**Supplemental Digital Content 2.** Supplementary analysesfor the raw wrist acceleration cut-pointsusing a ≥4-MET MVPA definition**.**

Supplemental Digital Content 2.1: Contingency tables for classification accuracy of raw wrist acceleration cut-points using a ≥4-MET MVPA definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Actual Intensity** | **Cut-points classification of intensity** | | |
|  | 1 | 2 | 3 |
|  | ENMO192+ | | |
| 1. non-MVPA | **14032 (93.1)** | 904 (6.0) | 137 (0.9) |
| 2. MPA | 2181 (46.0) | **2213 (46.6)** | 352 (7.4) |
| 3. VPA | 560 (9.9) | 2039 (36.2) | **3034 (53.9)** |
|  | GENEA250+ | | |
| 1. non-MVPA | **13887 (92.1)** | 1035 (6.9) | 161 (1.1) |
| 2. MPA | 1936 (40.8) | **2363 (49.8)** | 447 (9.4) |
| 3. VPA | 217 (3.9) | 1707 (30.3) | **3709 (65.8)** |
|  | BFEN314+ | | |
| 1. non-MVPA | **12322 (81.7)** | 2493 (16.5) | 258 (1.7) |
| 2. MPA | 672 (14.2) | **3421 (72.1)** | 653 (13.8) |
| 3. VPA | 42 (0.7) | 918 (16.3) | **4673 (83.0)** |

The presented values indicate the proportion of epochs classified for each intensity, with percentages presented between brackets. The values in boldface indicate the proportion of epochs correctly classified for the physical activity intensity. MPA: moderate physical activity; VPA: vigorous physical activity; MVPA: moderate-to-vigorous physical activity; ENMO: cut-points developed using Euclidian norm minus one; GENEA: cut-points developed using the GENEActiv post processing software; BFEN: cut-points developed using Bandpass Filtered followed by Euclidian Norm.

Supplemental Digital Content 2.2: Agreement analysis of raw wrist acceleration-based estimations of physical activity intensities compared to indirect calorimetry using a ≥4-MET MVPA definition.

|  |  |  |  |
| --- | --- | --- | --- |
| **Intensity** | **Mean bias (%)** | **Limits of agreement** | **p-value slope** |
| **ENMO192+** | | | |
| *MPA* | -2.6 | -78.7 - 73.6 | 0.00 |
| *VPA* | 53.7 | -44.6 - 152.1 | 0.00 |
| *MVPA* | 12.6 | -18.3 - 43.5 | 0.85 |
| **GENEA250+** | | | |
| *MPA* | -1.5 | -80.0 - 76.9% | 0.01 |
| *VPA* | 28.6 | -39.4 - 96.6 | 0.00 |
| *MVPA* | 9.3 | -23.0 - 41.6 | 0.03 |
| **BFEN314+** | | | |
| *MPA* | -34.4 | -89.1 - 20.4 | 0.01 |
| *VPA* | -0.5\* | -40.6 - 39.7 | 0.04 |
| *MVPA* | -18.3 | -50.2 - 13.5 | 0.11 |

MPA: moderate physical activity; VPA: vigorous physical activity; MVPA: moderate-to-vigorous physical activity; ENMO: cut-points developed using Euclidian norm minus one; GENEA: cut-points developed using the GENEActiv post processing software; BFEN: cut-points developed using Bandpass Filtered followed by Euclidian Norm. Mean bias was calculated as: measured intensity time – estimated intensity time; a positive value indicates underestimation; a negative value indicates overestimation. \*Significantly equivalent to indirect calorimetry (p < 0.05).

Supplemental Digital Content 2.3: 95% equivalence test for raw wrist acceleration-based estimated time spent in physical activity intensities using a ≥4-MET MVPA definition.



Times estimated by wrist-worn cut-points are equivalent to indirect calorimetry if 90% confidence intervals lie entirely within the equivalence region of indirect calorimetry. MPA: moderate physical activity; VPA: vigorous physical activity; MVPA: moderate-to-vigorous physical activity; ENMO: cut-points developed using Euclidian norm minus one; GENEA: cut-points developed using the GENEActiv post processing software; BFEN: cut-points developed using Bandpass Filtered followed by Euclidian Norm.

Supplemental Digital Content 2.4: Confusion matrices for the raw wrist acceleration cut-points using a ≥4-MET MVPA definition.

