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Innovative Protocols for Determining the Non-Reactive Agility of Female Basketball Players Based on Familiarization and Validity Tests

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Abstract: The aim of this study was to implement a familiarization protocol and to determine the constructive validity of four different non-reactive agility tests on a sample of professional female basketball players (n = 12; age: 18.17 ± 1.90 years). Following the protocol, the participants performed standardized tests three times (the Agility *t*-test and the Sprint 9-3-6-3-9 m with 180° Turns), while the lateral agility, universal agility, frontal agility, and semicircular agility tests were repeated five times each, with a three-minute rest period between each repetition. A single-factor analysis of variance for repeated measures (ANOVA) determined significant differences between a series of test repetitions for familiarization. Hierarchical cluster analysis grouped the samples based on the results of the standardized tests into two groups. A *t*-test for independent samples determined a significant difference between these groups ($p < 0.05$) on all four tests (lateral, universal, frontal, and semicircular agility). Pearson's linear correlation determined a correlation between the results of the standardized agility tests and the lateral, universal, frontal, and semicircular agility tests, with correlation coefficients ranging from r = 0.936 to r = 0.987. A high value was observed for the discriminant analysis (0.821), while the maximum value was observed for the Kendall coefficient of concordance (W = 1). The study confirmed the validity of the applied tests and determined that the results are influenced by the number of series performed during the preparation for testing. In practice, it is necessary to perform two series of universal and frontal agility tests, i.e., four series of repetitions of lateral and semicircular agility tests in professional women's basketball.

Keywords: measurement protocols; non-reactive agility; team sport

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1. Introduction

Specific situations and tasks during a sports game can be very complex, since they occur in a dynamic and unstable environment. Therefore, the decision-making process and the selection of the most suitable solution is of considerable importance, as it determines the ability to plan and program a movement in response to the appropriate stimulus [1]. Basketball is one of the most popular team sports in the world and its popularity is growing. Basketball players have highly developed aerobic and anaerobic fitness, a high level of motor performance, and excellent visual and perceptive characteristics [2–4]. Highly ranked basketball tournaments are characterized by quick, combined movements and complex motions performed by the players.

As a sport, basketball requires rapid decision making, a great number of jumps, and numerous and frequent changes in direction in a small space. Agility and motor skills have a high importance in this sport [5]. This is not surprising, since agility is often considered a significant component of many activities and numerous sports [6–8]. Analysis of movements in elite women's basketball shows that activity changes are performed every 2.56 s, and that during the game, basketball players perform an average of 576 $\pm$ 110 movements, in contrast to college female basketball players, who have a greater number of movements and a longer time to change activities [9,10]. At the same time, the analysis showed that a very important role in elite women's basketball is represented by short linear sprints of 1–5 m without the ball that are often repeated (57% of the total number of sprints), as well as that 52% of the total performed sprints involve changing the direction of movement, which indicates the importance of agility development in female basketball players [10]. Agility as a multidimensional ability can be manifested through pre-planned and adopted movements as non-reactive agility (offensive or defensive movements trained through training), but also in sports situations as reactive agility when movement structures are not pre-planned but mainly depend on external stimuli and cognitive abilities of the player [1,11–14]. Bearing in mind that agility is a decision-making process, that is, including both the ability to plan and perform precise movements suitable for predetermined (previously practiced) or unplanned stimuli [11], there is great interest in sports theory and practice for the development of appropriate tests for the diagnosis of this complex ability [10]. Authors working in this specific field [1,11] are rejecting the possibility of using usual and standardized tests with the intention of creating new tests of agility while using a new generation of instruments such as the FitLight Trainer™ system, and are working under the assumption that they will provide valid and reliable measures of agility. They have designed tests of reactive and non-reactive agility. To use them more frequently for diagnosis by professional coaches working with female basketball players, as well as by researchers in the field of sports, further work on familiarization protocols and the validity of these tests is becoming imperative.

Based on the aforementioned, this study aimed to analyze a familiarization protocol and to determine the constructive validity of four structurally different tests of non-reactive agility (a frontal agility test, lateral agility test, semicircular agility test, and universal agility test), on a sample of professional female basketball players.

