TEST-RETEST RELIABILITY AND VALIDITY OF THREE DIFFERENT AGILITY TESTS FOR VARIOUS TEAM SPORTS IN YOUNG MALE ATHLETES

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Abstract The purpose of this study is to examine the reproducibility of three different agility tests in basketball, soccer and water polo team sports.

To determine the reliability 44 young male athletes (Basketball age 16.5 ±0.6, height 177.9 ±7.7 weight 70.0 ±7.1; Soccer age 16.3 ±0.5, height 169.2 ±5.0, weight 71.2 ±7.9; Water Polo age 17.1 ±0.7, height 181.3 ±6.7, weight 76.7 ±7.2) performed 3 different agility tests (Zig-Zag, Illinois and AS) on two occasions 1 wk. apart for test-retest. Sprint time scores were analyzed for each test. To determine the reliability Paired Sample T-test and Pearson Correlation Statistics were computed. Scores of teams were compared with ANOVA statistics to determine the difference.

Test results showed that there was no significant difference between the two occasions for all agility test on subjects and teams ($p > 0.01$). There was higher correlation between test-retest values of subjects ($r = 0.90–0.97$). Three different agility tests were found valid in determining agility with significant moderate level correlation. ($r = 0.36–0.44$; $p < 0.01$). Differences among sport branches were found significant for agility scores ($p < 0.05$).

All three agility tests are reliable and valid for team sport athletes. Soccer players had better scores than other branches in soccer specific test (AS). This study showed that sport specific agility tests are more useful than general agility tests.

Key words agility, team sports, soccer, water polo, basketball

Introduction

The purpose of this study is to examine the reproducibility of three different agility tests in basketball, soccer and water polo team sports. The agility is one of the most significant motor skill, especially for team sports. Different agility test shows different results. Because of that, to find suitable sport-specific agility tests are important for coaches, scouts, managers and physical educators to reach best and correct result. So, the hypothesis of this research was to clarify the usefulness of sport-specific agility tests for sports branches.

Team sport performance, which depends on the technical skills and physical fitness of the players, is known to significantly influence match performance. The simultaneous use of both technical skills and fitness in soccer training would produce extremely effective performance (Little, Williams, 2007). Agility is the ability to maintain and control correct body positions while quickly changing direction through a series of movements (Twist, Benicky, 1995). This ability is a determinant of sport performance in field and court sports, evidenced by time-motion analysis, validation of testing batteries for elite and non-elite performers, and coaching analyses for various team sports (Sheppard, Young, Doyle, Sheppard, Newton, 2006).

Agility in team sports can be defined as basic movements requiring the player to perform sudden changes in body direction in combination with rapid movement of the limbs (Ellis et al., 2000). Another explanation for agility is often recognized as the ability to quickly change directions and to start and to stop quickly (Little, Williams, 2005).

To examine agility of players accurately, it is argued that agility test must cater for different diminutions of agility skill such as reactive aspect of performance through the addition of a visual-perceptual test component (Farrow, Young, Bruce, 2005). Various agility tests have been developed to test players' ability of change of direction in use different team sports (Angeli, Nyland, 2006).

The outcome of an agility test can discriminate elite soccer players from the general population better than any other field tests, such as strength, power, or flexibility (Reilly, Bangsbo, Franks, 2000; Reilly, Williams, Nevill, Franks, 2000). Reilly and Williams (2003) have also identified the Illinois agility test (IAT) as one of best tests to measure of soccer's agility. The classical T-drill agility test, developed by Semenick (1990) can be used in different sports. However, a few studies have evaluated sport-specific test such as agility, including sprints, changes of direction and striking at the goal (Kutlu, Yapıcı, Yoncalık, Çelik, 2012). It is seen that the studies carried out when the researches on the subject are examined are not enough in quantity (Little, Williams, 2005).

Kutlu et al. (2012) have developed and evaluated a novel test of agility and striking skill for soccer that involves sprint running, direction changing, and kicking stationary balls to the goal with accurate decision making.

It's a curiosity, how different agility tests for different team sports show level of validity and reliability. The purpose of this study was to examine the reproducibility and validity of three different agility tests in basketball, soccer and water polo team sports.

