**JPED-D-20-00462 – Supplementary Material**

**Supplementary Table 1 - Sex and age-specific percentile values using quantile regression for the absolute handgrip strength and relative handgrip strength (using maximum value of each subject) among Colombian aged 6–17.9 years.**

|  |  |  |
| --- | --- | --- |
|  | **Absolute handgrip strength** | **Relative handgrip strength** |
| **Male** | **n** | **P5** | **P10** | **P25** | **P50** | **P75** | **P90** | **P95** | **n** | **P5** | **P10** | **P25** | **P50** | **P75** | **P90** | **P95** |
| 6.0 to 6.9 years | **54** | 7.2 | 7.3 | 8.0 | 8.9 | 10.8 | 14.2 | 15.0 | **52** | 0.244 | 0.310 | 0.362 | 0.391 | 0.478 | 0.646 | 0.953 |
| 7.0 to 7.9 years | **52** | 8.3 | 9.2 | 10.1 | 10.1 | 11.3 | 12.8 | 14.6 | **49** | 0.324 | 0.334 | 0.436 | 0.449 | 0.536 | 0.542 | 0.595 |
| 8.0 to 8.9 years | **60** | 8.3 | 8.7 | 10.1 | 11.5 | 14.7 | 16.4 | 21.0 | **59** | 0.285 | 0.297 | 0.388 | 0.422 | 0.524 | 0.672 | 0.833 |
| 9.0 to 9.9 years | **64** | 9.7 | 10.5 | 11.7 | 14.6 | 15.2 | 15.9 | 17.0 | **64** | 0.351 | 0.314 | 0.467 | 0.513 | 0.565 | 0.565 | 0.590 |
| 10.0 to 10.9 years | **67** | 11.3 | 12.4 | 13.7 | 14.4 | 16.5 | 18.4 | 19.4 | **65** | 0.322 | 0.271 | 0.439 | 0.495 | 0.534 | 0.623 | 0.657 |
| 11.0 to 11.9 years | **58** | 12.3 | 13.1 | 14.8 | 16.5 | 19.6 | 22.3 | 23.8 | **57** | 0.287 | 0.299 | 0.427 | 0.446 | 0.560 | 0.661 | 0.688 |
| 12.0 to 12.9 years | **57** | 11.6 | 14.9 | 15.8 | 20.0 | 22.1 | 25.3 | 31.2 | **57** | 0.323 | 0.340 | 0.435 | 0.508 | 0.577 | 0.613 | 0.956 |
| 13.0 to 13.9 years | **244** | 15.3 | 16.6 | 19.9 | 23.9 | 29.0 | 32.8 | 35.0 | **237** | 0.344 | 0.303 | 0.422 | 0.507 | 0.596 | 0.686 | 0.711 |
| 14.0 to 14.9 years | **216** | 19.4 | 20.5 | 23.0 | 27.6 | 31.9 | 35.6 | 38.3 | **207** | 0.393 | 0.300 | 0.477 | 0.550 | 0.630 | 0.691 | 0.739 |
| 15.0 to 15.9 years | **230** | 21.0 | 24.3 | 27.4 | 32.0 | 36.6 | 39.9 | 43.0 | **221** | 0.389 | 0.344 | 0.500 | 0.582 | 0.652 | 0.712 | 0.744 |