2. Materials and Methods

2.1. Research Protocol

A sample of female basketball players who expressed interest in participating in the study and gave written consent were tested during the competitive season in the period February–March 2021. Involvement in this study required testing from 10 a.m. to 11.30 a.m. in a sports hall that was adequately lit, at an appropriate temperature, and under conditions in which players already train and compete. The FitLight Trainer™ system was used once a week to test non-reactive agility over a period of six weeks. The work included the initial 30 min of training as part of the standard morning training sessions of the professional female basketball players. Before applying any agility test, a standard warm-up was carried out as part of the training activities, for a duration of 10 min (running at low to moderate intensity, dynamic stretches of the entire body, and short bursts of high-intensity running). Immediately prior to the testing, two experienced invigilators described the selected tests in detail, while a standardized procedure was adhered to for the evaluation of body composition [15]. In accordance with the set goals of the research, measurements of the following anthropometric characteristics were taken: (body height—BH), (body weight—BW), (body mass index—BMI). During a specially predetermined morning session starting from 8 a.m. to 9 a.m. in order to avoid daily variations in measurements, in the Center for Multidisciplinary Research of the Faculty of Sports and Physical Education in Niš, anthropometric characteristics were measured using the InBody770 body analyzer (Body Composition Analyzer—InBody770, InBody Co., Ltd., Chungcheongnam-do, Republic of Korea) and Martin's anthropometer. The air temperature in the hall during testing ranged from 22 °C to 26 °C. All testing of anthropometric characteristics in this research lasted 60 min according to previously established protocols, which entailed that:

- Participants did not have any chronic disease and did not consume medications as a prescribed therapy in order to cure any kind of illness;
- Participants of this research were not in their menstrual period;
- Participants did not eat or drink 8 h before the test (no food or drink from 00:00 to 08:00);
- Participants emptied their bladder before the testing;
- Participants due to the needs of the testing, were barefoot and wore only their bathing suits.

Body height was measured with an anthropometer by Martin with 0.1 cm accuracy, while body mass index (BMI) was calculated on the basis of the standard procedure based on a formula with which body weight in kilograms is divided with square body height in meters (BMI = BW (kg)/ BH (m^2)) [16].

2.2. Subjects

The study, which includes work on standardization, i.e., determining the validity and familiarization protocols pertaining to agility tests using the wireless FitLight Trainer™ system (Fitlight Sports Corp., Aurora, ON, Canada), was carried out on a sample of 12 female basketball players from the same 1st division competitive women's basketball club. The sample consisted of players, age 18.17 ± 1.90, height 174.05 ± 7.04, weight 68.43 ± 7.47 and BMI 15.98 ± 5.01, who competed in the First Women's Basketball League in Serbia. All female basketball players had been involved in the training process for at least five years (7.17 ± 1.79 years), with competitive experience of at least one year (2.42 ± 0.94 years) at the highest level of competition at the national level. Subjects regularly participated in 6–10 training sessions per week lasting 90 min., including one match during a weekend day. Training included technical–tactical elements and exercises specific to basketball (40–60% of all weekly sessions), endurance exercises (20–40%), and strength exercises (20–30%). Strength training included free-weight- and machine-based exercises that averaged 30–40 min. During the testing weeks, the subjects participated in an average of 7 or 8 training sessions.

The sample power was calculated for statistical analysis: a single-factor repeated measures analysis of variance—ANOVA, the *t*-test for independent samples, and Pearson's correlation. ANOVA analysis was used for testing familiarization with the 4 FitLight™ tests of non-reactive agility with all 12 participants (one group). For testing the validity of the 4 new non-reactive tests, Pearson's correlation was used for all 12 participants (one group). To determine differences between the high performance agility group (HPA) and low performance agility group (LPA), which were determined by the results of the hierarchical cluster analysis (HCA), the *t*-test for independent samples was used. HPA consists of 5 participants and LPA consists of 7 participants (2 groups).

According to the results of power analysis (G*Power 3 software V3.1.9.7 Düsseldorf, Germany) for ANOVA test, the minimum sample size of 4 participants would result in statistical power at 0.80 at an alpha level of 0.05 and effect size of 0.8.

For Pearson's correlation, the minimum sample size of 6 participants would result in statistical power at 0.80 at an alpha level of 0.05 and a correlation coefficient of 0.9, according to the results of the power analysis.

For the *t*-test for independent samples, the minimum sample size of 12 participants would result in statistical power at 0.80 at an alpha level of 0.05 and an effect size of 2.0, according to the results of power analysis. Based on these results, the minimum of 12 participants were involved in the study.

Following a medical check-up and an oral explanation of the goals of the study along with the testing protocol presented by experienced invigilators, the participants provided voluntary consent for participation in this study. All procedures were approved by the Ethics Committee of the Faculty of Sport and Physical Education in Niš and were carried out in accordance with the Declaration of Helsinki [17].

2.3. Procedures

2.3.1. The Protocol of Familiarization with Agility Tests

In this study, which required the use of the FitLight™ system, the following tests of non-reactive agility were used: the non-reactive lateral agility test—LA, the universal agility test—UN, the non-reactive frontal agility test—FR, and the non-reactive semicircular agility test—SC (Table 1).

Table 1. Notation table.

