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ARTICLE

Issues of developing the speed ability of students playing Basketball

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Abstract: The purpose of this study is to improve the content and methodologies of the curriculum of the training courses for the development of the speed ability of high school students, who practice basketball. When developing the speed capacity of the high school students of National Secondary School of Horinger country of Hohhot, Inner Mongolia, People's Republic of China, a Chinese researcher Li Wenlong (2015) used the theory and concept that "an important part of training of basketball players is to develop their speed capacity by improving their strength capacity." Movement test methodology was used to determine the general speed ability of the students and the basic technical speed level of basketball and consequently, to calculate the results [3]. A program developed to study respondents' general speed and basketball speed revealed that a 30-meter run was improved by 0.51 sec, 50-meter run by 0.72 sec, and 100-meter run by 0.36 sec. According to the basic technical parameters of basketball, the speed during straight dribbling increased by 0.56 seconds, the dibbling speed around the 15 mark increased by 0.38 seconds, the speed of two students running and passing ball on a 28-meter court increased by 0.78 seconds, and the speed of the defensive transition improved by 4 times. We believe that the capacity of targeted exercises, tools, and exercise selection in the curriculum and planning models used in our study have become efficient.

Keywords: *basketball, speed capacity, muscle strength, physical development and preparation;*

INTRODUCTION

Basketball is a highly competitive game that requires a lot of physical development, preparation, movement ability, and personal skills in basic offensive and defensive techniques. It differs from other sports in that it requires the player to have special feelings and abilities, such as speed, explosiveness, strength, patience, agility, coordination of various movements, and spatial orientation.

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Basketball players, in total, run almost four kilometers during one game, make about 150 sprints at a distance of 5-20 meters, and make100 jumps in the presence of active opposition from the opponent [4]. In recent years, attack and defense in basketball have evolved into a sport of speed and power, and the speed of transition from one version to another has increased dramatically, as a result, the level of physical development and training of athletes have reached high levels, personal skills have improved, and competition on the court has become extremely intense.

Basketball has become popular around the world for its dynamic nature as a team sport, attracting both players and spectators. Modern basketball demands more speed, power, agility, strength, patience and flexibility from a player. Speed is one of the most important factors in basketball [1]. It is important for basketball players to improve their modern basketball techniques and tactics, personal movement speed, physical development level, build up stamina to play through the competition, maintain psychological stability, and have the ability to make instant situational decisions [5]. Basketball players are required to focus on mastering the speed of movement and last-minute decision-making that manifests in tactical participation [2].

In his paper "A Study on the Current Situation of Basketball Coaches Requesting Timeout during Games", a Chinese researcher [6] mentioned that “Since its inception, basketball has combined competition, skill, speed, power and explosiveness with the basic technical skills of the game. With these features, it has become an important sport of the people.”

When comparing the development of basketball with other sports, the defensive and offensive phases are constantly changing during the game, the players are on a continuous move, the changes in the speed and direction of the movement, special physical features and development level of the players, the burst of speed-power, and the spirit of the players are quite different from other sports, according to researchers.

Importantly, basketball players must have a high level of physical development, training, and the skills to make different movements, perform complicated technical maneuvers and have an active joint tactical joint movements at a high speed, perform power defense, and the have the ability to maintain the intensity of the load until the last minute of the game or until the final whistle by the referee. Therefore, there is a need to specially develop the speed skills of high school students during the training courses.

The purpose of the research is to determine and evaluate the level/capacity of speed among high school students who play basketball.

MATERIALS AND METHODS

Following methods have been used in this study:

- method of studying literature and documents to clarify the previous studies, and the theoretical basis of the issue;
- movement test method for determining the general speed capacity of students, basic technical speed level of basketball and determining the results;
- methods such as SPSS software for mathematical statistical processing to combine study data, compare indicators, and determine the correlation.

16 high school students of the National Secondary School of Horinger county, Hohhot of Inner Mongolia, China have taken part in this study.

Study phase 1. The level of speed capacity of high school students was determined by the general speed capacity indicator by running a distance of 30m, 50m, and 100m;

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Study phase 2. Methodology to evaluate speed capacity of the basic techniques of basketball:

- Students perform the test starting at the basketball baseline.
- Measuring the time the students speed through z 28-meter area performing straight dribble and layup.
- Measuring the time the students' speed dribble going around 15 markers and layup.
- Determining the transition time between parallel lines 15 m long, 3 meters apart in 30 seconds
- Identifying the number of times chest passes are done between 2 players while running. All test results were analyzed.