Material and methods

44 young male athletes (n = 44, Basketball n = 23; Soccer n = 11, Water Polo n = 10) performed 3 different agility tests (Zig-Zag; Bloomfield et al., 1994; Illinois; Roozen, 2004, and The New Agility and Skill Tests; Kutlu et al., 2012). Physical characteristics of team sports players were shown in Table 1.

Table 1. Physical and physiological characteristics of young team sports players

Groups	N	Age	Sports age	Height	Weight	% Fat	BMI
Basketball	23	16.5 ±0.7	4.0 ±2.0	178.0 ±8.0	70.1 ±8.0	13	22.1 ±5.0
Water Polo	10	17.1 ±0.7	4.5 ±3.0	181.0 ±7.0	76.7 ±7.0	14	23.5 ±6.0
Soccer	11	16.4 ±0.5	4.0 ±2.0	180.0 ±7.0	71.2 ±8.0	12	22.0 ±5.0
All Players	44	16.6 ±0.6	4.2 ±2.0	18.00 ±7.0	72.6 ±8.0	13	22.5 ±5.0

*$p < 0.05$.

Three different agility tests are Zig-Zag (Bloomfield et al., 1994), Illinois (Roozen, 2004) and The New Agility and Skill Tests (Kutlu et al., 2012) were used to determine the reliability for three different sport athletes (soccer, water polo, basketball) on two occasions a week apart for test-retest. The best sprint time scores were recorded and were analyzed for each test. To determine reliability of tests Paired Sample T-test and Pearson Correlation Statistics were computed. Scores of teams were compared with ANOVA statistics to determine differences among team's validity. All players became familiar with the testing procedures utilized in the current study before the official test was applied. The study protocol and methods were approved by university institutional ethics committee and all subjects gave written informed consent prior to participation. Statistical analysis SPSS 21 software package was used for statistical analyzes ($p < 0.05$ and $p < 0.01$ were set for confidence level and in statistical calculations).

Results

Physical and physiological characteristics of young team sports players are determined as descriptive values in Table 1.

Table 2. Different agility scores of young team sports athletes

Agility tests	N	Basketball	Water polo	Soccer	All players
Zig-Zag (sec.)	44	6.54 ±0.34*	6.55 ±0.13	6.70 ±0.41	6.58 ±0.33
Illinois (sec.)	44	16.77 ±0.89	14.32 ±0.54*	17.25 ±0.86	16.33 ±1.38
Agility and Skill (sec.)	44	15.45 ±0.99	14.26 ±0.88	14.18 ±1.38*	14.86 ±1.22

* Significant differences between groups.

Test results showed that there was no significant difference between the two occasions for all agility test on subjects and teams ($p > 0.01$). There were high significant correlations found between test-retest values of subjects ($r = 0.90–0.97$). Agility scores of all groups were shown in Table 2.

Table 3. Results for Two Occasions of 3 Different Agility Tests and Pearson Correlations Reliability

Agility Tests (seconds)	Basketball	Water polo	Soccer
Zig-Zag (Pre-Test)	6.490	6.510	6.660
Zig-Zag (Post-Test)	6.540	6.580	6.740
Correlation	0.980**	0.900*	0.840**
Illinois (Pre-Test)	16.700	14.220	17.260
Illinois (Post-Test)	16.780	14.420	17.210
Correlation	0.944**	0.860**	0.914**
Agility and Skill (Pre-Test)	15.340	14.190	14.150
Agility and Skill (Post-Test)	15.470	14.330	14.210
Correlation	0.910**	0.891**	0.980**

* Correlation is significant at the 0,05 level (2-tailed).
** Correlation is significant at the 0,01 level (2-tailed).

Test results showed that there was no significant difference between the two occasions for all agility test on subjects and teams ($p < 0.01–p < 0.001$). There were high significant correlations found between Pre-test and

Post-test values of Zig-Zag test (r = 0.84–0.98). There were high significant correlations found between Pre-test and Post-test values of Illinois test (r = 0.86–0.94). Also, there were very high significant correlations found between Pre-test and Post-test values of Agility and Skill test (r = 0.89–0.98; p < 0.01). Agility scores of all groups were shown in Table 3.