Notation	Definition
HPA	High performance agility group
LPA	Low performance agility group
LA	Lateral agility test
UA	Universal agility test
FR	Frontal agility test
SC	Semicircular agility test

To compare the results and determine validity, the standardized Agility *t*-test and Sprint 9-3-6-3-9 m with 180° Turns test were used. The participants were tested once a week, with a seven-day rest period between measurements, by applying one of the predetermined six tests of non-reactive agility. The reason for this is that the participants were professional basketball players, and the testing was conducted during the second half of the competitive season at the highest level of the national championship. Following the protocol, on the day of the testing, the participants performed the Agility *t*-test and the Sprint 9-3-6-3-9 m with 180° Turns test three times each, while the LA, UN, FR, and SC tests were repeated individually five times with a pause of three to five minutes between attempts, following Young et al. [18]. The precise order of the predetermined movements (Figure 1) when performing the tests using the FitLight™ system (LA: 1-2-3-4, UN: 1-2-3-4-5-6, FR: 1-2-3-4-5-6, SC: 1-2-3-4-5) included the activation of light signals in sequence with the LED lamps on this apparatus, which the participants had previously been informed about, following existing study protocols [1,11].

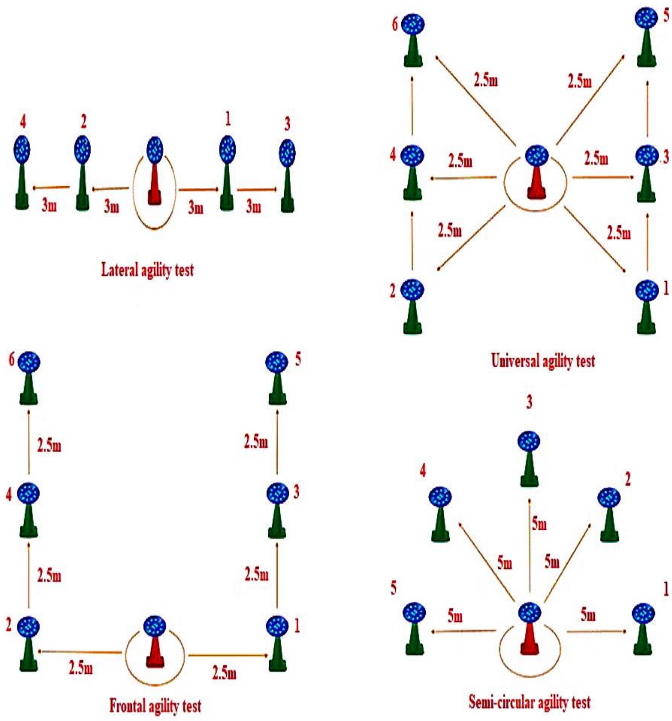

Figure 1. Description of non-reactive agility FitLight™ Trainer tests: frontal, universal, semicircular, and lateral.

2.3.2. Construct Validity Testing

Based on the analysis of the performed standardized tests of non-reactive agility, the Agility *t*-test and the Sprint 9-3-6-3-9 m with 180° Turns test, and the results of the hierarchical cluster analysis (HCA), the participants were divided into two groups, a high performance agility group (HPA) and a low performance agility group (LPA). The HPA group achieved better results in those standardized tests, while the other LPA group achieved poorer results on the same tests. Following this grouping, the construct validity of the applied non-reactive agility tests (LA, UN, FR, SC) was determined by comparing the results achieved in the aforementioned tests with the results of standardized agility tests (Agility *t*-test and Sprint 9-3-6-3-9 m with 180° Turns test) whose validity has been confirmed in earlier studies [19,20]. The testing protocol for the standardized tests required that, after the same standardized 10 min warm-up, the participants perform each series of tests three times, and that the best test time should be recorded for analysis (Figure 2).

