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29th Fiep World Congress
Istanbul, TURKEY

# Combined sets of European physical fitness percentile scores, with appropriate interpolations, for children and adolescents for the Alpha-fit test battery

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# Physical Fitness

**is an important health factor**

**in children and adolescents.**

**Body Composition**

**Cardiorespiratory Fitness**

**Musculoskeletal Fitness**

**Motor Fitness**

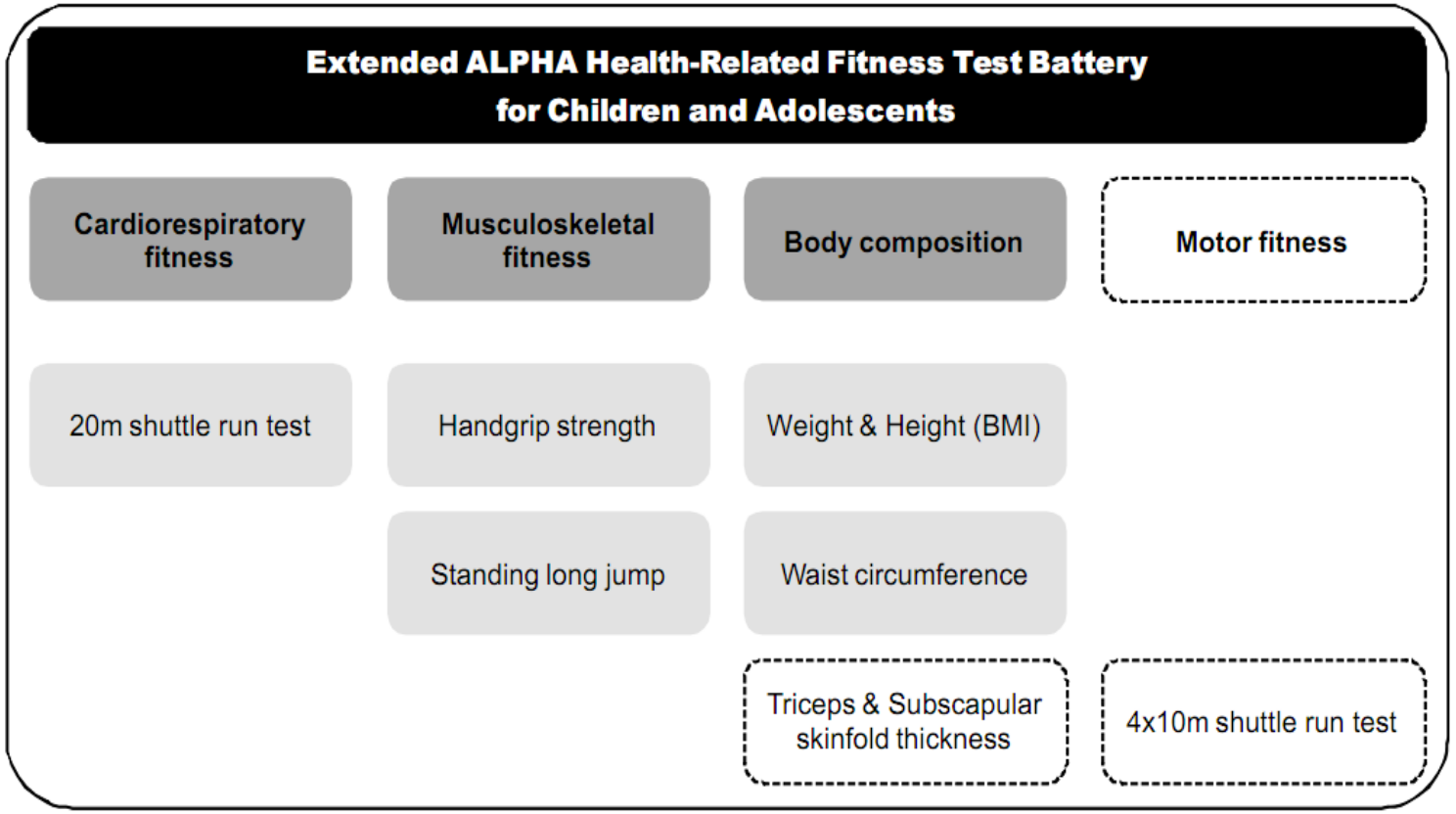
- Decreased future risk for obesity and cardiovascular diseases;
- Improved skeletal health;
- Improved quality of life;
- Improved mental health.

[Ortega, F. B., Ruiz, J. R., Castillo, M. J., & Sjostrom, M. (2008). Physical fitness in childhood and adolescence: a powerful marker of health. Int J Obes (Lond), 32(1)]

# PHYSICAL FITNESS ASSESSMENT

Assessing Levels of Physical Activity

**The Alpha-Fit test battery is one of the most widely applied in Europe for assessing physical fitness levels in children and adolescents.**




[ALPHA. (2009). The ALPHA Health-related Fitness Test battery for Children and Adolescents, Test Manual.]