Study phase 3. A program will be implemented to develop the speed capacity of the study respondents.

Study phase 4. The results of the program implemented in the test study will be processed and analyzed.

Table 1. Movement test to measure general speed of high school students and basic technical speed capacity

Movement test		
General speed	**Basic basketball technical speed**	
30м run (sec)	Speed capacity for straight dribbling (sec)	Run by dribbling the ball in a straight line 26.8 m and throw the ball into the hoop in two steps
50м run (sec)	Speed capacity for obstacle dribbling (sec)	Dibble the ball for 26.8 m, go through 15 markers and throw in two steps.
100м run (sec)	Defensive speed capacity (times)	Fast transition between parallel lines 15 m long, 3 meters apart in 30 seconds
	Transmission speed capability (sec)	Speed of 2 students to run and transfer the ball at 28 meters

The indicators of the results of the first study to determine the general speed level of the students shall be explained for each test before the start of the training program.

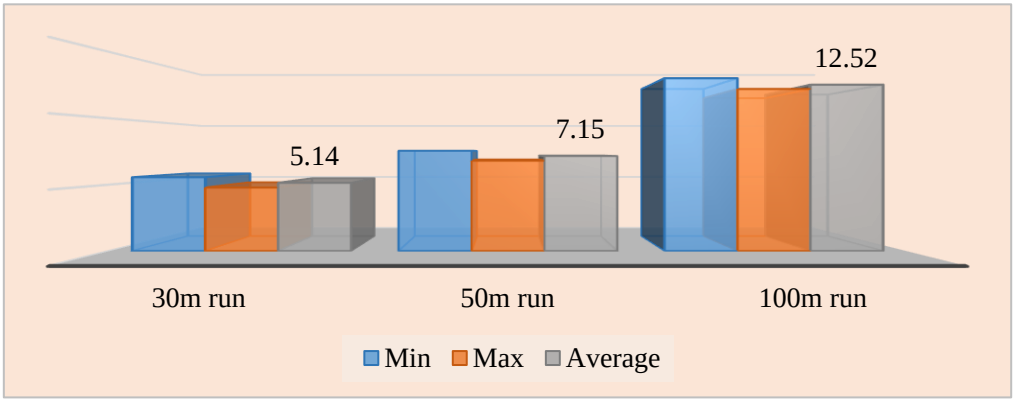

Figure 1. Indicators of general speed of high school students and basic technical speed capacity of basketball

Comparing the general speed indicators of 16 male students of a high school, the following were found:

- The minimum speed of running 30 meters is 5'56" seconds, the maximum

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speed is 4'78" seconds, and the average speed - 5'14" seconds.

- According to the performance of 50 meters running, the minimum performance is 7'55" seconds, the maximum performance is 6'80" seconds, and the average performance is 7'14" seconds.
- The minimum performance of 100 meters running is 13'01" seconds, the maximum performance is 12'20" seconds, and the average performance is 12'52" seconds.

By comparing the start parameters of the basic technical speed capacity of basketball of the students, the study confirmed the following:

- Minimum indicator of the attack speed capacity with a straight dibbling with 2 steps is 6'55" seconds, the maximum indicator is 5'25" seconds, and the average indicator is 6'07" seconds.
- Minimum indicator of the attack speed of running through obstacles is 13'06" second, the maximum indicator is 11'98" second, and the average speed is 12'09" seconds.

