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Speed And Agility Intervention for Young U16 Basketball Players

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ABSTRACT: In Tirana, Albania, young people of all ages play basketball extensively. For basketball players and coaches, the evaluation of physical components is essential. The purpose of this study is to evaluate the components of speed and agility in U-16 basketball players while they are undergoing a training regimen. techniques. In this study, forty (40) male basketball players between the ages of fourteen and sixteen took part. A 10-meter speed test and a 10-by-5-meter agility test were used to evaluate them both before and after training. The intervention study was conducted once a week for four months. Each training set lasted 30 minutes and used eight pieces of exercise equipment. outcomes. The results demonstrated a statistically significant improvement in 10x5m and 10m speed (seconds).At the p = 0.05 level, the results demonstrated a statistically significant improvement in 10m speed (seconds) and 10x5m agility (seconds). In conclusion. Coaches will be able to use this study as a strong tool to help their players perform better through physical training in this age range. In terms of speed and agility, the intervention used in this study was effective. With this style, developing speed and agility is a good training period and an efficient exercise regimen. Coaches will find this study to be a useful resource for enhancing players' performance through youth-focused training.

KEYWORDS: Boys, Training, Agility, Speed.

I. INTRODUCTION

Because basketball is a high-intensity sport, athletes must meet very high standards in all areas. Basketball games are known for being extremely sporadic, with players changing their movement patterns and engaging in different activities every one to three seconds.

In basketball, sprinting is essential to success (Figueira et al., 2021).

In the context of basketball, agility encompasses a number of factors, such as quick decision-making, precise movement, quick direction changes, and response time. Basketball requires agility, which includes quick acceleration, deceleration, and direction changes while keeping good form. Comprehensive conversations on strength, speed, reaction time, and other relevant attributes are usually part of assessment and training. As a result, agility is a crucial and intricate athletic trait in basketball. According to Sheppard and Young (2006) and Enoka (2015), the definition of agility is still up for debate in the field of sports science. A large portion of the tension imposed during the game is caused by players' frequent direction changes (Drinkwater et al., 2008).

According to Pyne, D. B., et al. (2013), the anaerobic energy system plays a major role in the development of important speed and agility traits including acceleration and explosiveness.Baker and Nance (1999) compared and evaluated the athletic performance of rugby players at the elite and developing league levels using the Illinois Agility Test and a 20-meter sprint.

Scholarly discourses define agility as the ability to change direction quickly or react quickly to inputs. There is no empirical evidence to support fitness coaches' belief that increasing linear acceleration will improve one's ability to shift direction fast. However, there is no correlation between changing direction running and linear sprinting because of their different physical characteristics.According to Horińska et al. (2014), strength training techniques designed for sprinting cannot be used to sports like basketball, which are known for their frequent and rapid direction changes. Basketball players' agility is not improved by increasing linear acceleration since it does not improve their ability to shift direction. Physical fitness has become a barrier separating elite athletes from subelite athletes in team sports due to the quick expansion of professional sports, consequently affecting competition results (Farley et al., 2021).In sports, athletes can gain benefits in both technical and tactical areas and lessen opponent intervention by executing rapid direction shifts (Yilmaz, 2014).

Basketball players must constantly move in multiple directions on the floor, even though linear quickness

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is essential in team sports.Statistics show that during a formal basketball game, adult males traverse a total distance of 203–269 meters with 450 lateral movements, whereas women cover a distance of 125 meters with 63–298 lateral movements (Yilmaz, 2014). Human strength, speed, flexibility, and balance are just a few of the attributes that are reflected in agility. For basketball players to execute a variety of challenging technical moves on the court, it provides an essential physical basis (Delextrat et al., 2014).Sprint drills, overspeed training, resistance sprinting, weight training, and plyometric exercises are some of the training techniques used to enhance sprinting performance (Rimmer &Sleivert, 2000).