# Physical Fitness Percentile Scores

| Age | Percentiles | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3 | 10 | 20 | 25 | 30 | 40 | 50 | 60 | 70 | 75 | 80 | 90 | 97 | 99 | 100 |
| 6.0 | 46.7 | 56.6 | 69.1 | | 81.1 | | | 93.8 | | | 106.1 | | 116.7 | 127.0 | 134.4 | |
| 6.5 | 51.1 | 61.0 | 73.6 | | 85.7 | | | 98.6 | | | 111.1 | | 121.9 | 132.3 | 139.9 | |
| 7.0 | 55.6 | 65.5 | 78.2 | | 90.4 | | | 103.5 | | | 116.0 | | 127.0 | 137.6 | 145.2 | |
| 7.5 | 60.2 | 70.1 | 82.8 | | 95.2 | | | 108.3 | | | 121.0 | | 132.1 | 142.7 | 150.5 | |
| 8.0 | 64.9 | 74.8 | 87.5 | | 99.9 | | | 113.1 | | | 125.9 | | 137.1 | 147.9 | 155.7 | |
| 8.5 | 69.6 | 79.5 | 92.3 | | 104.7 | | | 118.0 | | | 130.8 | | 142.1 | 152.9 | 160.8 | |
| 9.0 | ??? | | | | | | | | | | | | | | | |
| 10.0 | | | | | | | | | | | | | | | | |
| 11.0 | | | | | | | | | | | | | | | | |
| 12.0 | | | | | | | | | | | | | | | | |
| 13.0 | | | 107.0 | 118.1 | | 126.3 | 133.5 | 140.3 | 147.2 | 154.8 | | 163.7 | 176.4 | | | 207.8 |
| 14.0 | | | 110.4 | 121.8 | | 130.2 | 137.4 | 144.2 | 151.1 | 158.5 | | 167.3 | 179.6 | | | 209.3 |
| 15.0 | | | 111.6 | 123.0 | | 131.3 | 138.3 | 145.0 | 151.7 | 158.8 | | 167.2 | 179.0 | | | 207.1 |
| 16.0 | | | 114.8 | 126.0 | | 134.1 | 141.0 | 147.5 | 154.0 | 160.9 | | 169.1 | 180.4 | | | 207.5 |
| 17.0 | | | 118.6 | 129.5 | | 137.4 | 144.2 | 150.6 | 157.0 | 163.9 | | 172.0 | 183.4 | | | 210.7 |

**Unfortunately, there is a reference gap between 9 and 13 years in the European norms for:**

- **Handgrip strength**
- **Standing long jump**
- **4x10m shuttle run tests**
- **20m shuttle run test,**

**which has to be filled in to appropriately assess children's physical fitness.**

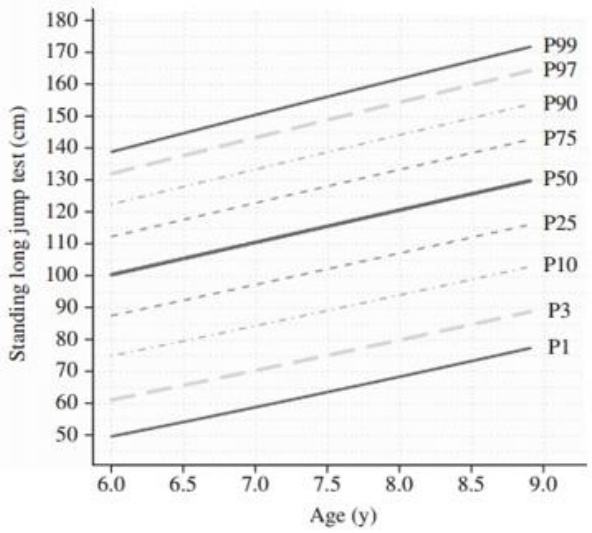
[Miguel-Etayo P, L. Gracia-Marco, F. Ortega, T. Intemann, R. Foraita, L. Lissner, et al. Physical fitness reference standards in European children: the IDEFICS study. International Journal of Obesity. 2014;38:57-66.]

# Aim of the Study

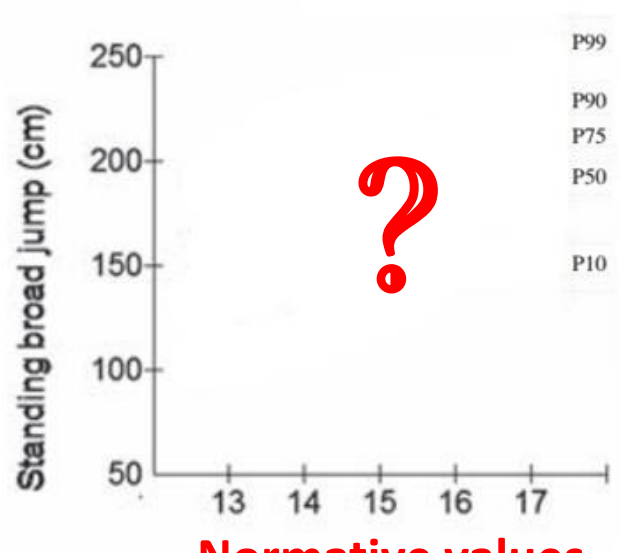
**The aim of this study was to fill in the gap in the European physical fitness percentile norms for the main tests in the Alpha-fit test battery, by using a linier interpolation between the existing percentiles.**