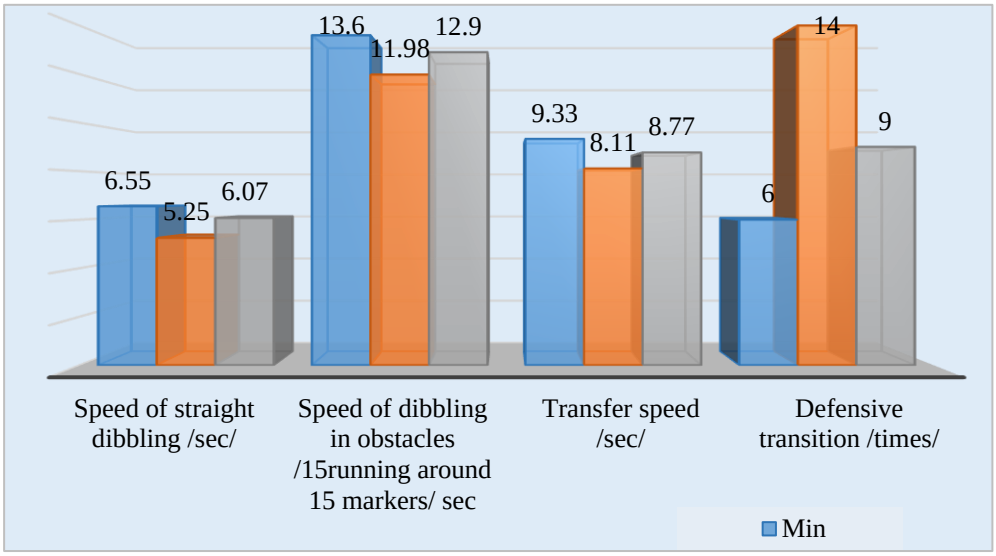

Figure 2. Indicators of general speed of high school students and basic technical speed capacity of basketball

- Minimum transmission speed capacity is 9'33" seconds, the maximum is 8'11" seconds, and the average is 8'77" seconds,
- Minimum indicator of defensive transition speed capacity is 6 times, the maximum is 14 times, and the average is 9 times.

Result of basketball training program for high school students

We conducted our study over a period of 4 months, from March to the end of June 2023, spending a total of 36 hours on general speed development training and a total of 84 hours on basketball technical speed development training, by implementing 120-minute programs 4 times a week. In order to determine if the program content was scientifically-based, and if the level of load affected the speed capacity of students, we have carried out the following study.

Table 2 shows the basketball training load, assuming that this distribution will meet our goal of developing the speed capacity of young basketball players.

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Table 2. Basketball training plan

Training content	Months of training				Total hours	
	III	IV	V	VI	Total hour	Per cent
Improvement of physical development (hour)	10	8	10	8	36	30.0%
Development of basketball technics and skills (hour)	20	16	24	24	84	70.0%
Load capacity (hour)	30	24	34	32	120	100.0%
Load intensity (%)	88.2%	70.6%	100%	94.1%	120	

Physical development time was planned to be 30 hours in total including 8 hours for general speed development, 6 hours for reaction speed development, 8 hours for speed and strength development, and 8 hours for speed burst development.

When planning the program, a plan of a total of 84 hours was devised and implemented, which included 12 hours for basketball dribbling speed development, 12 hours for passing speed development, 12 hours for shooting speed development, 24 hours for attacking speed development, and 14 hours for defensive speed development.

The initial test was taken in the first week of March. The training was conducted according to the content below, and the content is shown below by the first 3 parts.

Table 3. Features of training content

Content	***General speed***	***Main basketball techniques***
Load direction	*Speed, burst, speed-power*	*Instant speed, burst speed, speed and power,*
Training purpose	- Speed of changing the direction (develop complicated response) - Running (short distance) - Runnning backwards - Chasing speed	- ball handling - shooting version - transfer version - dibbling version - fast transitions
First part 10-15 min	- Stretching exercises - Running exercises	- Stretching exercise - Running exercise - Exercises with balls
Main part 90-95 min	Exercises to develop speed capacity by developing muscle strength using rubber bands, weights, and body weight	Exercises with versions to develop skills in basic basketball techniques
Final part 10-15 min	Soft running, stretching, and relaxation exercises to reduce stress	Soft running, stretching, and relaxation exercises to reduce stress

Coaching session #3
Class theme: Footwork, basic training to improve speed
Session purpose: To improve players' footwork, special training to develop speed and explosiveness
Class organization technique: Circuit training, explaining, demonstrating, discussing methodologies.
Session duration: 90 minutes

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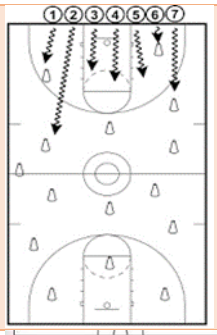
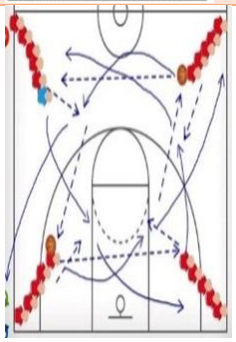
Table 4. One-time sample lesson