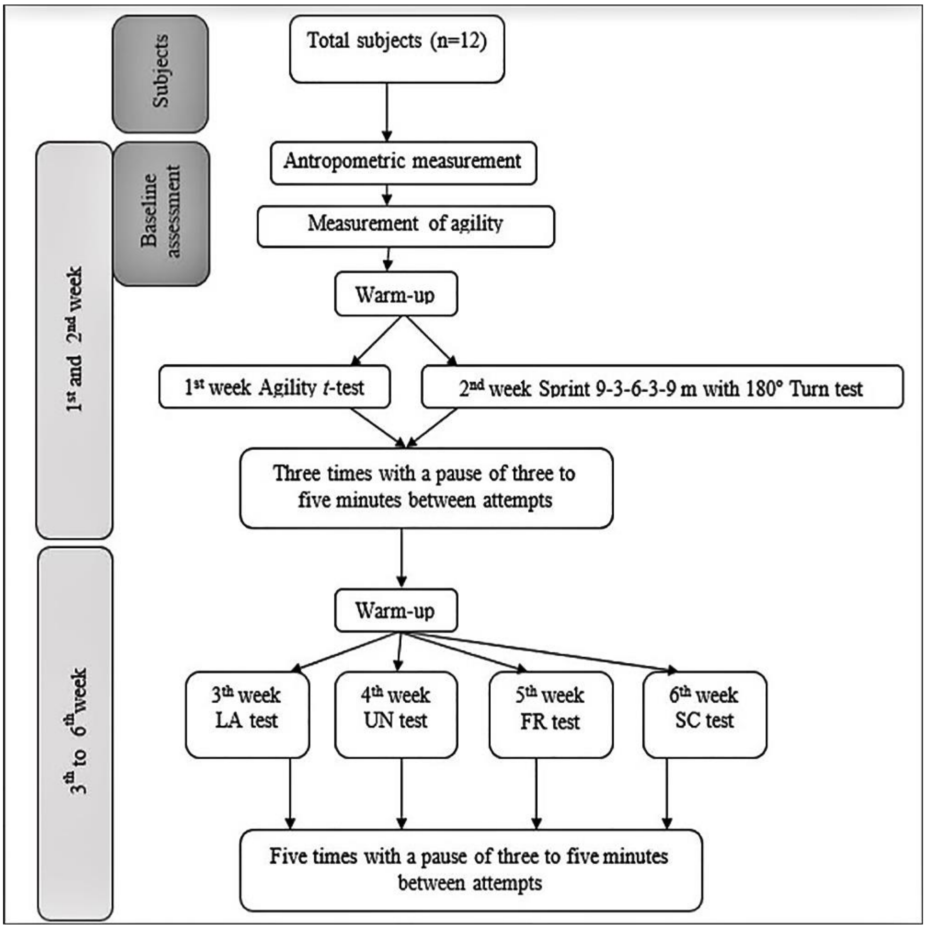

Figure 2. Flowchart for the study design.

2.4. Statistical Analysis

All data obtained are presented as parameters of descriptive statistics (mean, standard deviation—SD, minimum result—min, and maximum result—max). To evaluate the normality of the distribution, the Kolmogorov–Smirnov test was used. To track the differences between the testing sessions for each individual test, i.e., for familiarization with the FitLight™ test of non-reactive agility, a single-factor repeated measures analysis of variance—ANOVA was used. Partial Eta Squared was used to determine the effect size. The HCA divided the samples (n = 12) into two groups based on their achieved results, while the differences between the HPA (n = 5) and LPA (n = 7) groups of participants on non-reactive tests of agility were determined by the T for independent samples. The validity of the tests was determined using Pearson's correlation, a canonical correlation, and Kendall's coefficient of concordance. For the Pearson correlation, coefficient values were 0.1–0.2 poor, 0.3–0.5 fair, 0.6–0.7 moderate, and 0.8–0.99 very strong correlation [21]. The level of significance was set at $p < 0.05$. The data were processed using the SPSS package (IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY, USA: IBM Corp.).

3. Results

3.1. The Familiarization Protocol

The analysis of the test results for non-reactive agility provided the descriptive statistics parameters, which are presented in table form (Table 2) for each measurement session, which included five performances of each of the selected tests.

Table 2. Descriptive statistics of the performed non-reactive agility tests FR, LA, SC, and UN.

NTA	FR Mean ± SD	LA Mean ± SD	SC Mean ± SD	UN Mean ± SD
I	15.336 ± 1.030	10.703 ± 0.387	16.246 ± 0.875	12.888 ± 0.720
II	14.966 ± 0.761	10.694 ± 0.589	16.010 ± 1.110	12.887 ± 0.356
III	**14.514 ± 0.913**	10.578 ± 0.507	16.045 ± 1.076	**12.267 ± 0.657**
IV	15.203 ± 1.308	10.438 ± 0.502	16.023 ± 1.003	12.647 ± 1.224
V	15.141 ± 1.501	**10.232 ± 0.477**	**15.695 ± 0.854**	12.318 ± 1.033

NTA—number of test attempts; FR—non-reactive frontal agility; LA—non-reactive lateral agility; SC—non-reactive semicircular agility; UN—non-reactive universal agility; (I; II; III; IV; V)—number of test attempts. Mean—arithmetic mean; SD—standard deviation.

By comparing the values obtained during the five sessions of repetition of all four tests, familiarization was determined using a single-factor ANOVA. The statistically significant difference in the results between the repetitions for each individual test is shown in Table 3.

Table 3. Results of the ANOVA analysis with repeated measures—familiarization with the non-reactive agility tests.

Test	Wilks's Lambda	F	Sig.	Partial Eta Squared	Mauchly's Test of Sphericity (Sig.)	ANOVA (Sig.)			
FR	0.278	5.206	0.023	0.722	0.258	I–III (**0.016**)			
LA	0.169	9.844	0.004	0.831	0.113	I–V (**0.002**)	II–IV (**0.018**)	II–V (**0.002**)	III–V (**0.001**)
SC	0.188	8.664	0.005	0.812	0.001	I–V (**0.015**)			
UN	0.230	6.567	0.012	0.770	0.009	I–III (**0.022**)			

FR—non-reactive frontal agility; LA—non-reactive lateral agility; SC—non-reactive semicircular agility; UN—non-reactive universal agility; (I; II; III; IV; V)—number of test attempts; Sig.—level of statistical significance.