# Material and Methods

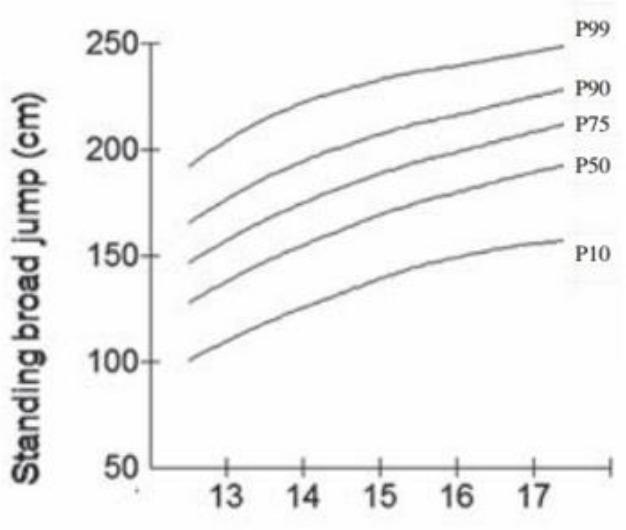
The available European normative values published by Miguel-Etayo et al., 2014, and Ortega et al., 2011, for the main tests of the Alpha-fit test battery were **linearly interpolated** in order to propose percentile scores to close the gap from 9 to 13 years of age.




**Normative values for children (6-9 y)**




**Normative values (9-13 y)**




**Normative values for adolescents (13-17 y)**

# Material and Methods

- Percentile scores for those of 5 and 18 years of age were also estimated by extrapolation.
- In addition, percentiles which were not given with the published norms (20th, 30th, 40th, 60th, 70th, 80th, and 100th in children, and the 1st, 3rd, 25th, 75th, 97th, and 99th in adolescents) were also interpolated.
- With regard to the $VO_2$max obtained by the 20m SRT, the European norms supplied by Miguel-Etayo et al., 2014 for children (6 to 9 years), and international norms in children and adolescents (9 to 17 years), as published by Tomkinson et al., 2016, were interpolated to produce a full set of percentile scores.

# RESULTS

## Table 1. Percentiles for the handgrip strength (kg) in girls

| | Percentiles | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 1 | 3 | 10 | 20 | 25 | 30 | 40 | 50 | 60 | 70 | 75 | 80 | 90 | 97 | 99 | 100 |
| 5.0 | 4.2 | 4.5 | 5.0 | 5.3 | 5.4 | 5.6 | 5.9 | 6.3 | 6.7 | 7.1 | 7.3 | 7.7 | 8.4 | 10.1 | 10.8 | 11.2 |
| 6.0 | 5.0 | 5.5 | 6.2 | 6.7 | 7.0 | 7.2 | 7.7 | 8.1 | 8.6 | 9.1 | 9.3 | 9.7 | 10.6 | 12.1 | 13.2 | 13.8 |
| 6.5 | 5.4 | 6.0 | 6.8 | 7.5 | 7.8 | 8.0 | 8.5 | 9.0 | 9.5 | 10.0 | 10.3 | 10.8 | 11.7 | 13.1 | 14.4 | 15.1 |
| 7.0 | 5.8 | 6.4 | 7.4 | 8.1 | 8.5 | 8.8 | 9.3 | 9.8 | 10.4 | 10.9 | 11.2 | 11.7 | 12.7 | 14.2 | 15.4 | 16.0 |
| 7.5 | 6.1 | 6.9 | 8.0 | 8.8 | 9.2 | 9.5 | 10.0 | 10.6 | 11.2 | 11.9 | 12.2 | 12.7 | 13.7 | 15.3 | 16.5 | 17.1 |
| 8.0 | 6.5 | 7.3 | 8.6 | 9.5 | 9.9 | 10.2 | 10.9 | 11.5 | 12.1 | 12.8 | 13.1 | 13.6 | 14.7 | 16.3 | 17.6 | 18.3 |
| 8.5 | 6.7 | 7.7 | 9.1 | 10.1 | 10.6 | 10.9 | 11.6 | 12.3 | 13.0 | 13.7 | 14.1 | 14.6 | 15.7 | 17.4 | 18.6 | 19.2 |
| 9.0 | 7.8 | 8.7 | 10.1 | 11.2 | 11.7 | 12.1 | 12.8 | 13.6 | 14.3 | 15.1 | 15.5 | 16.1 | 17.3 | 19.2 | 20.4 | 21.0 |
| 10.0 | 10.0 | 10.7 | 12.1 | 13.4 | 13.9 | 14.4 | 15.2 | 16.1 | 16.9 | 17.8 | 18.3 | 19.0 | 20.4 | 22.8 | 24.0 | 24.6 |
| 11.0 | 12.1 | 12.8 | 14.1 | 15.5 | 16.2 | 16.7 | 17.7 | 18.6 | 19.6 | 20.6 | 21.2 | 21.8 | 23.5 | 26.4 | 27.6 | 28.1 |
| 12.0 | 14.3 | 14.8 | 16.1 | 17.7 | 18.4 | 19.0 | 20.1 | 21.1 | 22.2 | 23.3 | 24.0 | 24.7 | 26.7 | 30.0 | 31.2 | 31.7 |
| 13.0 | 16.5 | 16.8 | 18.1 | 19.9 | 20.6 | 21.3 | 22.5 | 23.6 | 24.8 | 26.0 | 26.8 | 27.6 | 29.8 | 33.7 | 34.8 | 35.3 |
| 14.0 | 18.3 | 18.6 | 19.8 | 21.5 | 22.2 | 22.9 | 24.1 | 25.2 | 26.4 | 27.7 | 28.5 | 29.2 | 31.5 | 35.4 | 36.5 | 37.1 |
| 15.0 | 19.1 | 19.4 | 20.7 | 22.5 | 23.2 | 23.9 | 25.1 | 26.2 | 27.4 | 28.7 | 29.5 | 30.3 | 32.6 | 36.7 | 37.9 | 38.5 |
| 16.0 | 19.7 | 20.0 | 21.2 | 22.9 | 23.6 | 24.3 | 25.4 | 26.6 | 27.8 | 29.1 | 30.0 | 30.8 | 33.2 | 37.8 | 39.1 | 39.7 |
| 17.0 | 20.7 | 21.0 | 22.2 | 23.9 | 24.6 | 25.2 | 26.4 | 27.6 | 28.9 | 30.3 | 31.2 | 32.1 | 34.8 | 40.3 | 41.9 | 42.7 |
| 18.0 | 21.7 | 22.0 | 23.2 | 24.9 | 25.5 | 26.1 | 27.4 | 28.6 | 30.0 | 31.5 | 32.5 | 33.4 | 36.4 | 42.9 | 44.8 | 45.7 |