In Tirana, Albania, young people of all ages play basketball extensively. For basketball players and coaches, the evaluation of physical components is essential. The purpose of this study is to evaluate the elements of speed and agility in U-16 basketball players as a result of a training regimen.

II. 10m Speed Test and 10x5m Agility Test

The **10 m Speed Test** is a commonly used field test in basketball to assess a player's acceleration and short-distance sprinting ability. Since basketball players rarely sprint over long distances during competition, the ability to accelerate rapidly over the first few meters is more important than maximal sprint speed. This test evaluates how quickly an athlete can reach high running velocity from a stationary position, which is crucial during fast breaks, defensive recoveries, transitions, and movements to gain positional advantage on the court.

The primary objectives of the **10 m Speed Test** in basketball are to:

- Measure linear acceleration performance.
- Assess explosive lower-body power and force production.
- Monitor the effectiveness of speed and conditioning programs.
- Identify strengths and weaknesses in sprint performance.
- Track athletic development throughout a training season.

Test Procedure

Warm-Up

Before testing, players should complete:

- 5 minutes of light jogging
- Dynamic stretching exercises
- Basketball-specific movement drills
- 2–3 progressive acceleration runs

Test Execution

1. The tester gives the command "Ready – Go!".
2. The athlete sprints maximally through the 10 m distance.
3. The player must continue running beyond the finish line without decelerating early.

```
Start Line                    Finish Line
  |----------------------------------------|
  |--------------- 10 meters --------------|

 Cone                                  Cone
```

4. The time is recorded to the nearest 0.01 second.
5. Three trials are typically completed with 2–3 minutes of recovery between attempts.
6. The best performance is recorded as the final score.

The **10 × 5 m Agility Test** is a widely used field test designed to evaluate an athlete’s ability to accelerate, decelerate, change direction rapidly, and maintain speed while performing repeated shuttle runs. In basketball, agility is a fundamental physical component because players constantly execute quick directional changes during offensive and defensive actions. The test provides valuable information about a player's movement efficiency and ability to perform repeated high-intensity efforts similar to those encountered during competition.

The primary objectives of the **10 × 5 m Agility Test** in basketball are to:

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- Assess agility and change-of-direction speed.
- Measure acceleration and deceleration ability.
- Evaluate repeated sprint performance.
- Monitor the effectiveness of training programs.
- Identify strengths and weaknesses in movement performance.

Two parallel lines are marked **5 meters apart**. The athlete repeatedly runs back and forth between the lines, completing a total distance of **50 meters (10 × 5 m)**.

Start/Finish Line Turning Line

|--------------------------------|

| 5 meters |

|--------------------------------|

Shuttle 1 → 5 m

Shuttle 2 ← 5 m

Shuttle 3 → 5 m

Shuttle 4 ← 5 m

Shuttle 5 → 5 m

Shuttle 6 ← 5 m

Shuttle 7 → 5 m

Shuttle 8 ← 5 m

Shuttle 9 → 5 m

Shuttle10 ← 5 m

Test Procedure

Warm-Up

Before testing, athletes should perform:

- 5–10 minutes of light jogging
- Dynamic stretching exercises
- Lateral movement drills
- Acceleration and deceleration drills
- Practice shuttle runs

Test Execution

1. On the command **"Go"**, the athlete sprints to the opposite line located 5 meters away.
2. The athlete must place at least one foot on or beyond the line.
3. Immediately after reaching the line, the athlete changes direction and sprints back.
4. This process continues until **10 lengths of 5 meters** have been completed.
5. The stopwatch stops when the athlete crosses the finish line after the final shuttle.
6. Usually two trials are performed, and the best result is recorded.