| 16.0 to 16.9 years | **252** | 25.9 | 27.7 | 31.1 | 35.4 | 39.3 | 43.2 | 45.9 | **242** | 0.460 | 0.304 | 0.518 | 0.585 | 0.661 | 0.723 | 0.756 |
| 17.0 to 17.9 years | **221** | 25.2 | 28.1 | 30.9 | 36.8 | 41.4 | 46.3 | 49.9 | **209** | 0.432 | 0.306 | 0.533 | 0.618 | 0.700 | 0.772 | 0.809 |
| **Female** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6.0 to 6.9 years | **66** | 5.8 | 6.2 | 6.9 | 8.5 | 10.8 | 12.8 | 14.6 | **63** | 0.310 | 0.314 | 0.348 | 0.394 | 0.434 | 0.619 | 0.684 |
| 7.0 to 7.9 years | **72** | 7.4 | 8.0 | 8.6 | 8.6 | 10.1 | 11.3 | 11.7 | **71** | 0.311 | 0.368 | 0.378 | 0.428 | 0.446 | 0.483 | 0.498 |
| 8.0 to 8.9 years | **64** | 6.8 | 7.2 | 7.8 | 10.1 | 12.9 | 15.8 | 16.8 | **63** | 0.212 | 0.316 | 0.323 | 0.405 | 0.472 | 0.622 | 0.628 |
| 9.0 to 9.9 years | **60** | 8.6 | 9.3 | 10.0 | 11.9 | 13.7 | 15.7 | 17.1 | **57** | 0.299 | 0.388 | 0.378 | 0.442 | 0.481 | 0.548 | 0.585 |
| 10.0 to 10.9 years | **63** | 10.1 | 11.8 | 13.4 | 14.5 | 17.4 | 20.1 | 22.8 | **61** | 0.242 | 0.346 | 0.391 | 0.424 | 0.495 | 0.511 | 0.519 |
| 11.0 to 11.9 years | **79** | 10.8 | 10.8 | 12.3 | 14.0 | 17.1 | 20.3 | 22.3 | **77** | 0.291 | 0.335 | 0.322 | 0.364 | 0.493 | 0.531 | 0.597 |
| 12.0 to 12.9 years | **65** | 12.6 | 14.9 | 15.1 | 18.9 | 22.0 | 25.1 | 29.5 | **60** | 0.319 | 0.330 | 0.390 | 0.454 | 0.513 | 0.603 | 0.623 |
| 13.0 to 13.9 years | **136** | 12.3 | 14.2 | 17.7 | 20.4 | 22.6 | 24.7 | 26.1 | **134** | 0.273 | 0.381 | 0.362 | 0.431 | 0.463 | 0.537 | 0.584 |
| 14.0 to 14.9 years | **108** | 11.3 | 14.8 | 16.2 | 20.3 | 24.4 | 27.9 | 34.7 | **107** | 0.231 | 0.393 | 0.382 | 0.414 | 0.476 | 0.564 | 0.600 |
| 15.0 to 15.9 years | **115** | 15.4 | 16.3 | 18.7 | 22.2 | 25.2 | 28.7 | 29.8 | **105** | 0.303 | 0.444 | 0.374 | 0.427 | 0.469 | 0.520 | 0.573 |
| 16.0 to 16.9 years | **132** | 14.3 | 17.0 | 18.6 | 23.5 | 27.0 | 29.9 | 32.3 | **125** | 0.289 | 0.482 | 0.346 | 0.404 | 0.464 | 0.525 | 0.580 |
| 17.0 to 17.9 years | **112** | 14.6 | 14.6 | 20.0 | 23.4 | 26.1 | 27.2 | 28.8 | **107** | 0.266 | 0.499 | 0.353 | 0.410 | 0.450 | 0.512 | 0.582 |