# RESULTS

## Table 2. Percentiles for the handgrip strength (kg) in boys

| Percentiles | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 1 | 3 | 10 | 20 | 25 | 30 | 40 | 50 | 60 | 70 | 75 | 80 | 90 | 97 | 99 | 100 |
| 5.0 | 4.4 | 4.8 | 5.5 | 6.0 | 6.3 | 6.5 | 6.9 | 7.3 | 7.7 | 8.2 | 8.4 | 8.8 | 9.5 | 10.4 | 11.5 | 12.1 |
| 6.0 | 5.4 | 6.0 | 6.9 | 7.6 | 7.9 | 8.1 | 8.6 | 9.1 | 9.6 | 10.1 | 10.4 | 10.8 | 11.7 | 13.0 | 14.1 | 14.7 |
| 6.5 | 5.9 | 6.6 | 7.6 | 8.3 | 8.7 | 9.0 | 9.5 | 10.0 | 10.6 | 11.1 | 11.4 | 11.9 | 12.8 | 14.3 | 15.4 | 16.0 |
| 7.0 | 6.4 | 7.2 | 8.3 | 9.0 | 9.4 | 9.7 | 10.3 | 10.9 | 11.5 | 12.1 | 12.4 | 12.9 | 13.9 | 15.5 | 16.8 | 17.5 |
| 7.5 | 7.0 | 7.8 | 8.9 | 9.8 | 10.2 | 10.5 | 11.1 | 11.7 | 12.4 | 13.1 | 13.4 | 14.0 | 15.1 | 16.8 | 18.1 | 18.8 |
| 8.0 | 7.5 | 8.3 | 9.6 | 10.5 | 11.0 | 11.3 | 12.0 | 12.6 | 13.3 | 14.0 | 14.4 | 15.0 | 16.2 | 18.0 | 19.5 | 20.3 |
| 8.5 | 8.0 | 8.9 | 10.3 | 11.2 | 11.7 | 12.1 | 12.8 | 13.5 | 14.3 | 15.0 | 15.4 | 16.0 | 17.3 | 19.3 | 20.8 | 21.6 |
| 9.0 | 9.0 | 9.9 | 11.3 | 12.4 | 12.9 | 13.3 | 14.1 | 14.9 | 15.8 | 16.6 | 17.1 | 17.8 | 19.3 | 21.8 | 23.3 | 24.1 |
| 10.0 | 11.1 | 11.8 | 13.3 | 14.6 | 15.2 | 15.7 | 16.8 | 17.7 | 18.8 | 19.9 | 20.5 | 21.3 | 23.2 | 26.7 | 28.3 | 29.1 |
| 11.0 | 13.1 | 13.8 | 15.2 | 16.9 | 17.6 | 18.2 | 19.4 | 20.6 | 21.8 | 23.1 | 23.9 | 24.8 | 27.2 | 31.6 | 33.2 | 34.1 |
| 12.0 | 15.2 | 15.7 | 17.2 | 19.1 | 19.9 | 20.6 | 22.1 | 23.4 | 24.8 | 26.4 | 27.3 | 28.3 | 31.1 | 36.5 | 38.2 | 39.1 |
| 13.0 | 17.2 | 17.7 | 19.2 | 21.4 | 22.3 | 23.1 | 24.7 | 26.2 | 27.8 | 29.6 | 30.7 | 31.8 | 35.1 | 41.4 | 43.2 | 44.1 |
| 14.0 | 20.8 | 21.4 | 23.4 | 26.3 | 27.4 | 28.5 | 30.4 | 32.2 | 34.0 | 36.1 | 37.3 | 38.5 | 42.0 | 48.1 | 49.8 | 50.7 |
| 15.0 | 25.2 | 25.9 | 28.1 | 31.3 | 32.5 | 33.7 | 35.7 | 37.7 | 39.7 | 41.8 | 43.1 | 44.3 | 47.9 | 54.0 | 55.7 | 56.6 |
| 16.0 | 30.4 | 31.0 | 33.0 | 35.9 | 37.0 | 38.1 | 40.0 | 41.8 | 43.7 | 45.7 | 46.9 | 48.1 | 51.5 | 57.5 | 59.2 | 60.0 |
| 17.0 | 35.2 | 35.7 | 37.4 | 39.9 | 40.9 | 41.8 | 43.5 | 45.1 | 46.7 | 48.5 | 49.6 | 50.6 | 53.7 | 59.2 | 60.7 | 61.5 |
| 18.0 | 39.9 | 40.3 | 41.8 | 43.9 | 44.7 | 45.5 | 47.0 | 48.4 | 49.7 | 51.3 | 52.2 | 53.1 | 55.9 | 60.9 | 62.3 | 63.0 |