The results of the tests for frontal and universal non-reactive agility indicate that there is a significant difference between the first and third performance. Differences in the performance of the tests of semicircular non-reactive agility were determined between the first and fifth repetition, while statistically significant differences in the non-reactive lateral agility test were confirmed between the first and fifth, second and fourth, second and fifth, and third and fifth performance.

3.2. Validation

The HCA divided the sample (n = 12) based on the results achieved for the applied standardized tests of non-reactive agility (t-test and the Sprint 9-3-6-3-9 m with 180° Turns) into two groups (Figure 3), i.e., a group of participants (n = 5) who performed better on the tests (HPA) and a group of participants (n = 7) who performed poorly on the test (LPA).

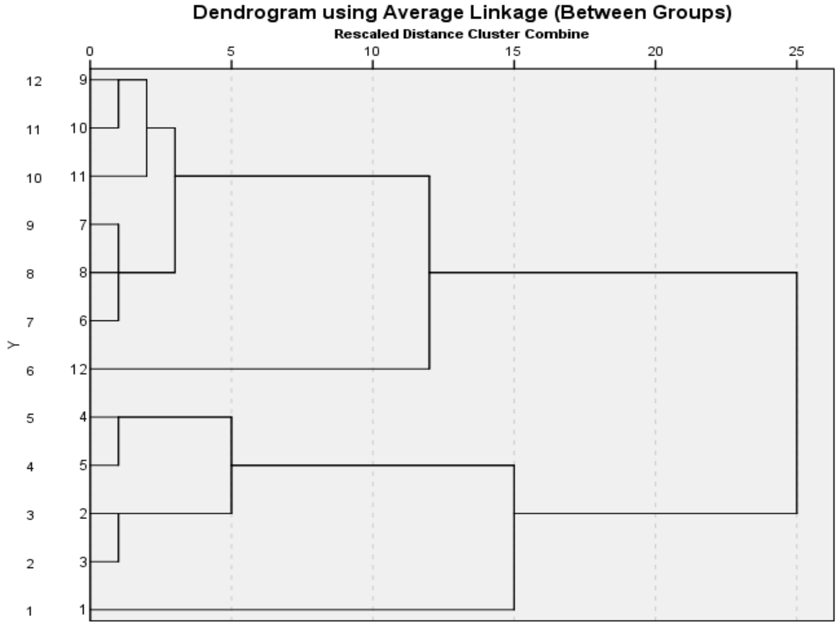

Figure 3. A dendogram of the participants was divided into two groups using the hierarchical cluster analysis based on the results achieved in standardized agility tests (the Agility *t*-test and the Sprint 9-3-6-3-9 m with 180° Turns test).

The Kolmogorov–Smirnov test confirmed the assumption of the normality of the distribution (Table 4).

Table 4. Normality of the distribution.

Variables	Group	Kolmogorov–Smirnov		
		Statistic	df	Sig.
Agility *t*-test	HPA	0.263	5	0.200
	LPA	0.193	7	0.200
9-3-6-3-9	HPA	0.203	5	0.200
	LPA	0.229	7	0.200
FR	HPA	0.332	5	0.075
	LPA	0.223	7	0.200
UN	HPA	0.278	5	0.200
	LPA	0.220	7	0.200
LA	HPA	0.170	5	0.200
	LPA	0.218	7	0.200
SC	HPA	0.240	5	0.200
	LPA	0.126	7	0.200

HPA—high performance agility group; LPA—low performance agility group; FR—non-reactive frontal agility; LA—non-reactive lateral agility; SC—non-reactive semicircular agility; UN—non-reactive universal agility; Sig.—level of statistical significance.

A statistically significant difference in the test results for non-reactive agility between the HPA and LPA group of participants at the ($p < 0.05$) level was determined using the independent samples *t*-test (Table 5).

Table 5. Differences between the HPA (n = 5) and LPA (n = 7) groups of participants in non-reactive agility tests using the *t*-test for independent samples.

Variables	HPA (Mean ± SD)	LPA (Mean ± SD)	Sig.
FR	13.706 ± 0.636	14.834 ± 0.475	**0.005**
UN	11.526 ± 0.549	12.440 ± 0.296	**0.004**
LA	9.782 ± 0.353	10.531 ± 0.244	**0.001**
SC	14.844 ± 0.657	16.164 ± 0.471	**0.002**

FR—non-reactive frontal agility; LA—non-reactive lateral agility; SC—non-reactive semicircular agility; UN—non-reactive universal agility; Sig.—level of statistical significance; Mean ± SD—arithmetic mean ± standard deviation.