These models were estimated independently for each sex; all analysis were adjusted by sampling weight (expansion factor) from the values given to each subject. These models were estimated using the maximum value of the handgrip strength measurements (maximum between *right hand* and *left hand;* additionally, the relative handgrip strength was adjusted by weight.

**Supplementary Table 2 - Sex and age-specific percentile values using quantile regression for handgrip strength adjusted by body mass index and height among Colombian aged 6–17.9 years.**

|  |  |  |
| --- | --- | --- |
|  | **Relative handgrip strength adjusted by body mass index (kg/mts2)** | **Relative handgrip strength adjusted by stature (mts)** |
| **Male** | **n** | **P5** | **P10** | **P25** | **P50** | **P75** | **P90** | **P95** | **n** | **P5** | **P10** | **P25** | **P50** | **P75** | **P90** | **P95** |
| 6.0 to 6.9 years | **52** | 0.37 | 0.38 | 0.44 | 0.52 | 0.64 | 0.82 | 1.03 | **52** | 5.49 | 5.71 | 6.57 | 7.35 | 8.48 | 12.19 | 17.40 |
| 7.0 to 7.9 years | **49** | 0.49 | 0.54 | 0.59 | 0.58 | 0.73 | 0.83 | 0.92 | **49** | 6.75 | 7.38 | 8.39 | 8.55 | 9.29 | 10.17 | 11.70 |
| 8.0 to 8.9 years | **59** | 0.40 | 0.53 | 0.57 | 0.66 | 0.77 | 0.95 | 1.34 | **59** | 6.38 | 6.66 | 7.91 | 8.85 | 10.88 | 12.65 | 15.95 |
| 9.0 to 9.9 years | **64** | 0.51 | 0.56 | 0.71 | 0.80 | 0.90 | 1.00 | 1.00 | **64** | 7.84 | 8.16 | 8.74 | 10.24 | 10.75 | 11.49 | 12.03 |
| 10.0 to 10.9 years | **65** | 0.61 | 0.63 | 0.75 | 0.84 | 0.98 | 1.10 | 1.10 | **65** | 8.00 | 8.21 | 9.89 | 10.27 | 11.94 | 12.71 | 13.81 |
| 11.0 to 11.9 years | **57** | 0.64 | 0.71 | 0.77 | 0.86 | 1.10 | 1.24 | 1.32 | **57** | 8.81 | 9.07 | 10.42 | 11.80 | 13.39 | 15.50 | 16.75 |
| 12.0 to 12.9 years | **57** | 0.59 | 0.72 | 0.94 | 1.02 | 1.17 | 1.24 | 1.68 | **57** | 7.66 | 9.98 | 10.36 | 12.43 | 14.69 | 17.09 | 19.74 |
| 13.0 to 13.9 years | **237** | 0.78 | 0.88 | 1.02 | 1.18 | 1.40 | 1.59 | 1.70 | **237** | 9.63 | 10.98 | 12.94 | 15.18 | 17.40 | 20.03 | 21.41 |
| 14.0 to 14.9 years | **207** | 0.98 | 1.03 | 1.20 | 1.41 | 1.61 | 1.82 | 1.93 | **207** | 11.97 | 12.92 | 13.41 | 16.61 | 18.89 | 21.26 | 22.26 |