# RESULTS

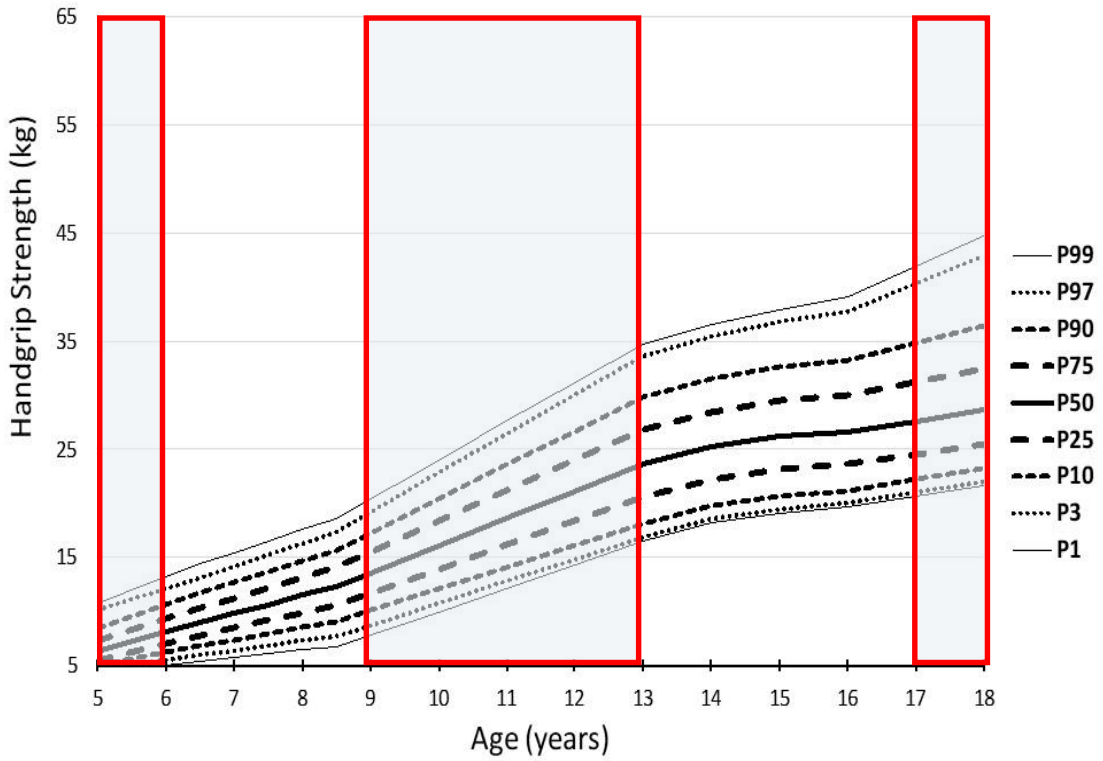



**Fig. 1. Percentile curves for the handgrip strength (kg) in girls**

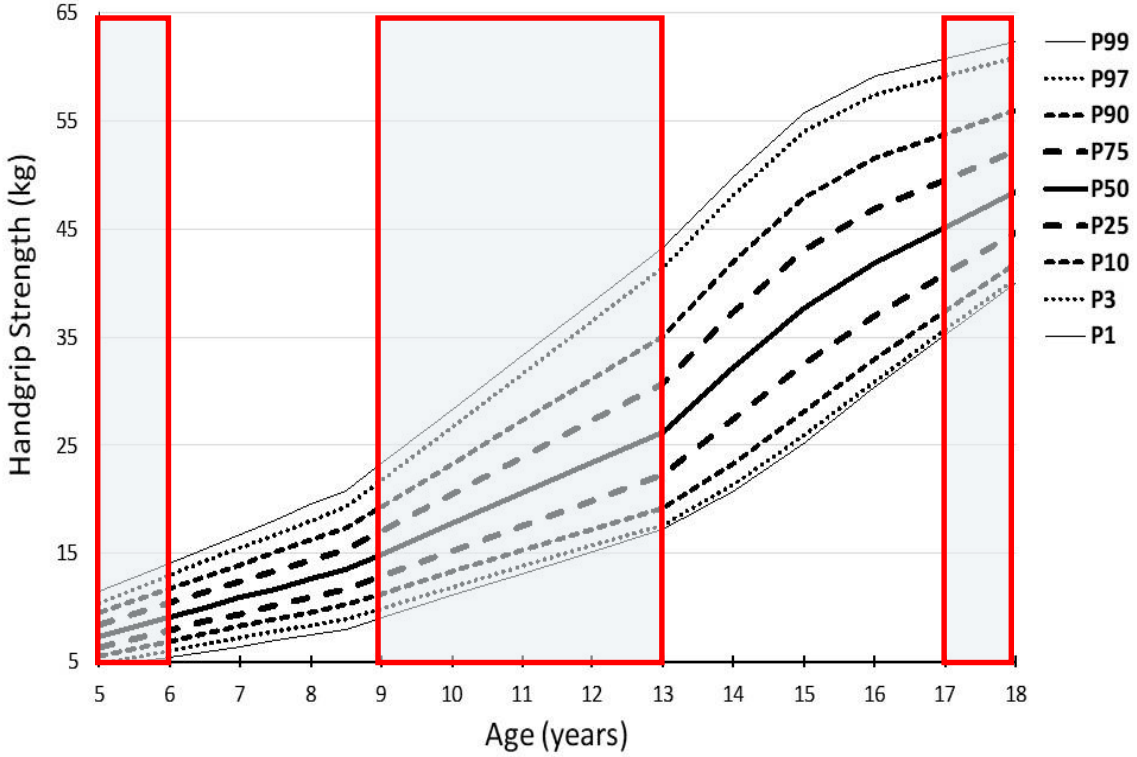
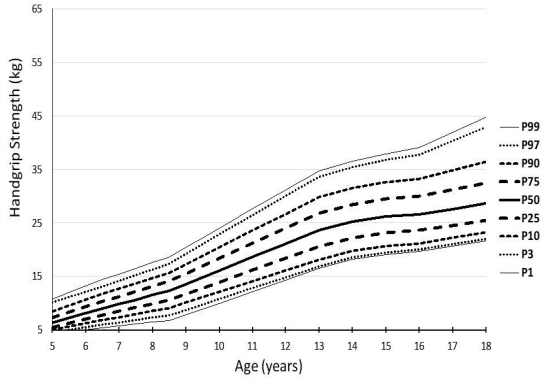
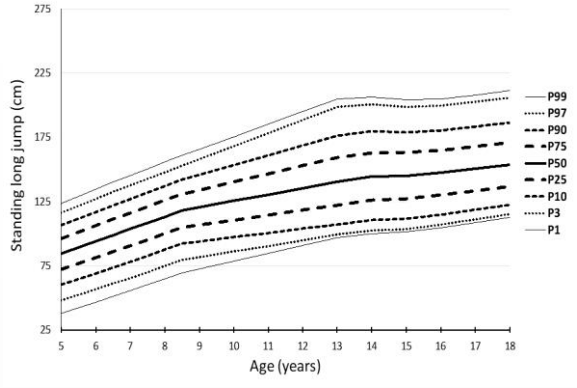
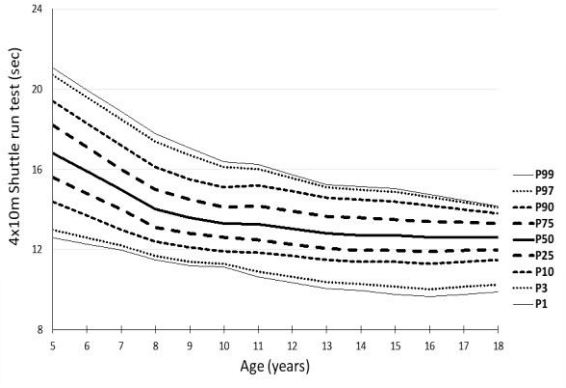