Based on Cohen's criterion (0.1 = small; 0.3 = medium; 0.5 = large) for the effect size of the correlation, a strong positive correlation between the results of the standardized tests of non-reactive agility (the *t*-test and the Sprint 9-3-6-3-9 m with 180° Turns test) and the results on the LA, UN, FR, SC tests, with coefficient correlations which ranged from r = 0.936 to r = 0.987, which was confirmed by Pearson's linear correlation analysis (Table 6).

Table 6. Results of Pearson's linear correlation analysis of the applied non-reactive agility.

Variables		Agility *t*-Test	9-3-6-3-9	FR	UN	LA	SC
Agility *t*-test	Pearson's Correlation	**1**	**0.970 ****	**0.948 ****	**0.936 ****	**0.969 ****	**0.973 ****
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000
9-3-6-3-9	Pearson's Correlation	**0.970 ****	**1**	**0.956 ****	**0.962 ****	**0.987 ****	**0.982 ****
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.000
FR	Pearson's Correlation	**0.948 ****	**0.956 ****	**1**	**0.983 ****	**0.949 ****	**0.985 ****
	Sig. (2-tailed)	0.000	0.000		0.000	0.000	0.000
UN	Pearson's Correlation	**0.936 ****	**0.962 ****	**0.983 ****	**1**	**0.958 ****	**0.987 ****
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.000
LA	Pearson's Correlation	**0.969 ****	**0.987 ****	**0.949 ****	**0.958 ****	**1**	**0.977 ****
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		0.000
SC	Pearson's Correlation	**0.973 ****	**0.982 ****	**0.985 ****	**0.987 ****	**0.977 ****	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	

**—Correlation is significant at the 0.01 level (2-tailed); FR—non-reactive frontal agility; LA—non-reactive lateral agility; SC—non-reactive semicircular agility; UN—non-reactive universal agility; Sig.—level of statistical significance.

The results of the canonical discriminant analysis are shown in Table 7. They indicate a high value of the canonical correlation (0.821), and refer to the correlation of the group of applied data based on which the discriminant analysis was carried out. The discriminant analysis coefficient (Wilks's Lambda) has a value of 0.326.

Table 7. Results of the discriminant analysis.

Discriminant Analysis								
Eigenvalue	**Canonical Correlation**	**Wilks's Lambda**	**Chi-Square**	**Sig.**	**LA**	**SC**	**UN**	**FR**
2.072	**0.821**	0.326	8.978	0.062	**0.961**	**0.895**	**0.825**	**0.777**

Wilks's Lambda—level of discriminatory strength; Sig.—level of statistical significance; Chi-square—significance of the connection of the investigated spaces; FR—non-reactive frontal agility; LA—non-reactive lateral agility; SC—non-reactive semicircular agility; UN—non-reactive universal agility; Sig.—level of statistical significance.

In addition, Kendall's coefficient of concordance indicates a high level of statistical significance ($p = 0.000$) and has a maximum value of (W = 1), as shown in Table 8.

Table 8. Results of the reliability with Kendall's coefficient of concordance.

Reliability	Kendall's Coefficient of Concordance	
Cronbach's Alpha	W	Sig.
0.981	1	**0.000**

Sig.—level of statistical significance; W—Kendall's coefficient of concordance.

4. Discussion

With the aim of standardizing tests of non-reactive agility (LA, UN, FR, SC), and their more frequent use by women's basketball coaches and professionals in the field, the constructive validity of the tests was determined. An analysis of the impact of motor learning (the familiarization protocol) during the performance of agility tests among female basketball players was also carried out. Several highly significant findings were noted, which might play a key role in the practical applications of these tests of non-reactive agility, thus contributing to the ability to diagnose complex motor skills.

The basis for the creation of an adequate model of an athlete's functional fitness in the training process can be found in appropriate diagnosis programs which are used to analyze the performance and determine the appropriate factors of analysis responsible for its further improvement [22]. Bearing in mind the multidimensionality of agility as a motor skill, i.e., the fact that agility can be reactive and non-reactive and thus represents a complex ability which includes the process of rapid decision making and movement in several different directions [23], the single-factor ANOVA with repeated measures was used to analyze familiarization with the tests. Spatial configurations of tests describe four different sub-components of non-reactive agility (lateral agility; universal agility; frontal agility; semicircular agility), all characterized by a completely different structure of movement, and which have already been used by authors in previous studies [1,11,12].

Few studies have focused on familiarization with motor tests of agility among professional athletes, and they mostly included samples of elementary-school-aged children and adolescents [24,25]. One of the rare studies of the process of familiarization, i.e., the impact of motor learning on the results of motor tests among young athletes, was that of Gray et al. [26].

