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Original article

VALIDITY AND RELIABILITY OF VOLLEYBALL - SPECIFIC REACTIVE AGILITY TEST

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Abstract

Aim. In volleyball sport, a player must make motoric reactions based on visual information to perform fast and accurately. In the literature, it is seen that reactive agility test protocols are handled in accordance with the structure of the sport and arranged accordingly. In this context, the aim of this study is to determine the validity and reliability of a new reactive agility test designed for volleyball players.

Methods. A total of 50 volleyball players participated in the study. 25 elite (age: 22.9±02.76 years, height: 179.81±10.13 cm, body weight: 73.42±09.68 kg, training experience: 9.92±1.22 years) and 25 sub-elite (age: 21.18±1.85 years, height: 175.63±09.80 cm, body weight: 62.45±6.45 kg, training experience: 1.67±0.63 years). Elite volleyball players were selected from volleyball Iraqi universities championship. Sub-elite athletes were selected from Baghdad university.

Results. Statistical analyses showed that highly significant explanatory coefficient was determined between the two tests (test & retest) for the sub-elite group.

Conclusions. The present study attempted to develop a test protocol that included cognitive activities for volleyball players. It has been determined that the newly developed volleyball specific reactive agility test is a valid and reliable measurement method. Accordingly, it is proposed that this test protocol can be used to improve and monitor reactive agility ability for volleyball players.

Keywords: Validity, Reactive Agility, Volleyball.

Introduction

Agility has been defined as rapid change of direction and rapid reaction to different stimulus, it is a critical ability for athletes, especially in team sports. It appears when trying to get rid of the opponent, following the opponent, trying to hold the ball, or reacting to the moving ball (Young et al., 2002). Accordingly, it includes sudden deceleration, changing direction and acceleration again.

Agility tests consist of pre-planned displacements (Young & Farrow, 2006). For this purpose, many field tests have been developed that can be easily applied by coaches and athletes. The most important feature of these tests is that they can be performed with a few simple pieces of equipment and simple rules (Karacabey, 2013).

However, when these definitions and tests are examined, it will be seen that they generally focus on the motoric characteristics of the athletes. Although this situation is classically defined as agility, it would be inadequate to define this situation as agility because the athlete knows the area, the beginning, the end, and the places to turn. In this type of study, the athletic capacity of these athletes can be measured. (Yıldız et al., 2018) However, perceptual and decision-making factors such as quick thinking, quick decision making, and quick reaction cannot be measured. For example, an athlete with moderate rapid change of direction skills may also have much more developed perceptual and decision-making skills. Because in team sports, players react to stimulus. Therefore, movement speed is affected by perceptual and decision-making factors, and it would be more accurate to define the ability to change direction and acceleration in pre-planned areas as rapid change of direction (Young & Farrow, 2006).

Previous study (Karacabey, 2013) reported that visual scanning is a very important factor affecting agility performance among the perceptual and decision-making factors. Research conducted in various sports fields supports the view that visual-perceptual and visual-cognitive skills can be improved (Starks & Ericsson, 2003; Williams et al., 1999). Additionally, it has been reported that elite athletes have better perceptual perception, more effective eye movements, and better cognitive processing speed compared to sub-elite athletes (Mann et al., 2007; Voss et al., 2010). During volleyball training, players engage in agility drills, depending on running through tools such as ladders, hurdles, and cones. These tools are great for conditioning and speed work, the exercises that are used with them might not be giving athletes all the expected benefits of agility training because it ignored one major element of agility training is often overlooked—the ability to swiftly react to different situations. During volleyball competitions, athletes must react to a live stimulus and change their body's position efficiently based on what is happening around them, in real-time. At no point during an athletic competition does your opponent tell you what they are going to do next and give you time to prepare for it.

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Research suggests that more high-level players will perform better on reactive agility tests compared to low-level players, while on planned change of direction tests there was no difference between skill levels (Paul & Stephen, 2016). This indicates that reactive agility could be related to playing at a higher level and should therefore be included in the training plan. It has also been shown that the likelihood of injury increases when movement is unplanned, so training reaction capacity is important to reduce the risk of injury (Holmberg, 2009). In volleyball sport, a player must make motoric reactions based on visual information to perform fast and accurately. In the literature, it is seen that reactive agility test protocols are handled in accordance with the structure of the sport and arranged accordingly. In this context, the aim of this study is to determine the validity and reliability of a new reactive agility test designed for volleyball players.