III. EXPERIMENTATION

A Regulated 5V DC power supply is feed to Arduino board and IC 7805 Voltage regulator. All microcontrollers operate at low voltages and require a small amount of current to operate while solenoids require higher voltages and current. Hence current cannot be supplied to the solenoid from the microcontroller .This is the primary need for IC L293D.A diode(**IN4007**) and a voltage regulator (**7805**) IC are connected in the path ,thediode is used as a one-way check valve. Since these diodes only allow electrical current to flow in one direction.IC 7805 is a 5V Voltage Regulator that restricts the voltage output to **5V** and draws 5V regulated power supply. A digital signal generated by Arduino based on the input program is feed to the L293D IC .L293D Is a voltage amplifier that amplifies the 5V into 12V.The L293D IC receives signals from the micro controller and transmits the relative signal to the solenoids .A L293D IC consists of 16 pins in total. 4 ground pins,4-input pins,4-output pins,2 voltage and enable pins. The digital signal output from 7 pin of arduino is feed to 10^{th} pin of L293D(input),output from 7^{th} pin is feed to 14^{th} pin of L293D(output).The 4^{th},5^{th} and the 13^{th},12^{th} pins of L293D are grounded. L293D has an enable facility which helps you enable the IC output pins. If an enable pin is set to logic high, then state of the inputs match the state of the outputs. If you pull this low, then the outputs will be turned off

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regardless of the input states Depending upon our power requirements we can use Transistors/MOSFETs as switches.

Participants

Forty (40) young male basketball players from Albania's capital city of Tirana were chosen. From a pool of ninety young basketball players who frequently competed in the national youth basketball championship, these participants were chosen at random. The chosen players were 16.4 ± 1.4 years old on average. Prior to the commencement of this study, the chosen players had 3.8 ± 1.8 years of playing experience and routinely participated in training. The individual completed four tests: a 10-meter speed test and a 10-by-5-meter agility test.

Table 1. Descriptive Statistics for participants

Variable	N	Minimum	Maximum	Mean	SD
Age (years)	40	15.9	16.9	16.4	1.4
Body Weight (kg)	40	60.0	84.0	72.5	8.0
Body Height (m)	40	1.71	1.86	1.79	0.05
Body Mass Index (kg/m²)	40	19.9	24.4	22.5	1.6

Note. N = number of participants; SD = standard deviation; BW = Body Weight; BH = Body Height; BMI = Body Mass Index.

Intervention
Three months were spent on the young basketballplayers' intervention. Twice a week was the overall frequency, and each session lasted ten to fifteen minutes. They trained in the gym where the training intervention was conducted. speed and agility exercises, whereas the agility exercises (speed and agility exercises) require four to six exercises.

Statistical Analysis

An Excel file was created after the data was gathered and arranged. The statistical software SPSS (Windows version) was then used to transfer and analyze them. First, we determined each parameter's descriptive statistics (means and SDs). A high level of significance ($p \leq 0.005$) was chosen for each variable's pre- and post-comparison using the ANOVA test. For two-time measurements, only analyses performed during the comparison ($p \leq 0.005$) were regarded as statistically significant. The outcomes of this research study were computed using the statistical software SPSS.

RESULTS

The speed and agility test results for young female basketball players before and after three months of training are shown in Table 2. According to the speed and agility test, the pre- and post-measurements were 1.89 and 1.81 seconds for the 10-meter sprint, 3.5 and 3.3 seconds for the 20-meter sprint, and 14.1 and 13.6 seconds for the agility power (table 2).

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Table 2. Descriptive statistics for velocity and agility at pre and post measurement

Variable	Test	Mean	SD	SE	95% CI Lower	95% CI Upper	Min	Max
Sprint 10 m Duration (s)	Pre	1.89	0.0587	0.0239	1.828	1.952	1.80	1.97
	Post	1.81	0.0554	0.0226	1.759	1.875	1.72	1.88
	Total	1.85	0.0665	0.0192	1.811	1.896	1.72	1.97
Sprint 10 m Velocity (km/h)	Pre	19.01	0.6178	0.2522	18.368	19.665	18.20	20.00
	Post	18.95	1.2438	0.5078	17.645	20.255	17.30	20.80
	Total	18.98	0.9370	0.2705	18.388	19.579	17.30	20.80
Agility 10 × 5 m Duration (s)	Pre	14.15	0.4807	0.1962	13.641	14.650	13.57	14.94
	Post	13.64	0.4150	0.1694	13.205	14.076	13.10	14.00
	Total	13.89	0.5029	0.1452	13.573	14.212	13.10	14.94
Agility 10 × 5 m Velocity (m/min)	Pre	19.45	0.8979	0.3666	18.513	20.397	18.47	20.86
	Post	18.85	0.4126	0.1685	18.422	19.288	18.27	19.46
	Total	19.15	0.7363	0.2125	18.687	19.623	18.27	20.86