| 15.0 to 15.9 years | **221** | 1.07 | 1.17 | 1.33 | 1.53 | 1.77 | 1.94 | 2.03 | **221** | 13.45 | 14.76 | 16.68 | 18.46 | 21.43 | 23.50 | 24.46 |
| 16.0 to 16.9 years | **242** | 1.18 | 1.26 | 1.40 | 1.64 | 1.80 | 2.01 | 2.09 | **242** | 14.50 | 16.38 | 18.05 | 20.09 | 22.53 | 24.94 | 26.39 |
| 17.0 to 17.9 years | **208** | 1.13 | 1.29 | 1.46 | 1.70 | 1.92 | 2.12 | 2.28 | **208** | 15.04 | 16.00 | 17.89 | 20.79 | 24.28 | 26.11 | 27.14 |
| **Female** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6.0 to 6.9 years | **63** | 0.38 | 0.37 | 0.44 | 0.50 | 0.61 | 0.79 | 1.01 | **63** | 4.98 | 5.17 | 6.05 | 6.38 | 8.85 | 11.20 | 11.38 |
| 7.0 to 7.9 years | **71** | 0.42 | 0.44 | 0.51 | 0.56 | 0.58 | 0.66 | 0.77 | **71** | 6.37 | 6.51 | 7.13 | 7.23 | 7.87 | 8.64 | 9.14 |
| 8.0 to 8.9 years | **63** | 0.35 | 0.46 | 0.49 | 0.62 | 0.76 | 0.94 | 0.96 | **63** | 4.84 | 5.74 | 6.44 | 7.69 | 10.17 | 11.11 | 11.97 |
| 9.0 to 9.9 years | **57** | 0.45 | 0.58 | 0.65 | 0.68 | 0.83 | 0.94 | 1.07 | **57** | 6.31 | 6.81 | 7.35 | 8.49 | 9.72 | 11.70 | 12.88 |
| 10.0 to 10.9 years | **61** | 0.45 | 0.52 | 0.70 | 0.82 | 0.95 | 1.07 | 1.13 | **61** | 7.40 | 8.35 | 8.66 | 10.51 | 11.94 | 13.28 | 13.46 |
| 11.0 to 11.9 years | **77** | 0.58 | 0.58 | 0.70 | 0.74 | 1.00 | 1.09 | 1.18 | **77** | 7.37 | 7.37 | 8.51 | 9.45 | 11.24 | 13.09 | 14.09 |
| 12.0 to 12.9 years | **60** | 0.71 | 0.74 | 0.83 | 0.92 | 1.12 | 1.25 | 1.30 | **60** | 8.89 | 9.39 | 10.89 | 12.25 | 14.13 | 17.23 | 18.29 |
| 13.0 to 13.9 years | **134** | 0.64 | 0.66 | 0.84 | 0.97 | 1.10 | 1.26 | 1.32 | **134** | 7.90 | 8.22 | 10.93 | 12.81 | 14.42 | 15.41 | 16.84 |
| 14.0 to 14.9 years | **107** | 0.59 | 0.71 | 0.86 | 0.98 | 1.11 | 1.33 | 1.60 | **107** | 7.05 | 8.61 | 9.78 | 12.46 | 14.56 | 17.10 | 19.37 |
| 15.0 to 15.9 years | **105** | 0.74 | 0.78 | 0.89 | 1.05 | 1.11 | 1.25 | 1.34 | **105** | 9.59 | 10.64 | 11.56 | 12.92 | 15.39 | 16.92 | 17.27 |
| 16.0 to 16.9 years | **125** | 0.64 | 0.68 | 0.79 | 0.93 | 1.09 | 1.32 | 1.40 | **125** | 8.90 | 10.89 | 11.90 | 14.62 | 16.92 | 18.22 | 19.40 |
| 17.0 to 17.9 years | **107** | 0.65 | 0.73 | 0.84 | 0.91 | 1.06 | 1.23 | 1.34 | **107** | 9.06 | 9.24 | 12.30 | 14.52 | 16.10 | 16.61 | 18.19 |

