RELIABILITY AND VALIDITY OF NEW TESTS ON AGILITY AND SKILL FOR CHILDREN SOCCER PLAYERS

Mehmet Kutlu,[1, A, C, D] Hakan Yapici,[2, B, E] Erkan Demirkan,[3, D, E] Abdullah Yılmaz[4, C, D]

[1] Department of Physical Education and Sport, Education Faculty, the University of Kırıkkale, Turkey
[2] School of Physical Education and Sport, Kırıkkale University, Turkey
[3] Physical Education and Sports School, Hitit University, Çorum, Turkey
[4] Department of Statistics, Art & Science Faculty, the University of Kırıkkale, Turkey
[A] Study Design; [B] Data Collection; [C] Statistical Analysis; [D] Manuscript Preparation; [E] Funds Collection

Address for correspondence:
Mehmet Kutlu, PhD
Department of Physical Education and Sport
Education Faculty, the University of Kırıkkale, 71450 Yahşihan Kırıkkale, Turkey
E-mails: mkutlu@kku.edu.tr

Abstract. Recently developed the agility and skill tests (AS) were reevaluated to assess the children's agility together with the soccer shoots to ball for goal. Children (male) soccer players (N = 68) (age = 11.6 ±0.5 yrs; height = 147 ±6.6 cm; weight = 35.5 ±5.6 kg) participated in this study. Test-retest and comparisons, including 20 m Sprint, Long Jump, T-Drill Test, AS (with ball), AS (goal success) and Zigzag Tests were used to assess the children's sprinting, jump power, and agility with shooting ball. All handled test results showed that there were significant differences between the test-retest sessions ($p < 0.01$) except for the 20 m Sprint. There were a near perfect correlations between test and retest values ($r = 0.90–0.99$). A higher level of correlation between the AS tests (goal success, with ball) ($r = 0.99$) was found. There were very high levels of correlations between the AS (goal success and with ball) tests and Zigzag tests ($r = 0.71$, $r = 0.70$ respectively). These results suggest that the AS tests are reliable and valid agility and skill tests for children players. Because the AS tests have unique values and are composed of soccer specific agility and active shooting skills, they are very important in identifying the talent and ability of children.

Key words: agility, skill, tests, children, soccer

Introduction

Agility has traditionally been thought of as simply the ability to change direction quickly. In team sports agility is an important quality to evade opponents when attacking or to place pressure on opponents when defending (Young and Willey 2010; Young and Farrow 2006). Soccer sports involves perceptual-motor skills that operate simultaneously in a rapidly changing environment (Bangsbo et al. 1991; Bate 1996; Bullock et al. 2012; Lockie et al. 2013). Sportive performance and success in the complex and hybrid sport of soccer is depend on multiple factors like technical skills, (i.e. kicking, dribbling) tactics and mental aspects and physical capacities (i.e. strength, duels, jump power, sprint, agility) (Stolen et al. 2005; Commetti et al. 2001; Lockie et al. 2011). Physical capacity of the

soccer players mentioned above have been tested some physical fitness tests. Fitness tests for soccer can be divided in to laboratory tests or soccer specific field tests. Even though laboratory test use considered reliable and useful in measuring the soccer player general fitness level but their validity is suspected (Swenson and Drust 2005; Aanstad and Simon 2013).

Some of the soccer fitness test consist of submaximal running, straight sprints and agility sprints (Aanstad and Simon 2013). However, some soccer specific tests include movement or actions with the ball (Chamari et al. 2005) which increases the validity of test. Still, such tests might not be ideal for measuring physical fitness since ball handling skills likely influence the result (Da Silva et al. 2011, Krustrup et al. 2003; Lemmink V. and Visscher 2004; Gabbett 2010; Psotta et al. 2005; Sporis et al. 2010), but rarely a combination of all three of these components obtained preliminary data on the validity and reliability of a battery of soccer skill tests in young players using simple protocols that included a shooting test (Aanstad and Simon 2013; Reilly and Holmes 1983). However, in this type of test, shots at goal were taken from at static position and it can therefore be argued that the test was actually assessing "technique" rather than "skill" Recognizing the limitation of the available skill and technical tests, (Ajmol et. al. 2007) developed the loughborough passing and loughborough shooting skill tests, with decision making. But these tests were not measuring the agility. Recently, (Lockie et al. 2013) develop a new test for field based sport in the name of chance of direction and acceleration test (CODET) which is monitoring the players performance or team selection. However, this test also was not including the shooting ball skill. Kutlu et al. (2012) developed a soccer specific agility and skill test, including sprinting change direction, acceleration, deceleration, forward and backward sprinting and also shooting the goal to target with decision making that is the clear aim of a soccer match to make score more goals than opposing team (Ali 2013).

While, the new developed agility and shooting ball to goal skill test as a modified version of the classical T-agility test was valid and reliable for male soccer players, whether this test is reliable and valued for children soccer players is unknown (Kutlu et al. 2012). Therefore the purpose this study was to evaluate the content validity and test-retest reliability in these soccer agility and skill specific field tests for male children soccer players.

