

NEUROMUSCULAR FACTORS AND YO-YO ENDURANCE TEST PERFORMANCE IN FINNISH YOUNG AND ADULT FOOTBALL PLAYERS

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INTRODUCTION

Yo-yo fitness tests have been commonly used in football to measure endurance performance and also to estimate players' aerobic capacity (Vo₂max). Some studies have been carried out with adult football players to compare Yo-Yo test results to measured aerobic fitness factors such as Vo₂max (e.g. Castagna et al. 2006, Metaxas et al. 2005).

Purpose

- To examine the relationship between estimated and measured Vo₂max in young and adult Finnish male football players
- To find out if neuromuscular factors are related to the performance in the Yo-yo Endurance Test in different age groups

METHODS

Subjects

11 years (11y)

- height 1.48 ± 0.07 m, weight 36.9 ± 5.0 kg, body fat 12.0 ± 4.2 %, n=12

15 years (15y)

- 1.71 ± 0.07 m, 59.6 ± 10.6 kg, 8.5 ± 4.1 %, n=9

Adults (A)

- 1.77 ± 0.06 m, 75.4 ± 6.7 kg, 12.4 ± 2.5 %, n=14

Measurements

- Maximal oxygen uptake [VO₂max] on a treadmill
- The Yo-yo Endurance Test Level 1 (20-m shuttle run test) to estimate VO₂max [eVO₂max] from the distance covered in the test [Dis]
- Speed tests (10-m [10m] and 30-m [30m] sprints) with photocells and Counter Movement Jump [CMJ] used as neuromuscular factors



Figure 1. Players performing the Yo-Yo test

Pearson's correlation coefficient was used to evaluate relationships between variables. One-way ANOVA with Tukey's post hoc test was applied to detect the differences between the groups. The level of significance was set at p<0.05.

RESULTS

A significant difference in measured Vo₂max was found between 11y vs. A (p<0.001) and 15y vs. A (p<0.05) (Table 1). In the Yo-yo test results the 11y differed significantly from 15y (p<0.05) and A (p<0.001). Significant differences between all groups were only found in neuromuscular factors 11y vs. 15 and A (p<0.001) and 15y vs. A (p<0.05).

Table 1. Means and standard deviations of the measured variables in different groups.

| Group | Vo ₂ max (ml/kg/min) | Dis (m) | eVo ₂ max (ml/kg/min) | 10m (s) | 30m (s) | CMJ (m) |
|------------|---------------------------------|------------|----------------------------------|-------------|-------------|-------------|
| 11y (n=12) | 46.0 ± 4.8 | 1886 ± 263 | 48.7 ± 4.1 | 2.01 ± 0.10 | 5.12 ± 0.24 | 0.29 ± 0.05 |
| | **A | **A *15y | **A *15y | **A **15y | **A **15y | **A **15y |
| 15y (n=9) | 49.0 ± 3.8 | 2376 ± 308 | 55.8 ± 4.3 | 1.82 ± 0.10 | 4.44 ± 0.23 | 0.38 ± 0.03 |
| | *A | *11y | *11y | **11y *A | **11y *A | **11y *A |
| A (n=14) | 55.1 ± 4.1 | 2451 ± 269 | 56.8 ± 3.8 | 1.70 ± 0.06 | 4.12 ± 0.13 | 0.43 ± 0.04 |
| | **11y *15y | **11y | **11y | **11y *15y | **11y *15y | **11y *15y |

** The mean difference is significant at the 0.001 level

* The mean difference is significant at the 0.05 level

Table 2. Correlation matrix of the measured variables for 11y (upper), 15y (middle) and A (lower).

| | Dis | eVo ₂ max | 10 m | 30 m | CMJ |
|----------------------|-------------------------|-------------------------------|------------------------------|-------------------------------|-------------------------------|
| Vo ₂ max | 0.311 0.395 0.502 | 0.310 0.409 0.487 | 0.270 -0.485 -0.246 | 0.456 -0.429 -0.390 | -0.232 0.482 0.322 |
| Dis | | 0.978** 0.999** 0.999** | -0.470 -0.847** -0.117 | 0.158 -0.822** -0.276 | 0.326 0.257 0.292 |
| eVo ₂ max | | | 0.059 -0.851** -0.123 | 0.222 -0.826** -0.263 | 0.279 0.253 0.288 |
| 10 m | | | | 0.901** 0.961** 0.872** | -0.653* -0.374 -0.669** |
| 30 m | | | | | -0.605* -0.363 -0.669** |

** Correlation is significant at the 0.01 level.

* Correlation is significant at the 0.05 level.

A significant (p< 0.01) correlation was found in the 15 year old players between the distance covered in the Yo-yo test and 10-m (r = -0.847) and 30-m (r = -0.822) sprint times (table 2). The correlation between the estimated Vo₂max and 10-m (r=-0.851) and 30-m (r=-0.826) sprint times was also significant (p< 0.01). No correlation was found between the estimated and measured Vo₂max-values.

DISCUSSION

- The results revealed, in contrast to previous findings (Metaxas et al. 2005), that the estimated Vo₂max - values were higher than the measured Vo₂max in all groups.

- The absence of the relationship between predicted and measured Vo₂max in all of these groups suggests that the Yo-yo Endurance Test could be more suitable to measure endurance performance in football players and that Vo₂max should be measured on a treadmill as previously pointed out by Metaxas et al. (2005).

- The correlations between the sprint times and Yo-yo test results in 15 year old players imply that in addition to aerobic capacity neuromuscular factors seem to affect their performance in the Yo-yo test. Especially this seems to be the case in this type of heterogeneous group, in which maturation varied greatly.

- Another reason for the effect of the neuromuscular factors could be the nature of the Yo-yo test, which requires a lot of turns and short sprints.

- To sum, the results suggest that in the present subjects Vo₂max could not be reliably estimated based on the Yo-yo test results. Nevertheless, the Yo-yo tests provide an easy and helpful tool for coaches to evaluate players' endurance performance.

REFERENCES

- Castagna, C. et al. (2006) Journal of Strength and Conditioning Research, 20(2), 320-325
- Metaxas, T.I. et al. (2005) Journal of Strength and Conditioning Research, 19(1), 79-84

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