Methods

Experimental approach to the problem

The reactive agility test was designed to compare elite and sub-elite volleyball players to determine the relationship between results and the level of the athletes. The Reactive agility test consists of non-planned directional changes adapted to the volleyball sport, arranged individually for each athlete. this time with a light stimulus. Comparison of elite and sub-elite athlete values has been used in many studies in the development of sport-specific reactive agility protocols (Farrow, Young & Bruce, 2005; Gabbett & Benton, 2009; Lima et al., 2021). In test-retest reliability measurements, two measurements were made for all candidates in protocols with four light stimulus and the same distance length.

Participants

A total of 50 volleyball players participated in the study. 25 elite (age: 22.9±02.76 years, height: 179.81±10.13 cm, body weight: 73.42±09.68 kg, training experience: 9.92±1.22 years) and 25 sub-elite (age: 21.18±1.85 years, height: 175.63±09.80 cm, body weight: 62.45±6.45 kg, training experience: 1.67±0.63 years). Elite volleyball players were selected from volleyball Iraqi universities championship. Sub-elite athletes were selected from Baghdad University.

Procedure

The Reactive agility test lasted a total of ten days (elite 5 days, sub-elite 5 days) and was carried out between 11:00 am and 02.30 pm. While the elite players were measured in the Cairo university Hall before the championship competitions, the sub-elite participants were tested in Zagazig University Hall. All participants were instructed to have breakfast according to their usual habits and to consume normal fluid intake in the morning. Before the test, the Age, height body, weight, and training experience of the participants were taken as descriptive statistics. The participants warm up in 10 minutes. submaximal aerobic exercise (jogging) and dynamic stretching before the test, all participants tried the reactive agility protocol 3 times to demonstrate the rules during familiarization, trial, and measurement.

Volleyball - specific Reactive Agility Test

As seen in Figure 1, the Volleyball - specific Reactive Agility protocol provides that:

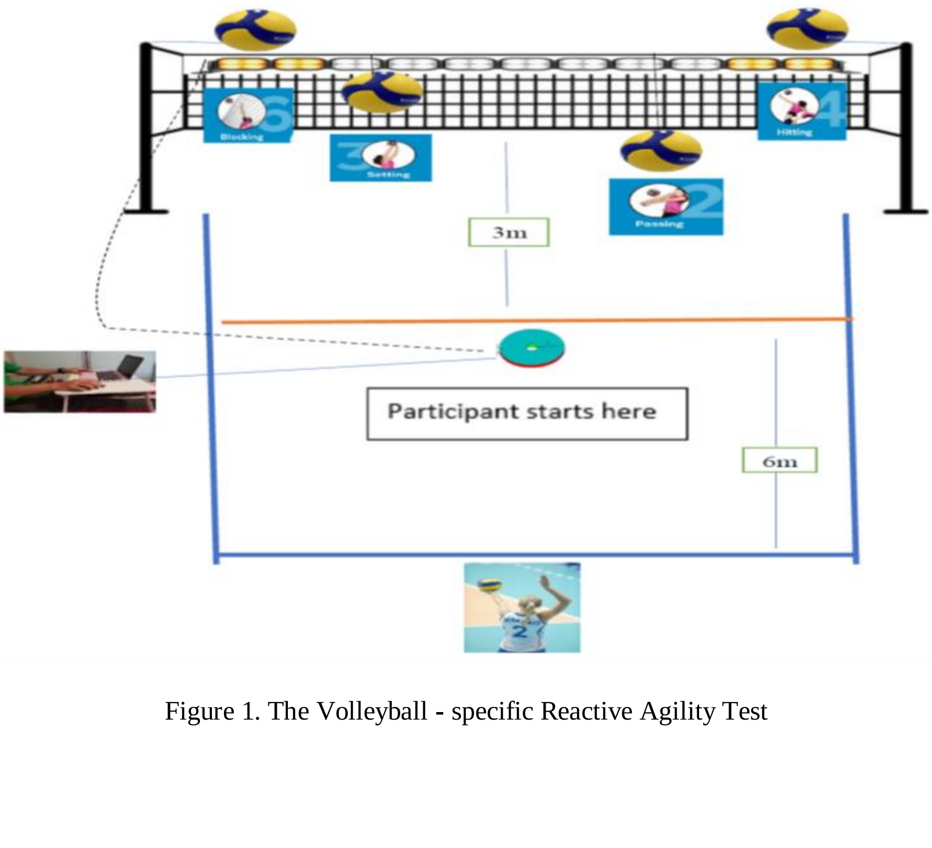

Figure 1. The Volleyball - specific Reactive Agility Test

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Instrument size distance

- The distance from the start position to disc 1 is 6 meters.
- The distance between disc 1 and volleyball net is 3 meters.

Equipment used

- 1 disc.
- 4 balls.
- 1 Stopwatch.
- 1 light tape.
- 1 laptop.