Table 4. Pearson correlations of different agility tests for validity

Agility Tests	N	Zig-Zag	Illinois	Agility and skill
Zig-Zag	44	1.00	0.44**	0.36*
Illinois	44	0.44	1.00	0.40**
Agility and skill	44	0.36*	0.40**	1.00

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Three different agility tests were found valid in determining agility with significant light to moderate level correlation (r = 0.36–0.44; p < 0.01, Table 4). Differences among sport branches were found significant for agility scores (p < 0.05, Table 4). According to the Anova analysis, there were found significant differences among the test results of the three groups (p < 0.05). It has shown in Table 4.

Discussion

Agility and Skill Test, Zig-Zag test and Illinois agility tests were used to ensure the reliability of tests for team sports of soccer, basketball and water polo. All three agility tests were found reliable and valid for different team sports athletes (p < 0.05).

The within-subject variations in all 3 agility tests are acceptable similarly with some other studies (Pauole, Madole, Garhammer, Lacourse, Rozenek, 2000; Sporis, Jukic, Milanovic, Vucetic, 2010). The correlation values for the three different agility test obtained in this study are the highest. When comparing the results of our study with the results from previous studies in which the similar methods were used, we can conclude that young soccer players are nearly 1 second faster than other group of athletes especially in the test of soccer specific Agility and Skill test (p < 0.05) (Kutlu et al. 2012; Sporis et al., 2010). However, basketball players had better score on Zig-Zag test than others and water polo players had better score on Illinois test than others (p < 0.05) (Table 2).

Different team sports athletes had significantly different agility test scores in our study. Even soccer players had better scores than other branches in soccer specific test (AS) other team sports athletes could have better scores on other agility tests (Sporis et al., 2010). This study showed that sport specific agility tests should be chosen carefully for testing the athletes. So, they could be more suitable for different kind of team sports.

High-speed actions are known to impact soccer performance and can be categorized into actions requiring maximal speed, acceleration, or agility. Contradictory findings have been reported to the extent of the relationship between the different speed components (Little, Williams, 2005).

Based on the low coefficients of determination, it was concluded that acceleration, maximum speed, and agility are specific qualities and relatively unrelated to one another. The findings suggest that specific testing and training procedures for each speed component should be used when working with elite players.

Like mentioned above the study and in a specially designed research which is similar to our work; the famous footballer Cristiano Ronaldo has been subjected to different tests in a laboratory environment with high technological equipment ("Castrol Edge Presents Ronaldo Tested to the Limit", 2011). In terms of speed and agility, Ronaldo was tested and compared with a Spanish champion sprinter. As a result of the tests, in the agility test of Zig-Zag, Ronaldo was more successful than the sprinter athlete, however, failed to pass the athlete in the 25-meter sprint test. From these findings, it can be easily understood that the Zig-Zag agility test was more effective and suitable to determine the soccer specific performance for soccer players. In our study, there is a linear positive relationship, even if not at a high level, between the tests for all three sport branches (Table 3). This is an indication of the validity of the agility tests used in the study for different team sports. However, statistically significant differences in the performance of the agility tests were found (Table 4) ($p < 0.05$), indicating that some sports branches were more useful in some agility tests; (in such as, soccer players were successful in football-specific test than others) significantly outperform others in other agility tests, making the effectiveness and selectivity of tests relatively valid and thus questionable. (Little, Williams, 2005).

Conclusion

Thus, it is possible to arrive from the results that different speeds, quickness and agility tests have their specific characteristics and are relatively unrelated to each other. Therefore, in terms of speed, agility and short skills, the selection of the appropriate test is like problem and to find best the whose concerned, required some research endeavors in determining the suitable tests for coaches.

Consequently, the agility and skill of athletes are very important in talent identification, and to determine the performance development. Different sport branches could need sport specific agility skills. So, this type of sport specific research studies and practical results make sense and are beneficial for team sport coaches, sports managers and scouts. When the results of this study are evaluated, it may be possible to achieve better and significant performance results by using skill-based agility tests.

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