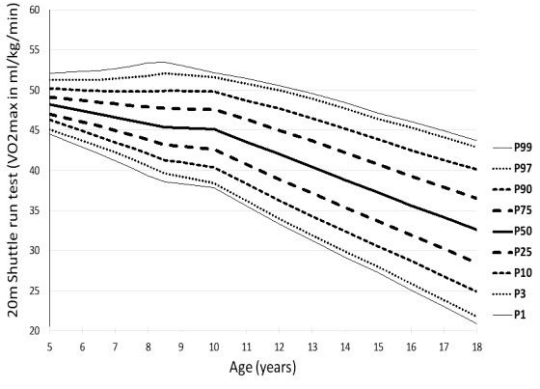

**Fig. 2. Percentile curves for the handgrip strength (kg) in boys**

# RESULTS



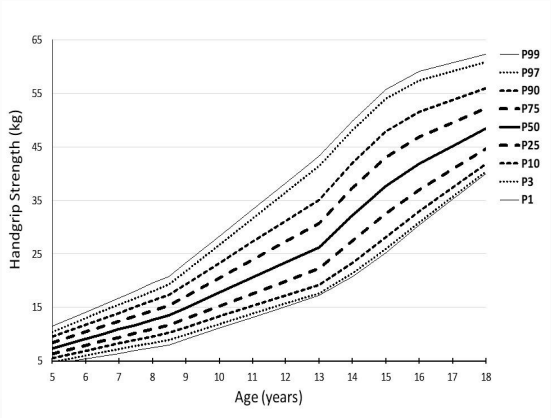



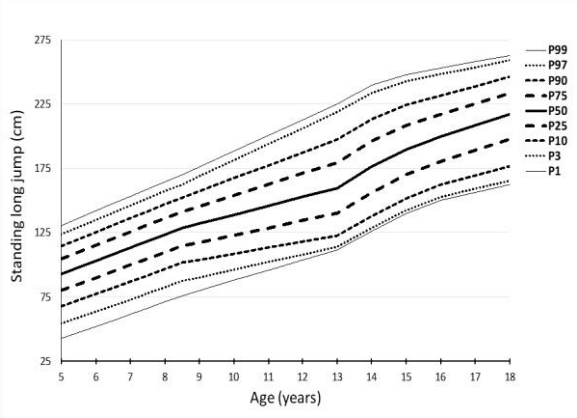

## Handgrip Strength

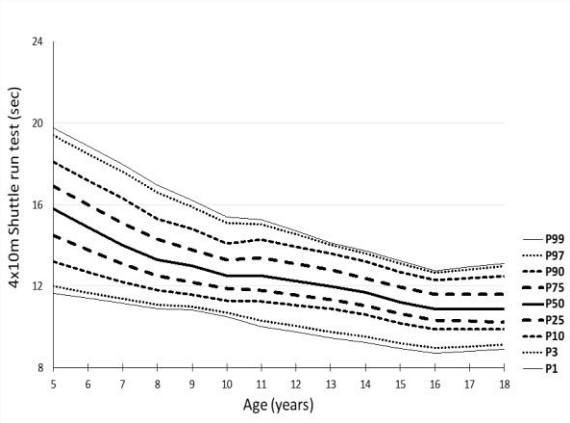
## Standing Long Jump

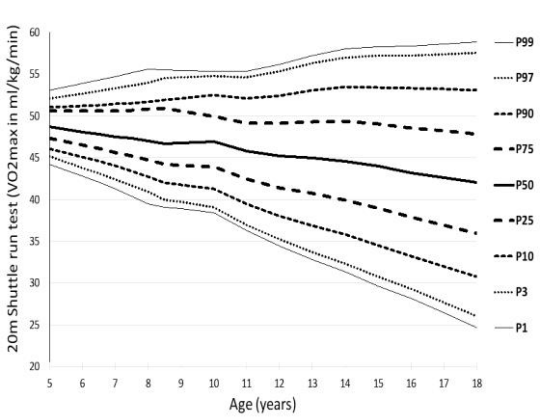
## 4x10 m SRT

## 20 m SRT



# DISCUSSION

HELENA study (2011)
Ortega et al., 2011

**3 528**
Adolescents

IDEFICS study (2014)
Miguel-Etayo et al., 2014

**18 745**
Children

Tomkinson et al. (2016)

**1 142 026**
Children & Adolescents

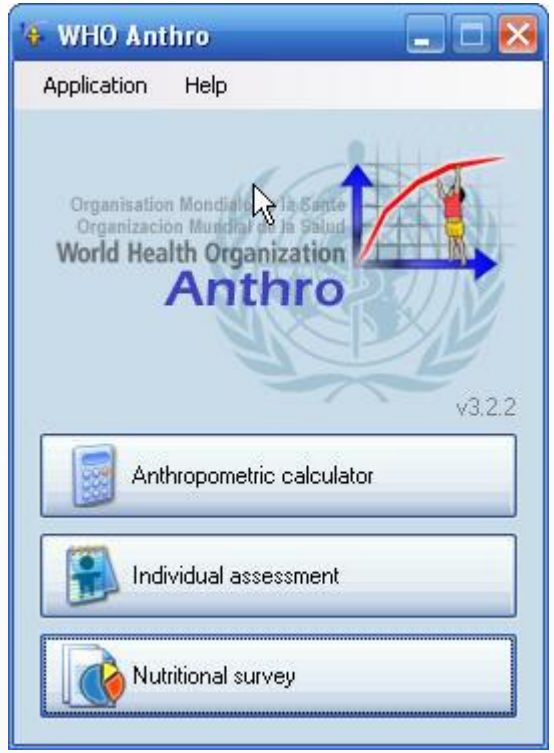