Test instructions

- The examiner stands behind the starting line (volleyball court line end) and concentrates on hearing the signal from the tester while the stopwatch was turned on.
- The examiner plays the serve and ran towards disc 1 to put pressure on it, without stopping. The examiner concentrated on seeing the light signal given using light tape.
- After the light signal, if the light appears in hitting skill, the examiner runs as fast as possible towards the ball above the net to hit it. If the light appears in passing skill, the examiner runs as fast as possible towards the ball under the net to pass it.
- After performing the skill, the examiner returns to disc 1 to put pressure on it.
- The total duration of the test was recorded for statistical analysis.

Statistical analysis

Descriptive statistics for all participants were calculated. In the validity study, an independent variable t test was applied to determine the difference between groups for Volleyball -specific Reactive Agility test. Test-retest reliability was tried to be estimated by Cronbach's Alpha correlation coefficient, and Pearson Correlation coefficient.

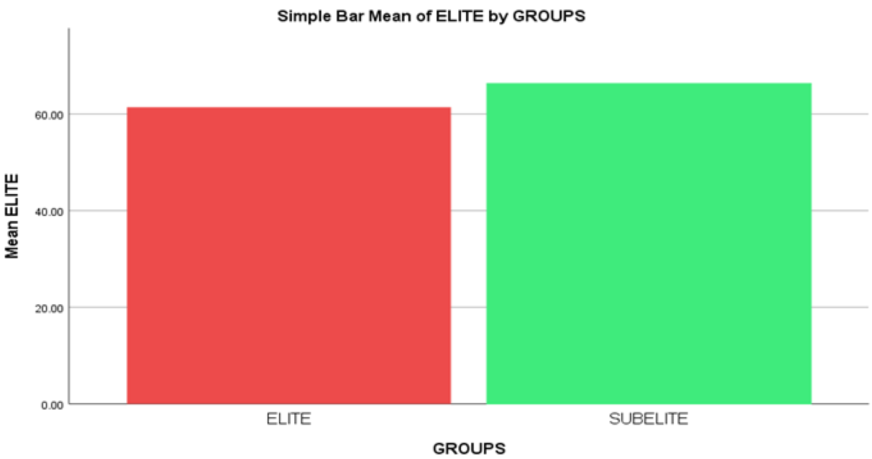
Results

Table 1. Comparison of Volleyball - specific Reactive Agility values of elite and sub-elite players

Test	*Elite*	*Sub-Elite*	*P*	*T*
	χ ±SD	χ ±SD		
Volleyball -specific Reactive Agility	61.415 ±1.462	66.317± 2.068	.000	7.497

X: Mean, SD: Standard Deviation, p<0.01.

As seen in Table 1, it was determined that there was a statistically significant difference in Volleyball -specific Reactive Agility values between elite and sub-elite players, and that values were shorter in the elite group (p<0.01).



Graph 1. Statistical results between elite and sub-elite players

As seen in Graph 1, there is a statistically significant difference in Volleyball -specific Reactive Agility values between elite and sub-elite players.

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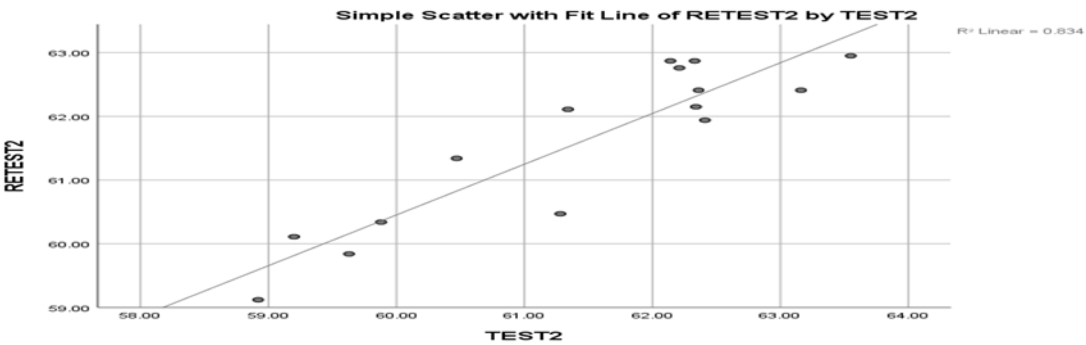
Table 2. Test-retest reliability of Volleyball -specific Reactive Agility values of elite players

Test	*Elite*		*Cronbach's Alpha*	*Pearson Correlation*
	TEST	*RETEST*		
	χ ±SD	χ ±SD		
Volleyball -specific Reactive Agility	61.415 ±1.462	61.759± 1.276	.950	0.913

As seen in Table 2, in testing reliability for elite group, the Cronbach's Alpha correlation coefficient was found to be very high 0.950, in addition, the Pearson Correlation coefficient was found to be very high also 0.913.



