

# Interrelationships among the three performance tests in competitive youth soccer players



Matthew A. Mohammadnabi, Andrew D. Fields, Michael R. Esco  
*The University of Alabama, Department of Kinesiology*

## Abstract

**INTRODUCTION:** The 20-meter shuttle run (20MSR), T-test (TT), and vertical jump (VJ) are popular field-based performance tests among soccer players. Though each test is an indicator of a specific parameter of performance-related physical fitness (i.e., aerobic capacity, agility, and explosive power, respectively), there is limited information on the interrelationships between these tests. The purpose of this study is to examine whether there is shared variance across these three tests in competitive youth soccer players. **METHODS:** Nineteen male youth soccer players (age = 14.9±5.4 years, height = 163.8±6.4 cm, weight = 66.3±7.4 kg) participated in the study. Following dynamic warm-up and familiarization procedures, each participant performed one trial of the 20MSR, three trials of the TT, and three trials of VJ. The order of testing was randomized. Performance of the 20MSR was recorded as total meters completed. The best performances of the three trials for TT (seconds) and VJ (cm) were recorded and analyzed. Two Certified Strength and Conditioning Specialists supervised the tests and recorded the scores. **RESULTS:** The mean ± SD was 1409.5 ± 339.4 meters for 20MSR, 11.7 ± 1.1 seconds for TT, and 57.4 ± 8.9 cm for VJ. Stepwise regression analysis revealed that variance in the 20MSR was explained by the TT ( $r = -0.68$ ,  $R^2 = 0.46$ ,  $p = 0.001$ ), variance in the TT was explained by the VJ ( $r = -0.76$ ,  $R^2 = 0.57$ ,  $p < 0.001$ ), and variance in the VJ was explained by the TT ( $r = -0.76$ ,  $R^2 = 0.57$ ,  $p < 0.001$ ). However, the VJ did not significantly explain variance in the 20MSR (partial  $r = 0.25$ ,  $p = 0.31$ ), nor did the 20MSR explain variance in the TT (partial  $r = -0.39$ ,  $p = 0.11$ ) or VJ (partial  $r = 0.25$ ,  $p = 0.31$ ). **CONCLUSIONS:** These findings suggest a strong relationship between TT and VJ, with the TT also significantly explaining variance in the 20MSR. However, the 20MSR did not account for variance in either the TT or VJ, indicating that agility may contribute to aerobic performance, but not vice versa. **PRACTICAL APPLICATIONS:** Strength coaches and practitioners working with youth soccer players should recognize the strong relationship between the agility and lower body explosive power, as improves in one may carry over to the other. Additionally, improvements in agility performance may contribute to 20MSR. This finding suggests that agility training could have carryover effects on aerobic performance as tested by the 20MSR, perhaps due to the 108 degree turns at each point of the test. However, developing aerobic fitness alone may not enhance agility or lower-body explosive power. These postulations should be confirmed with longitudinal, cause-effect research study.

## Introduction

- Field-based tests are commonly used to assess physical performance in youth soccer, due to their practicality and relevance to sport-specific demands.
- Three widely used tests in soccer are the 20-meter shuttle run (20MSR), which evaluates aerobic capacity; the T-test (TT), which measures agility and change-of-direction ability; and the vertical jump (VJ), which reflects lower-body explosive power.
- Each of these test targets a distinct component of performance-related fitness. However, in real-world performance, these abilities often interact, and it is unclear to what extent the tests may be measuring overlapping features. Understanding the relationships among these tests can help coaches and practitioners reduce redundancy in performance assessments and better design training programs.
- Despite their popularity, limited research has explored how closely these tests are related to competitive youth soccer players. Identifying whether they share variance can elucidate whether they assess unique or common aspects of athletic performance.
- The purpose of this study was to examine whether there is a shared variance among the 20MSR, TT, and VJ in competitive youth soccer players.