**Studies which are conducted in order to obtain physical fitness percentile scores require a considerable amount of time and financial support due to the need to cover a substantial number of participants.**

# Recommendations & Conclusion

**Extended ALPHA Health-Related Fitness Test Battery for Children and Adolescents**

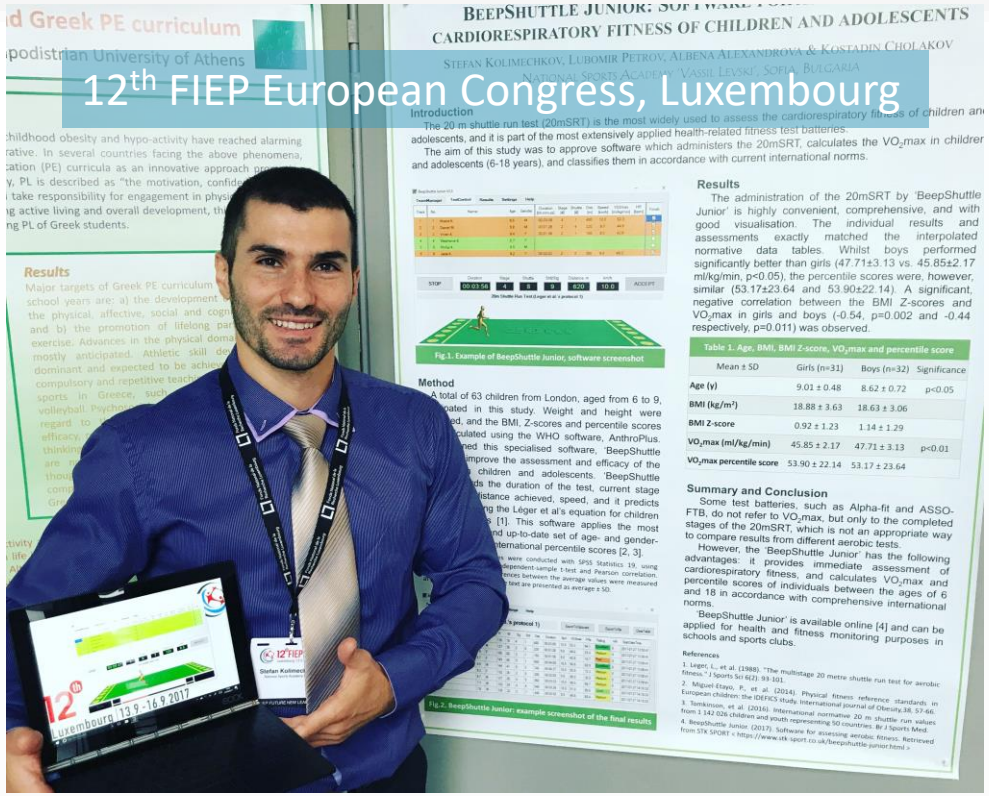
| Cardiorespiratory fitness | Musculoskeletal fitness | Body composition | Motor fitness |
|---|---|---|---|
| 20m shuttle run test | Handgrip strength | Weight & Height (BMI) | |
| | Standing long jump | Waist circumference | |
| | | Triceps & Subscapular skinfold thickness | 4x10m shuttle run test |