These models were estimated independently for each sex; all analysis were adjusted by sampling weight (expansion factor) from the values given to each subject. These models were estimated using the mean value of the handgrip strength measurements in each hand *(right hand + left hand) / 2*, they were adjusted by body mass index (kg/mts2) and stature (mts).

**Supplementary Table 3 - Methodology used in cited studies.**

| **Author** | **Publication year** | **Country** | **Estimation method** | **Dynamometer brand** | **Elbow position** | **Number of measurements to estimate HS in each individual** |
| --- | --- | --- | --- | --- | --- | --- |
| Ramírez-Vélez et al.33 | 2021 | Colombia | LMS method | TKK 5001 GRIP-A (Takei® Scientific Instruments Co. Ltd., Tokyo, Japan) | Extended elbow | Several (2-4) trials were performed for each hand.The maximum effort was recorded |
| García-Hermoso et al.28  | 2021 | Chile | LMS method | Hydraulic Hand Dynamometer 1 Model PC-5030 J1, Fred Sammons, Inc., Burr Ridge, IL: USA) | NA | Two (2) trials for each hand. The mean of the all values of each hand was recorded. |
| Cadenas-Sanchez et al.12  | 2019 | Spain | Generalized additive models | TKK 5001, Grip-A (Takei® Scientific Instruments Co. Ltd., Tokyo, Japan) | Extended elbow | Two (2) trials for each hand. The mean of highest value of each hand was recorded. |
| Kocher et al.21  | 2019 | USA | Generalized linear models | TKK 5401, Grip-A (Takei® Scientific Instruments Co. Ltd., Tokyo, Japan) | Extended elbow | Three (3) trials for each hand. It is not clear how the value was estimated for each subject |
| Tomkinson et al.13 | 2018 | 24 countriesa | LMS method | Multiple brands | NA | NA. |
| Gómez-Campos et al.29 | 2018 | Chile | LMS method | Hydraulic Hand Dynamometer1 Model PC-5030 J1. (Fred Sammons, Inc., Burr Ridge, IL: USA) | NA | Two (2) trials for each hand. The highest score was used for each hand. Independent models were estimated for right and left hands. |
| Ramírez-Vélez et al.30  | 2017 | Colombia | LMS method | TKK 540 (Takei® Scientific Instruments Co. Ltd., Tokyo, Japan) | Extended elbow | Two (2) trials for each hand. The mean of highest value of each hand was recorded. |
| Laurson et al.22  | 2017 | USA | LMS method | TKK 5401 (Takei® Scientific Instruments Co. Ltd., Tokyo, Japan) | NA | Three (3) trials for each hand. The maximum effort from each hand was recorded and summed |
| Lee S et al.26 | 2017 | South Korea | LMS method | NA | NA | Two (2) trials for each hand. The mean of highest value of each hand was recorded. |
| Kocher et al.24  | 2017 | Hawaii | Generalized linear models | Hydraulic Hand Dynamometer Model PC-5030 J1, Fred Sammons, Inc., Burr Ridge, IL: USA) | Extended elbow | Three (3) trials for each hand. The mean of highest value of each hand was recorded. |
| Bohannon et al.23  | 2017 | USA | Generalized linear models | Jamar Dynamometer (Lafayette, IN, USA) | Flexed elbow | Trials quantity for each hand are not clear. The highest score was used for each hand. Independent models were estimated for dominant and non- dominant hands. |
| Hong Kong government27 | 2016 | Hong Kong | NA | NA | NA | NA |
| Ramos-Sepúlveda et al.31  | 2016 | Colombia | LMS method | T-18 TKK SMEDLEY III (Takei® Scientific Instruments Co. Ltd., Tokyo, Japan) | Extended elbow | Two (2) trials for each hand. It is not clear how the value was estimated for each subject |
| Dobosz et al.14  | 2015 | Poland | LMS method | Saehan Sh5001 Hand Dynamometer (Saehan®, Seul, Korea) | NA | NA. |
| Saint Maurice et al.15  | 2015 | Hungary | Quantile Regression | Smedley Digital Hand Dynamometer 12-0286 (Baseline, EEUU) | Extended elbow | Two (2) trials in the dominant hand. The highest score was used. |
| Roriz de Oliveira et al.16  | 2014 | Portugal | LMS method | TKK 5401, Grip-A (Takei® Scientific Instruments Co. Ltd., Tokyo, Japan) | NA | Two (2) trials (The hand used is not clear). The highest score was used. |
| De Miguel-Etayo et al.17  | 2014 | 8 countriesa | Generalized additive models | TKK 5101, Grip-A (Takei® Scientific Instruments Co. Ltd., Tokyo, Japan) | Extended elbow | Trials quantity for each hand are not clear. The score is calculated as the average of right and left handgrip strength |
| Catley et al.25  | 2013 | Australia | LMS method | NA | NA | Trials quantity for each hand are not clear. The score is calculated as the average of right and left handgrip strength |
| Bustamante et al.32  | 2012 | Peru | LMS method | TKK 5401, Grip-A (Takei® Scientific Instruments Co. Ltd., Tokyo, Japan) | NA | NA |
| Ortega et al.18  | 2011 | 10 countriesa | LMS method | NA | NA | NA |
| Hong Kong government27  | 2011 | Hong Kong | NA | NA | NA | NA |
| Marrodán Serrano et al.19 | 2009 | Spain | NA | NA | Extended elbow | Two (2) trials for each hand. The highest score was used for each hand. Independent models were estimated for right and left hands |
| Hong Kong government27  | 2005 | Hong Kong | NA | NA | NA | NA |
| Ortega et al.20 | 2005 | Spain | LMS method | TKK 5101, Grip-A (Takei® Scientific Instruments Co. Ltd., Tokyo, Japan) | NA | Trials quantity for each hand are not clear. The sum from each hand was recorded. |

NA, not available in the original report.

a All countries were from Europe.

LMS Method: Lambda, miu and sigma method.