.020 (0.019 to 0.021) | 0.031 (0.029 to 0.032) |
| β2 (95%CI) x10-5 | -1.1 (-1.2 to -1.0) | -1.4 (-1.5 to -1.3) | -1.2 (-1.3 to -1.1) | -2.6 (-2.9 to -2.2) |
| MET | 1.260 + 0.020 m*g* + (-1.1m*g2* x 10-5) | 1.363 + 0.022 m*g* + (-1.4m*g2* x 10-5) | 1.351 + 0.020 m*g* + (-1.2m*g2* x 10-5) | 1.117 + 0.031 m*g* + (-2.6m*g2* x 10-5) |
| Adjusted R2 | 89.8 | 88.8 | 87.6 | 89.5 |

Equation 1: only outputs from 8 activities were included (similar activities used by Hildebrand et al);

Equation 2: 9 activities were included (Hildebrand + intermittent running)

Equation 3: Equation 2 and inclusion of a quadratic term for acceleration. Figures presented in the main document were based on this equation.

**Supplementary Table 6:** Average confusion matrix indicating the ability of thresholds to accurately classify intensities (% accurately classified). Columns indicate actual intensity, while rows indicate predicted intensity.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Sedentary a  n (%) | Light b  n (%) | Moderate  n (%) | Vigorous  n (%) | Kappa (SE) |
| GA non-dominant |  |  |  |  | 0.63 (0.02) |
| Sedentary | 151 (58.8) | 104 (40.5) | 2 (0.8) | 0 (0.0) |  |
| Light | 2 (2.2) | 70 (70.1) | 20 (21.7) | 0 (0.0) |  |
| Moderate | 0 (0.0) | 6 (4.1) | 117 (80.7) | 22 (15.2) |  |
| Vigorous | 0 (0.0) | 0 (0.0) | 18 (13.2) | 118 (86.7) |  |
| AG non-dominant |  |  |  |  | 0.72 (0.02) |
| Sedentary | 144 (77.4) | 42 (22.6) | 0 (0.0) | 0 (0.0) |  |
| Light | 21 (10.9) | 146 (75.7) | 26 (13.5) | 0 (0.0) |  |
| Moderate | 0 (0.0) | 10 (5.8) | 130 (75.1) | 33 (19.1) |  |
| Vigorous | 0 (0.0) | 0 (0.0) | 14 (10.1) | 125 (89.9) |  |
| AG dominant |  |  |  |  | 0.66 (0.02) |
| Sedentary | 171 (65.5) | 88 (33.7) | 2 (0.8) | 0 (0.0) |  |
| Light | 11 (7.1) | 116 (74.4) | 29 (18.6) | 0 (0.0) |  |
| Moderate | 0 (0.0) | 11 (6.0) | 138 (75.0) | 35 (19.0) |  |
| Vigorous | 0 (0.0) | 0 (0.0) | 17 (11.0) | 138 (89.0) |  |
| AG waist |  |  |  |  | 0.53 (0.02) |
| Sedentary | 185 (51.8) | 171 (47.9) | 1 (0.3) | 0 (0.0) |  |
| Light | 1 (2.6) | 23 (60.5) | 14 (36.8) | 0 (0.0) |  |
| Moderate | 0 (0.0) | 26 (12.8) | 146 (71.6) | 32 (15.7) |  |
| Vigorous | 0 (0.0) | 0 (0.0) | 27 (15.7) | 145 (84.3) |  |

Interpretation: e.g. AG non-dominant wrist: from all epochs the threshold classified as sedentary, 77% were sedentary (sitting and lying). Sedentary time based on Hildebrand et al.

**Supplementary Table 7:** Comparison between thresholds for moderate and vigorous intensity physical activity reported by Hildebrand et al and thresholds estimated using three different analytical approaches (as described in Supplementary Table 3).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Hildebrand 2014 | Equation 1 | Equation 2 | Equation 3 |
| GA non-dominant |  |  |  |  |
| 3 METs | 93 | 108 | 100 | 92 |
| 6 METs | 418 | 381 | 373 | 283 |
| AG non-dominant |  |  |  |  |
| 3 METs | 101 | 89 | 88 | 78 |
| 6 METs | 429 | 339 | 361 | 249 |
| AG dominant |  |  |  |  |
| 3 METs | - | 102 | 99 | 85 |
| 6 METs | - | 374 | 399 | 270 |
| AG waist |  |  |  |  |
| 3 METs | 69 | 75 | 74 | 65 |
| 6 METs | 259 | 225 | 224 | 190 |

Equation 1: only outputs from 8 activities were included (similar activities used by Hildebrand et al);

Equation 2: 9 activities were included (Hildebrand + intermittent running)

Equation 3: Equation 2 and inclusion of a quadratic term for acceleration. Figures presented in the main document were based on this equation.