Table 1. Confusion matrix for sedentary and light physical activity intensity activities.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Actual**  **Intensity** | **Lying**  **Down** | | | **TV**  **viewing** | | | **Computer**  **Game** | | | **Handheld**  **e-game** | | | **Writing/**  **Colouring** | | | **Standing**  **activity** | | | **Getting**  **ready** | | | **Slow**  **walk** | | |
|  | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
|  | **ENMO192+** | | | | | | | | | | | | | | | | | | | | | | | |
| 1. non-MVPA | **100.0** | 0.0 | - | **100.0** | 0.0 | - | **99.9** | 0.1 | - | **100.0** | 0.0 | - | **99.9** | 0.1 | - | **99.1** | 0.9 | - | **97.3** | 2.0 | 0.8 | **80.9** | 18.5 | 0.6 |
| 2. MPA | 100.0 | **0.0** | - | - | **-** | - | - | **-** | - | 100.0 | **0.0** | - | - | - | - | 100.0 | **0.0** | - | 92.3 | **7.4** | 0.3 | 55.5 | **44.5** | 0.0 |
| 3. VPA | - | - | **-** | - | - | **-** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 25.0 | 75.0 | **0.0** |
| 4. MVPA |  | **0.0** | |  | **-** | |  | - | |  | **0.0** | |  | - | |  | **0.0** | |  | **7.7** | |  | **44.7** | |
|  | **GENEA250+** | | | | | | | | | | | | | | | | | | | | | | | |
| 1. non-MVPA | **100.0** | 0.0 | - | **100.0** | - | - | **100.0** | 0.0 | - | **100.0** | 0.0 | - | **99.4** | 0.6 | - | **98.8** | 1.2 | - | **96.8** | 2.4 | 0.8 | **69.8** | 29.5 | 0.7 |
| 2. MPA | 100.0 | **0.0** | - | - | **-** | - | - | **-** | - | 100.0 | **0.0** | - | - | **-** | - | 100.0 | **0.0** | - | 91.4 | **8.3** | 0.3 | 47.0 | **53.0** | 0.0 |
| 3. VPA | - | - | **-** | - | - | **-** | - | - | **-** | - | - | - | - | - | - | - | - | - | - | - | - | 25.0 | 75.0 | **0.0** |
| 4. MVPA |  | **0.0** | |  | **-** | |  | **-** | |  | **0.0** | |  | - | |  | **16.7** | |  | **12.3** | |  | **48.5** | |
|  | **BFEN314+** | | | | | | | | | | | | | | | | | | | | | | | |
| 1. non-MVPA | **99.8** | 0.2 | - | **100.0** | 0.1 | - | **98.7** | 1.3 | - | **99.9** | 0.1 | - | **98.4** | 1.6 | - | **87.3** | 12.7 | - | **33.3** | 66.0 | 0.8 | **63.7** | 35.3 | 1.1 |
| 2. MPA | 100.0 | **0.0** | - | - | **-** | - | - | **-** | - | 100.0 | **0.0** | - | - | - | - | 100.0 | **0.0** | - | 18.5 | **80.9** | 0.6 | 38.5 | **61.4** | 0.1 |
| 3. VPA | - | - | **-** | - | - | **-** | - | - | **-** | - | - | - | - | - | - | - | - | - | - | - | - | 25.0 | 25.0 | **50.0** |
| 4. MVPA |  | **0.0** | |  | **-** | |  | - | |  | **0.0** | |  | - | |  | **0.0** | |  | **81.5** | |  | **61.6** | |

Note Table 1: Values in boldface indicate the percentage of epochs correctly classified. MPA: moderate physical activity; VPA: vigorous physical activity; MVPA: moderate-to-vigorous physical activity; ENMO: cut-points developed using Euclidian norm minus one; GENEA: cut-points developed using the GENEActiv post processing software; BFEN: cut-points developed using Bandpass Filtered followed by Euclidian Norm.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Actual Intensity** | **Dancing** | | | **Brisk walk** | | | **Tidy up** | | |
|  | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
|  | **ENMO192+** | | | | | | | | |
| 1. non-MVPA | **40.6** | 54.2 | 5.2 | **48.4** | 51.6 | 0.0 | **91.6** | 8.4 | 0.0 |
| 2. MPA | 19.2 | **61.8** | 19.1 | 23.2 | **76.4** | 0.4 | 85.8 | **14.2** | 0.0 |
| 3. VPA | 12.0 | 56.4 | **31.6** | 3.4 | 96.6 | **0.0** | 64.2 | 35.8 | **0.0** |
| 4. MVPA |  | **87.5** | |  | **79.6** | |  | **17.7** | |
|  | **GENEA250+** | | | | | | | | |
| 1. non-MVPA | **38.2** | 55.0 | 6.8 | **43.2** | 56.8 | **0.0** | **86.1** | 13.9 | 0.0 |
| 2. MPA | 12.1 | **61.2** | 26.7 | 20.3 | **78.9** | 0.8 | 79.6 | **20.4** | 0.0 |
| 3. VPA | 3.4 | 46.2 | **50.4** | 8.6 | 90.5 | **0.9** | 59.7 | 40.3 | **0.0** |
| 4. MVPA |  | **89.9** | |  | **78.2** | |  | **28.4** | |
|  | **BFEN314+** | | | | | | | | |
| 1. non-MVPA | **14.3** | 70.8 | 14.9 | **34.4** | 65.6 | 0.0 | **28.6** | 71.4 | 0.0 |
| 2. MPA | 0.7 | **59.0** | 40.3 | 14.2 | **84.8** | 1.0 | 6.6 | **93.4** | 0.0 |
| 3. VPA | 0.0 | 35.9 | **64.1** | 0.9 | 90.5 | **8.6** | 6.5 | 93.5 | **0.0** |
| 4. MVPA |  | **99.4** | |  | **86.9** | |  | **93.4** | |