Note. SD = Standard Deviation; SE = Standard Error; CI = Confidence Interval. Pre = measurements before the intervention; Post = measurements after the intervention.

The findings of the ANOVA statistics from the speed and agility test variables' pre- and post-measurements are displayed in Table 3. At the p = 0.05 level, there was a statistically significant improvement in terms of 10m speed (seconds), 20m speed (seconds), and 10x5m agility (seconds).

Table 3. ANOVA comparison for velocity and agility at pre and post measurement

Variable	Source of Variation	Sum of Squares	Mean Square	F	p
Sprint 10 m Duration	Between Groups	0.016	0.016	4.959	0.050
	Within Groups	0.033	0.003	—	—
	Total	0.049	—	—	—
Sprint 10 m Velocity	Between Groups	0.013	0.013	0.014	0.909
	Within Groups	9.643	0.964	—	—
	Total	9.657	—	—	—
Agility 10 × 5 m Duration	Between Groups	0.765	0.765	3.794	0.050
	Within Groups	2.016	0.202	—	—
	Total	2.781	—	—	—
Agility 10 × 5 m Velocity	Between Groups	1.080	1.080	2.212	0.168
	Within Groups	4.883	0.488	—	—
	Total	5.963	—	—	—

Note. ANOVA = Analysis of Variance; $p < .05$ indicates statistical significance. Sprint 10 m Duration and Agility 10 × 5 m Duration showed statistically significant differences between pre- and post-test measurements ($p = .050$), whereas Sprint 10 m Velocity and Agility 10 × 5 m Velocity did not show significant differences ($p > .05$).

DISCUSSION

The study's findings demonstrated that young female basketball players significantly improved after this three-month training. At the p = 0.05 level, the results demonstrated statistically significant improvements in 10m speed (seconds) and 10x5m agility (seconds). This demonstrates unequivocally that there was a substantial difference between the groups in the adjusted pre-test and post-test scores after controlling for pre-test scores. It was demonstrated (Ho et al., 2019) that a skill-based training program's workload should be suitable in order to increase players' fitness and get better athletic performance.Diversity in movement varies by sport. Sprint speed, for instance, is a crucial aspect of physical performance, particularly during basketball quick-break moves. Male volleyball players reportedly showed notable gains in speed, strength, and agility with volleyball-specific plyometric training (Mannan & Johnson, 2015).The outcomes demonstrated the effectiveness of this training in terms of speed and agility factors. The purpose of the 10 x 5 m Shuttle Run Test was to gauge the players' speed and coordination. The test findings showed that, in comparison to the beginning of the training program, speed and agility scores had improved by 2.4 seconds. According to (PadrónCabo et al., 2020), 10 m speed running improves by 2.54% after six weeks of agility training.According to Miller MG et al. (2006), a study that examined the impact of a 6-week plyometric training program on agility found that plyometric exercise was a successful training method for enhancing an athlete's agility. Another perspective that the decision-making process in sports games is crucial and significantly influences the pace at which motor tasks are completed supports these findings (Spasic M, et al., 2015).

IV. CONCLUSION

In terms of speed and agility, the intervention used in this study was effective. With this model, speed and agility development is an efficient training period and exercise regimen. Coaches will find this study to be a useful resource for enhancing players' performance through youth-focused training.

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