The importance of familiarization with the performance of a motor task, as well as the motor learning which emerges during that time, can significantly improve the test results. Thus, in addition to determining the validity of the tests, for their successful application with the aim of obtaining the most precise results, it is necessary to determine the optimum number of repetitions for each test, which would, in turn, provide the most objective results [27]. The significance of the process of familiarization with a certain test is reflected in the precision of the decision-making process regarding the effects of a certain exercise program. This means that if the result achieved during the initial testing is used, without the achieved stability of the results through the process of familiarization, it could lead to the result at the final testing being not just the outcome of the applied program, but of more rapid motor learning [24].

Specifically, in the case of the LA test, the results of the analysis indicated that there is a statistically significant difference between the series of test repetitions (Wilks's Lambda = 0.169, F = 9.844, $p = 0.004$, Partial Eta Squared = 0.831) in favor of repetitions four and five, and that due to the phase of motor learning [28] of the participants, the stabilization of the analyzed parameters occurred only after three performed series of tests. When performing the tests, for the participants to completely acquire the preplanned movement, it was necessary to perform more than three series of repetitions. It was determined that adequate data on the current performance of female basketball players could only be obtained following a fourth measurement. The analysis of the results for the performance of the UN test showed a statistically significant difference between the first and third series of the test performance (Wilks's Lambda = 0.230, F = 6.567, $p = 0.012$, Partial Eta Squared = 0.770), which indicates that during familiarization with the test, it is necessary to carry out two series of test performances, and only then carry out further measurements. Similar results were determined for the FR test, where a difference was determined between the first and third series of the test performance (Wilks's Lambda = 0.278, F = 5.206, $p = 0.023$, Partial Eta Squared = 0.722), where the process of motor learning also had an impact during the first two series of repetitions, which is why better performances of the participants were noted after the third series. Significant differences in the results of the SC test were determined between the first and fourth series of performances (Wilks's Lambda = 0.188, F = 8.664, $p = 0.005$, Partial Eta Squared = 0.812). For objective insight into the current performance of the semicircular agility of the participants, when preparing for measurement, it was necessary to perform four series of tests. Based on the results, it was confirmed that for a higher-quality performance of complex motor tasks, both the creation of a mental image of movement and practical training are needed [29]. Predetermined motor programs for a certain task during the initial series are further developed by additional performance of the task, up to a certain stage when the stabilization of the results is achieved [30].

Attempts to determine the constructive validity of tests for the evaluation of agility were made in different sports [31], along with the standardization of tests of agility and other motor skills of male and female basketball players [32–37]. In regard to determining the constructive validity of the applied tests of LA, UN, FR, SC, following the division of the participants into two groups (HPA and LPA), and based on data compiled from the standardized tests (the Agility *t*-test and the Sprint 9-3-6-3-9 m with 180° Turns test), hierarchical clustering analyses were used, which have already been applied in the previous literature [38]. First, a statistically significant difference was noted in the performance of agility in favor of one group of female basketball players (HPA) for all applied tests (LA, $p = 0.001$; UN, $p = 0.004$; FR, $p = 0.005$; SC, $p = 0.002$), after which a strong positive correlation was determined ($p = 0.01$) between the results achieved by the participants on all tests. High values of the correlation coefficient were determined both between the results achieved on the tests whose validity was being assessed and the Agility *t*-test (LA, r = 0.969; UN, r = 0.936; FR, r = 0.948; SC, r = 0.973), and for the results of the Sprint 9-3-6-3-9 m With 180° Turns test (LA, r = 0.987; UN, r = 0.962; FR, r = 0.956; SC, r = 0.982). These findings clearly indicate that the constructive validity of the aforementioned tests of non-reactive agility was confirmed, and that the spatial design of the movement in these tests is in accordance with the specificities and nature of movement in a sport such as basketball. This is confirmed by the results of the applied canonical discriminant analysis, which determined a strong correlation coefficient (canonical correlation = 82%), which due to the high quality of the sample, i.e., the small number of female participants, is still not significant, but is very close to the level of statistical significance (Sig. = 0.062). It confirms a high match between the new and the existing tests. A considerable overlap between the new tests and the existing ones is indicated by an exceptionally strong correlation (LA = 0.961; SC = 0.895; UN = 0.825; FR = 0.777), which is statistically significant (Sig. = 0.000), along with the maximum value of Kendall's coefficient of concordance (W = 1).

The results of the constructive validity applied in the study indicate that four new tests for the evaluation of agility among female basketball players can successfully be used, as they have a strong correlation with the existing tests for the evaluation of agility, which are already being used not only in basketball, but in other sports as well [39–42]. In addition, the new tests indicate a significant difference between the better and weaker performances, which allows for a more suitable level of precision during the selection process of female players, and when monitoring the level of their motor performance. In particular, the factor that gives an advantage to and recommends these tests for greater application is the possibility for the more precise evaluation of four different subcomponents of agility (lateral, frontal, semicircular, and universal). This refers to the simulation of player movement both during offense and defense in response to external stimuli during the game of basketball, which requires rapid and frequent stops and the ability to move in several directions [43].