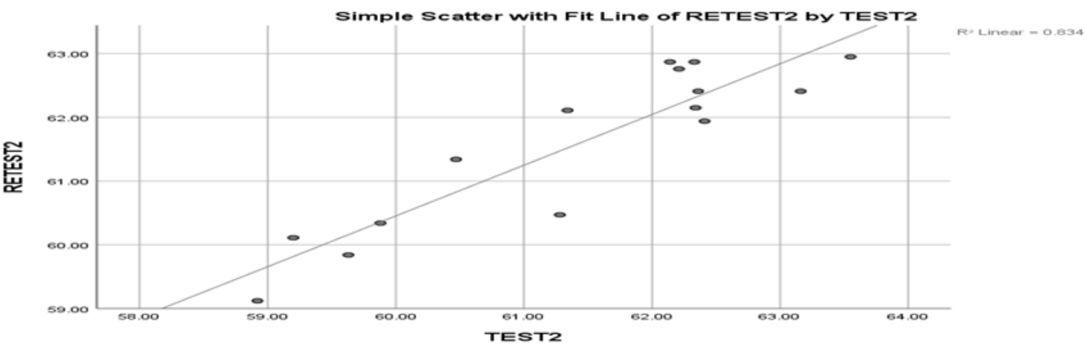
Graph 2. Reactive agility explanatory coefficient scatter for elite group

As seen in Graph 2, a highly significant explanatory coefficient was determined between the two tests (test & retest) for the elite group.

Table 3. Test-retest reliability of Volleyball - specific Reactive Agility values of sub-elite players

Test	*Sub- Elite*		*Cronbach's Alpha*	*Pearson Correlation*
	TEST	*RETEST*		
	χ ±SD	χ ±SD		
Volleyball -specific Reactive Agility	66.3173±2.068	66.0813± 2.086	0.958	0.919

As seen in Table 3, in testing reliability for sub-elite group, the Cronbach's Alpha correlation coefficient was found to be very high 0.958, in addition, the Pearson Correlation coefficient was found to be very high also 0.919.



Graph 3. Reactive agility explanatory coefficient scatter for sub-elite group

As seen in Graph 3, a highly significant explanatory coefficient was determined between the two tests (test & retest) for the sub-elite group.

Discussions

The aim of this study is to investigate the test-retest reliability and validity of a new reactive agility protocol designed for volleyball through determining the difference between the results of elite and sub-elite groups. Test results were significantly shorter in the elite group. At the end of the study, it was determined that the newly developed test had high reliability and validity. In addition, high reliability was determined in test-retest measurements. The fact that elite volleyball players respond to given stimuli in a shorter time suggests that these players use visual and information processing strategies better by ignoring unnecessary sources of information. There are very limited studies in the literature on reactive agility in volleyball. Like this study, the Reliability of a Reactive Agility Test for Youth Volleyball Players, they used FitLight Trainer (FITLIGHT Sport Corp., Ontario, Canada) to measure Reaction Time and hand-eye coordination. This system contains four sensors (Lima et al., 2021). In another study, which used agility ladder exercises. The results revealed that the agility ladder and side shuttle were effective for young female volleyball players. The agility ladder training provides an advantage for the field of change-of-direction tests and an advantage for sprinting and reactive-agility tests (Chuang, et al. 2022). Similarly, research study has found that open skill athletes, including volleyball players, had better reaction speeds than closed skill athletes (swimmers, gymnasts, and long-distance athletes) in the reactive agility test, where there were 9 mats placed at 30 cm intervals on the ground and the stimulus was given from the computer (Tsubouchi et al., 2016). In another study, found that gender differences in reactive agility of female and male players. Motor and perceptual-cognitive components significantly reactive agility performance in competitive youth volleyball players (Zwierko, et al. 2022). Reactive agility and classical agility are different from each other and develop according to the usage situation. There are many studies in the literature aimed at developing sport-specific reactive agility protocols in other sports branches (Farrow, et al. 2005; Gabbett & Benton, 2009). For example, Gabbett & Benton (2009) showed that decision-making and movement speed in elite players were faster than in sub-elite players in the reactive agility test. Similarly, Serpell et al. (2010) reported that elite rugby players had better sport-specific reactive agility test values than sub-elite players. In addition, a previous study found a 50% common variance between reactive agility and planned change of direction values in elite, middle and low-level netball players. These findings support the idea that reactive agility and planned change of direction tests are not similar. (Farrow, et al. 2005)

Conclusions

The present study attempted to develop a test protocol that included cognitive activities for volleyball players. It has been determined that the newly developed volleyball specific reactive agility test is a valid and reliable measurement method. Accordingly, it is proposed that this test protocol can be used to improve and monitor reactive agility ability for volleyball players.

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