## Methods

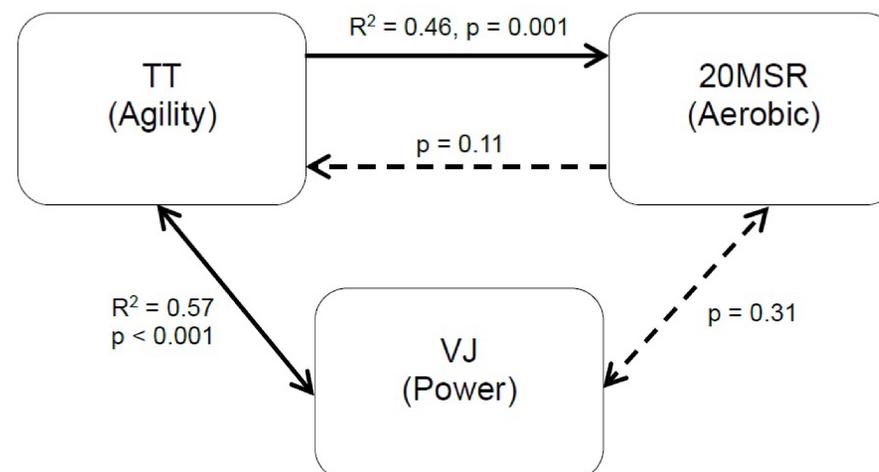
- Nineteen male youth soccer players (mean age: 14.9 ± 5.4 years; height: 163.8 ± 6.4 cm; weight: 66.3 ± 7.4 kg) took part in the study.
- After completing a dynamic warm-up and familiarization procedures, each participant performed one trial of the 20MSR, three trials of the TT, and three trials of the VJ, in randomized order.
- Performance on the 20MSR was recorded as the total distance completed in meters.
- For the TT and VJ, the best of the three trials was used for analysis, recorded in seconds and centimeters, respectively.

## Results

**Table 1.** Descriptive Statistics and Regression Results Among Performance Tests

DV	M ± SD	IV	r	R <sup>2</sup>	p-value
20MSR	1409.5 ± 339.4 m	TT	-0.68	0.46	0.001
		VJ	0.25	—	0.31
TT	11.7 ± 1.1 s	VJ	-0.76	0.57	<0.001
		20MSR	-0.39	—	0.11
VJ	57.4 ± 8.9 cm	TT	-0.76	0.57	<0.001
		20MSR	0.25	—	0.31

DV = dependent variable, IV = independent variable, M = mean value, SD = standard deviation, r = correlation coefficient, R<sup>2</sup> = shared variance, m = meters, s = seconds, cm = centimeters.



**Figure 1.** Regression pathways among the performance tests

## Conclusions

- This study was done to determine if three soccer related physical abilities are interrelated in youth soccer players.
- The findings showed that agility was strongly associated with lower-body power and significantly contributed to aerobic performance.
- Particularly, agility performance occurred as the strongest predictor of shuttle run outcomes, while vertical jump performance predicted agility in a significant way.
- However, aerobic fitness did not significantly account for variation in agility or lower-body explosive power.
- Also, explosive power did not predict aerobic performance.
- These results suggest a straight relationship in which agility may enhance aerobic capacity, possibly due to shared movement loads.
- Nonetheless, improvements in aerobic fitness alone are unlikely to be assigned to agility or power-based tasks.
- All in all, the results highlight the fundamental role of agility in youth soccer performance and support the integration of agility training as a potentially beneficial strategy for developing both aerobic and explosive physical values.

## Practical Applications

- Strength and conditioning professionals working with youth soccer players should acknowledge the strong association between agility and lower-body explosive power, as enhancements in one may positively influence the other.
- Moreover, improvements in agility performance may contribute to enhanced outcomes on the 20MSR, potentially due to the repeated 108-degree changes of direction required during the test.
- This finding indicates that agility training may elicit beneficial carryover effects on aerobic performance, as assessed by the 20MSR.
- In contrast, developing aerobic fitness in isolation is unlikely to result in significant gains in agility or lower-body explosive power.
- Further investigation is needed through longitudinal, cause-effect research designs.