Materials and Methods

Subjects

Sixty eight male children soccer players (age = 11.6 ±0.5 yrs; height = 147 ±6.6 cm; weight = 35.5 ±5.6 kg) volunteered as subjects in the present study. The study, complied with the Declaration of Helsinki, was approved by the Bioethics Commission of the University of Kirikkale.

Performance assessment

48 hours prior to first testing a familiarization session was conducted and performed two to three trials of each test with the best score used for comparative statistical analysis. Minimum three minutes of tests were provided between same trials and approximately 5–6 min. rest were given between different tests to reduce the likelihood of fatigue. To ensure each participant received the same amount of rest a handled stopwatch (Polar RS400 Multi Electro 01, Kempela and Filland) was used to time to interval between trials and tests. Two testing session were completed by subjects (test-retest), also within 48 hours between the two trials. No more than 20 athletes were

assessed in a single session, therefore rest periods were kept constant during all test sessions. Participants wore shorts, t-shirts and futsal soccer shoes during tests.

Before the first testing season, each subject's age, height and body weight were recorded. Subjects completed 5 different tests within a session: 20 m sprint; Stand long jump, T-Drill Test (classical), AS (with ball) and Zigzag tests.

Time was measured through the use of timing gates (Tumer Electronic, Tyming system Ankara-Turkey). Subjects used a standing start 30 cm behind the start line in order to trigger the first gate (Oliver and Meyer, 2009) placing their preferred foot in the forward position. If the subjects make mistake, hesitated, or slipped period to in any of the tests, the trial was disregarded and another attempt was allowed after the recovery period. Time for each distance was recorded to the nearest 0.01 for all tests (Garberd et al. 2008 and Sporis et al. 2009).

Statistical Analyses

Data analyses were performed using the statistical package program SPSS (V 20.0 IBM Corporation NY,USA). The normality of data was controlled using Shapiro Wilk W test. Means, standard deviations (SD) and correlations (r) were calculated for test-retest results. For the best values of each tests means, standard deviations and coefficient of variance (CV) were calculated. For the reliability Pearson correlation coefficients were used. If a correlation between seasons is equal or above to 0.70 was considered acceptable (Baumgartner and Chung, 2001; Hori et al. 2009). Absolute reliability was also assessed by paired samples T-test ($p \leq 0.01$) which were used to assess any significant differences between the test – retest for seasons. To determine the validity of AS tests correlation coefficients were calculated among handled tests. If a correlation is less than 0.30 was considered small; 0.31 to 0.49 moderate; 0.5 to 0.69 large; 0.70 to 0.89 very large; and 0.90 and higher near perfect (Hopkins 2002; Lockie et al. 2013).

Results

Characteristics of children soccer players was presented in the table below.

Table 1. Characteristics of children soccer players (N = 68)

Variables	Mean ±SD	Min–max
Age (years)	11.6 ±0.5	11–12
Height (cm)	147 ±6.6	134–162
Weight (kg)	35.5 ±5.6	23–48
Training experiences (year)	2.2 ±0.9	1–4

Descriptive data for testing seasons 1 and 2 (test-retest), p value for differences between the sessions and correlations, means, standard deviations and CVs for best scores were shown in Table 2 for each of tests.

Table 2. Test-retests agility, speed, long jump and AS tests values

	Test	Retest	p	Best	CV (%)	r
20 m	3.94 ±0.39	3.88 ±0.4	0.011	3.9 ±0.4	10	0.90
Stand long jump	1.26 ±0.12	1.29 ±0.14	0.000	1.3 ±0.1	11	0.97
T drill (classical)	14.11 ±1.34	14.06 ±1.33	0.001	14.0 ±1.3	10	0.99
AS (with ball)	18.37 ±2.72	18.12 ±2.71	0.000	18.1 ±2.7	15	0.99
AS (goal success)	17.69 ±2.73	17.44 ±2.76	0.000	17.4 ±2.8	16	0.99
Zigzag	7.01 ±0.65	6.97 ±0.66	0.003	6.7 ±0.7	9	0.99

P < 0.05.

All of test results showed that there were significantly differences between the test-retest session except 20 m run ($p < 0.01$) (Table 2). For testing seasons 1 and 2, retest results were significantly lower than test results. There were a perfect and significant correlations between test and retest values for all handled tests ($r = 0.90–0.99$). Beside the near perfect correlation all tests showed between the seasons, CVs were also equal or less than %16 (the range of 9 to 16) showed acceptable indicator of reliability (Thomas and Nelson 2001).

Table 3. The correlations of handled speed, agility, stand jump and AS tests

Test (r)	20 m	Stand long jump	T-Drill (classical)	AS (with ball)	AS (goal success)	Zigzag
20 m	1.00	–0.28*	0.21	0.35**	0.36**	0.53**
Stand long jumb		1.00	–-0.32**	–0.59**	–0.59**	–0.52**
T-Drill (classical)			1.00	0.43**	0.42**	0.48**
AS (with ball)				1.00	0.99**	0.70**
AS (goal success)					1.00	0.71**
Zigzag						1.00

* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.