Table 2. Confusion matrix for moderate physical activity intensity activities.

Note Table 2: Values in boldface indicate the percentage of epochs correctly classified. MPA: moderate physical activity; VPA: vigorous physical activity; MVPA: moderate-to-vigorous physical activity; ENMO: cut-points developed using Euclidian norm minus one; GENEA: cut-points developed using the GENEActiv post processing software; BFEN: cut-points developed using Bandpass Filtered followed by Euclidian Norm.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Actual Intensity** | **Basketball** | | | **Running** | | | **Locomotor course** | | | **Soccer** | | |
|  | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
|  | **ENMO192+** | | | | | | | | | | | |
| 1. non-MVPA | **30.0** | 68.3 | 1.7 | **21.5** | 23.4 | 55.1 | **20.7** | 39.1 | 40.2 | **45.6** | 38.2 | 16.2 |
| 2. MPA | 17.0 | **78.1** | 4.9 | 6.1 | **22.1** | 71.8 | 13.8 | **39.4** | 46.8 | 15.7 | **35.2** | 49.1 |
| 3. VPA | 7.5 | 71.6 | **21.0** | 9.4 | 19.2 | **71.4** | 7.7 | 28.5 | **63.8** | 7.2 | 19.2 | **73.6** |
| 4. MVPA |  | **96.4** | |  | **98.5** | |  | **98.2** | |  | **98.8** | |
|  | **GENEA250+** | | | | | | | | | | | |
| 1. non-MVPA | **38.3** | 58.3 | 3.3 | **21.5** | 22.4 | 56.1 | **29.3** | 34.5 | 36.2 | **48.5** | 32.4 | 19.1 |
| 2. MPA | 15.2 | **77.7** | 7.1 | 4.6 | **20.6** | 74.8 | 6.5 | **29.0** | 64.5 | 9.3 | **36.1** | 54.6 |
| 3. VPA | 3.0 | 63.8 | **33.2** | 1.1 | 15.0 | **83.9** | 1.7 | 17.6 | **80.7** | 0.6 | 17.2 | **82.2** |
| 4. MVPA |  | **95.8** | |  | **98.5** | |  | **98.1** | |  | **98.6** | |
|  | **BFEN314+** | | | | | | | | | | | |
| 1. non-MVPA | **13.3** | 75.0 | 11.7 | **13.1** | 19.6 | 67.3 | **11.5** | 21.8 | 66.7 | **39.7** | 26.5 | 33.8 |
| 2. MPA | 3.1 | **71.9** | 25.0 | 3.8 | **3.1** | 93.1 | 5.3 | **13.8** | 80.9 | 8.3 | **19.4** | 72.2 |
| 3. VPA | 0.2 | 31.7 | **68.1** | 0.9 | 2.4 | **96.7** | 0.7 | 5.6 | **93.8** | 0.3 | 5.7 | **94.1** |
| 4. MVPA |  | **99.3** | |  | **98.8** | |  | **99.0** | |  | **99.1** | |

Table 3: Confusion matrix for vigorous physical activity intensity activities.

Note Table 3: Values in boldface indicate the percentage of epochs correctly classified. MPA: moderate physical activity; VPA: vigorous physical activity; MVPA: moderate-to-vigorous physical activity; ENMO: cut-points developed using Euclidian norm minus one; GENEA: cut-points developed using the GENEActiv post processing software; BFEN: cut-points developed using Bandpass Filtered followed by Euclidian Norm.