World Health Organization




**When evaluating the anthropometric result, we recommend that the international normative values for children and adolescents provided by the World Health Organisation are used.**

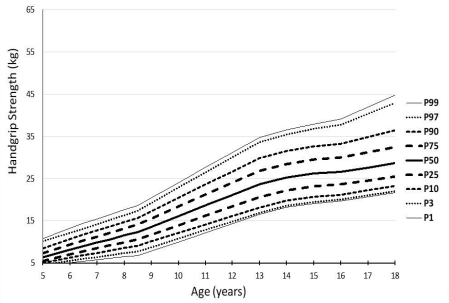
# RECOMMENDATIONS & CONCLUSION

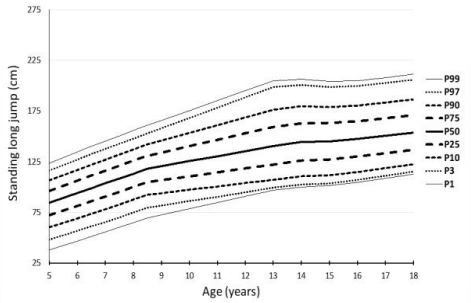



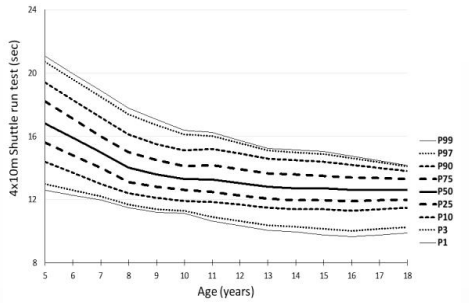

**For the administration of the 20 m SRT, we recommend using the specialised software 'BeepShuttle Junior'.**

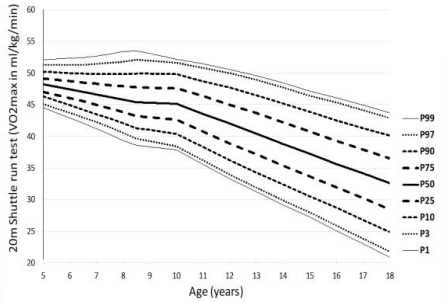
[Kolimechkov, S., Petrov, L., Alexandrova, A., & Cholakov, K. (2018). BeepShuttle Junior: Software for the administration of the 20m shuttle run test in children and adolescents. Journal of Advanced Sport Technology, 1 (3), 35-40.]

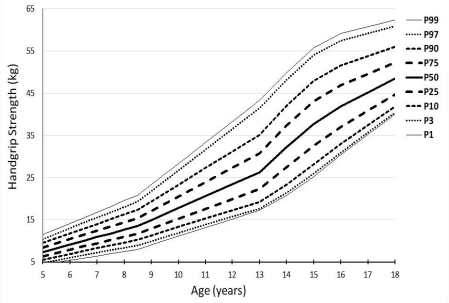
# RECOMMENDATIONS & CONCLUSION

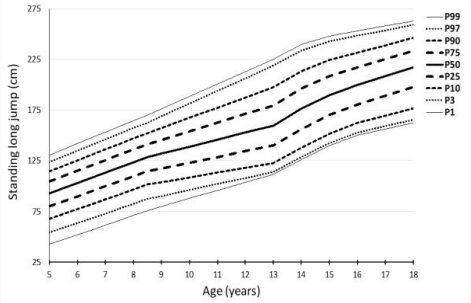


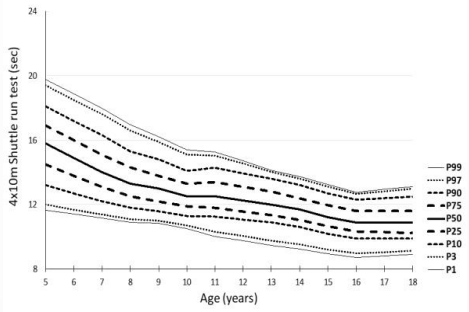



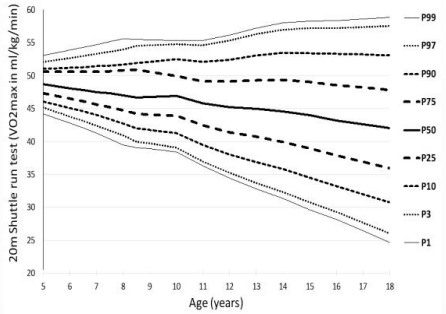




**The proposed combined and interpolated percentile scores can be applied in order to evaluate European children and adolescents at all ages until the missing values are established by experimental research.**

# Our Team

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