There was a perfect correlation between AS (goal success) and AS (with ball) ($r = 0.99$), a very large correlation between the AS tests (goal success and with ball) and Zigzag test ($r = 0.71$, $r = 0.70$ respectively) and there were moderate to large correlations between the AS tests and other handled tests (Table 3).

Discussion

Soccer specific field test not only reflect real game distances covered, but also the quantities of different movement categories and intendeds. Agility sprints and straight sprints are major types of those tests (Aandstad 2013). But such tests might not be ideal for measuring special physical fitness of soccer player since this these type of tests is not measure the ball handling skills. However in the actual soccer match situations, players must perform both agility and skill, together for success. This study aimed to analyze agility and skill tests (AS) developed by Kutlu et al. (2012) for especially measured children's directional change agility together with the soccer shoots to ball for goal as a type of soccer skill. We chose 11 year old subjects ın order to reduce the risk for great variations

in test-retest result (Alricsson et al. 2001) Results of the study displayed high reliability between test and retest (the correlation range from 0.90 to 0.99) for children soccer players, which was similar to adult male soccer players (Kutlu et al. 2012). This considered as a significant evidence for the reliability of the tests (Table 2). However, significantly decreasing values were observed between test to retest means for handled tests (paired t-test $p < 0.01$) except 20 m run sprint test. Because of the agility tests were complex than 20 m straight sprint test this decreasing values means that there might be some learning effects on children during retest, in contrast to adult male soccer players (Sporis et al. 2011; Pearson 2001). This result might be limitation of our study is that we assessed sprint and agility ability of children after a familiarization session only 48 hours before the actual testing. So that these tests should be repeated and examined at the same day for children as a second familiarization phase. Beside the near perfect correlation all tests showed between the seasons, CV were also less than 20 % showed acceptable indicator of reliability.

Agility performances on the T-Drill (classic), AS (with ball), AS (goal success), and Zigzag tests were all correlated at statistically significant levels ($p < 0.01$) (Table 3). Like our findings, some researchers found the correlations low to moderate levels among agility, sprint and power tests (Kowacks et al. 1999; Gabbett et al. 2008; Sekulic et al. 2013). In our study AS (with ball) and AS (goal success) were in perfect correlation ($r = 0.99$) as like our hypothesis for children. As an indicator of validity, correlations between AS tests and zigzag test (which was only an agility test without ball) were also highly correlated ($r = 0.70$ and $r = 0.71$). Similar to our results most of the agility and sprint tests produced acceptably and reliable correlations as physical performance tests (Thomas and Nelson 2001; Lockie et al. 2013) found that very large correlations between the change-of-direction and acceleration test and the 20 m sprint ($r = 0.75$). In contrast of these studies, (Sporis et al. 2011) found that there was no and low significant correlation between the agility test (Zigzag with the Ball) and speed and quickness ($r = 0.093–0.247$). (Little and Williams 2005) found particularly low correlations ($r = 0.35$) between a 10 m sprint test, and a zigzag test which utilized 3 turns at 100º. In our study also indicate similar results that there was no or low significant correlations between some agility and sprint test (Table 3). The studies (Little and Williams 2005; Sporis et al. 2011) and our results suggest that the structure of the agility with the ball is much more complex in comparison with the speed and basic skills without the ball tests that might be easily applied.

The analysis of results also indicates that the differences between the durations of the T-Drill (classic) (14.00 ±1.33) and the AS tests (with ball:18.12 ±2.7; goal success: 17.44 ±2.8) suggest that the evaluated AS tests for children requires additional time and skills of ball striking to target with decision making. Thus, the AS (with ball) test produces less successful performance in recorded time results compared to the T-Drill (classic) test. Successful performance in team sports, such as soccer, requires not only quickness, speed and agility but also well-developed skills with perceptual and decision making skills that are evidenced by superior anticipatory motor performance (Gabbett et al. 2008; Bullock et al. 2012; Ali et al. 2007).

Conclusion

It can be concluded that newly developed AS (with ball) and AS (goal success) tests values showed a good reliability and validity in groups of male children soccer players during the test-retest experimental design and comparisons used in this study. AS (with ball) and AS (goal success) tests are inexpensive, easy to perform short field sport specific and accessible for children to test and evaluate their agility and also shooting skill to target in soccer sport. These tests might even be more valuable for athletes to identify talents of different ages. Such the

test that is important in talent identification and assessment of soccer sports especially for children, because it measured not only agility, acceleration, deceleration and directional changes of the children but also quick and accurate striking skills to goal. With this study, It is also recommended that to remove the learning effect especially on children for retest, familiarization phase should be done a bit longer and also done testing days. This novel developed AS tests should not only validated with some agility, sprint and power test, but also soccer specific skill test in future for females and males.

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