A comparison of these results with the published results of authors who applied the same tests of non-reactive agility, and whose samples also consisted of female participants [1,12], indicated that the results for the LA, UN, FR, and SC tests in this study are considerably better. This could be a reflection of the high quality of the sample, i.e., of participants who are professional basketball players and who at the moment of testing were in the second half of the national championship season. In addition to the differences in the choice of participants in previous studies, who included female students/athletes from several different sports (football, basketball, handball, tennis, track, and field), a difference was also noted in the surface on which the testing was carried out. Tartan was the surface of choice in previous studies, which could also be the cause of the better results of the female participants in this study, considering that the measurements were carried out on a parquet floor, which is the natural surface for basketball players. In addition, another difference is that the best results were achieved on the LA test, while the SC test took the longest to perform. This can be explained by, in addition to the requirements of the spatial configuration of the tests, the greater distance between the sensors, which leads to the development of greater speed and a longer speed stop during changes in direction. Longer contact with the surface and an increase in the braking impulse have been proved to affect the speed of finding solutions and situational success in the dynamic environment of the game itself [44]. Therefore, the results of lateral movements reflected in the LA test come as no surprise, since these movements represent fixed patterns of movement of the female participants on the court during active play, which to a great extent depend on external stimulus and could lead to variability in the results [1,45]. Finally, we can conclude that the movement speed, i.e., the reaction to the stimulus, which is conditioned by adequate mechanics of movement (holding the body's center of gravity low, closer to the surface) with an appropriate level of perceptive cognitive abilities and the adequate development of propulsive abilities, and are necessary during changes in direction [44], are all suitable for the objective measurement of agility, and could successfully be applied in the case of professional female basketball players based on the tests performed in this study.

Our findings must be interpreted in the light of some limitations. The limitation of this study is primarily reflected in the small sample of respondents. However, it should be considered that our research was conducted with the approval of the club's management and coaches on the senior team, that is, professional female basketball players during the training process in the competitive season. It should be noted that the tests were performed in the middle of the week (on Wednesdays), after the recovery period of the female basketball players, considering that the competitive games are played during the weekend. The female basketball players' tests were performed in the initial part of the standard warm-up training and had a specific time frame so as not to disrupt the training structure. Despite the aforementioned limitations in the organization of testing, the research was carried out during the competitive season when the physical performance of female basketball players is expected to be at its peak. Additionally, the validity of the tests is assessed by comparing the results with the equivalent results of the gold standard procedure. However, it should be known that in this research, the validity of tests of complex motor ability such as agility was examined, for which although there are a large number of tests, there is no gold standard.

5. Conclusions and Practical Applications

The study focused on familiarization with and the validity of four tests of non-reactive agility, which in previously published studies had, among other things, been also used as an instrument to evaluate the level of motor performance of female basketball players, i.e., the various subcomponents of one complex motor ability such as agility. The results of this study indicate the need for and importance of motor learning when performing the applied tests of preplanned agility. This would make it possible to determine differences adequately and objectively in the existing characteristics, i.e., by means of the current level of development of this multidimensional motor skill among professional basketball players. The study determined that the results of the aforementioned tests are significantly affected by the number of series performed during familiarization, and that when preparing for measurement, it is necessary to perform two series of UN and FR tests, i.e., four series of repetitions regarding the practical application of the SC and LA tests among senior female basketball players.

In addition, based on the results obtained, it could be concluded that the validity of the applied tests was confirmed, and that the LA, UN, FR, and SC tests can be used as a suitable measure to determine the differences in the quality and level of the aforementioned subcomponents of non-reactive agility among female basketball players.

The results indicate the importance of familiarization, confirm the validity of the applied tests, and encourage coaches and researchers interested in women's basketball to use these tests more frequently as a diagnostic measure, to evaluate and determine objective differences in the current performance of complex motor skills such as agility. By determining the objective level of development of the subcomponents of agility of female basketball players and noting their shortcomings in motor status, it is possible to, in an adequate manner, affect the quality of planned and programmed training activities with the aim of forming a suitable model of an athlete needed to achieve the best possible results. The application of these tests in the training process through frequent testing and implementation of activities focused on the development of agility in women's basketball, as an ability which is highlighted as an important element, can contribute to the achievement of the desired competitive form and lead to the realization of determined competitive goals which the female basketball players and their coaches have set for themselves. In addition, the authors emphasize the high applicability of tests of non-reactive agility by using the FitLight Trainer™ system, since it is a wireless and easily transportable system which allows the transformation and use of these tests for the evaluation of the reactive agility and visual perceptive characteristics of athletes.

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