Heading	Class content	Teaching methodology	Picture
Beginning 15min	Team	Warm-up Stretching Running	
Main section 60 min	Exercises using rubber bands for development of foot muscles	Stand with your feet wider than shoulder width apart and put a rubber band on your feet. While the body is in an upright position, move the legs to the sides, outwards, and inwards alternately. 1 student performs this exercise at 100% speed for 30 seconds, then rests for 30 seconds and repeats 5 times. Complete in 16 minutes.	
	Side-step pulls using rubber bands	Side-step pull. Put a rubber band on your feet, hold a 3 kg weight ball in your hand, and stand with your feet shoulder-width apart. Without moving the right leg, step sharply to the side from the left leg to the side. 1 student performs this exercise 10 times on both legs alternately, then rests for 1 minute and repeats the exercise 5 times.	
	Lunges using rubber bands	Stand with your feet wider than shoulder width apart and put a rubber band on your feet in a half-squat position. Jump forward and backward on your feet. This helps players develop faster defense moves. A student performs this exercise 10 times on both legs alternately, then rests for 1 minute and repeats 5 times.	
	Dribble exercises	Players start at the baseline and perform speed dribble while weaving through obstacles. 28x2x3	
		Starting at the baseline, perform straight dribble and layup to the opposite hoop, and quickly return for opposite court offense. 28x2x3	
		Starting at the baseline, perform straight dribble to the opposite court and do a spin, then layup. 28x2x3	
	4-point pass	Participants are divided into four groups, each standing in a square at a distance of 5-6 m. The 1st position player passes the ball to the first position player on his right and runs to receive the pass himself. The 2nd position player receives the ball from the 1st position, passes it back to him /1/ and runs after it. The 1st position player passes the ball to the 3rd position player and stands behind the 3rd position player's line. The 3rd position player runs behind the 1st position player and passes to the 2nd position player who runs behind him. In this way, the transfer takes place at each position.	
Ending 15 min	Relaxation exercises	- Entire body stretching - Team breathing exercises - Do relaxation exercises	15 min

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RESULTS AND DISCUSSION

Three indicators of general speed capacity and 4 indicators of basic technical speed capacity were compared before and after the training.

The results of the study of 3 types of general speed of students and 4 indicators of basic technical speed capacity of basketball were analyzed using SPSS software.

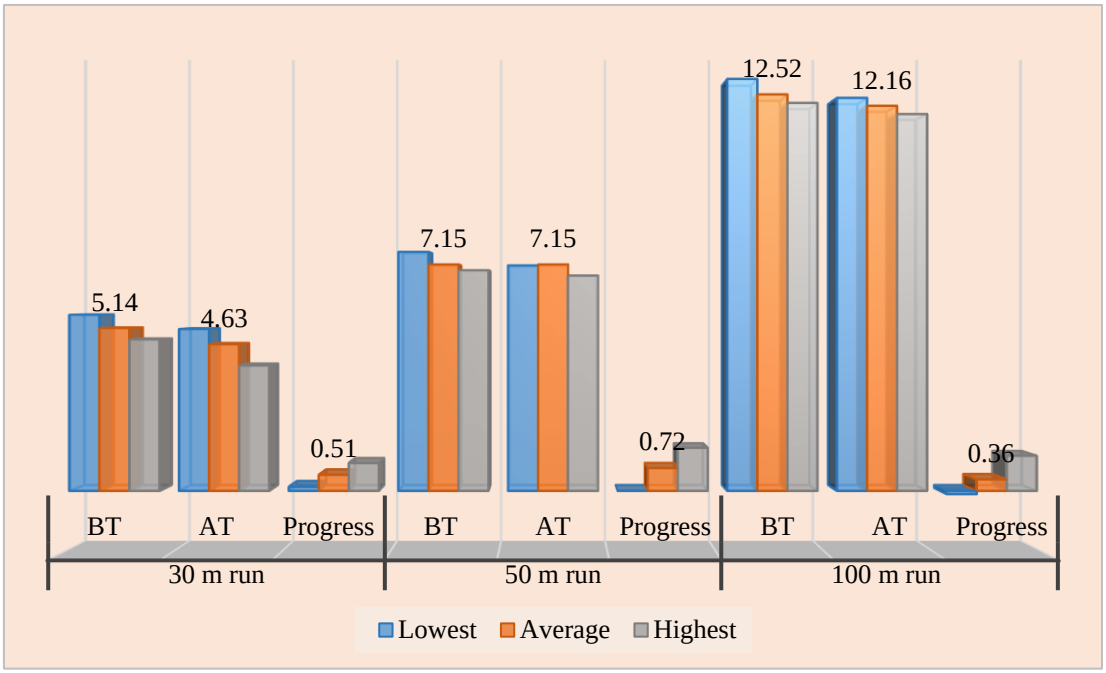

Figure 3. Comparison of average indicators of general speed of high school students

PS: BT- before training, AT- after training

Below are results of general speed indicators among high school students who have been subject to testing.

- Prior to the implementation of the the program, for a 30-meter run, the longest time was 5’56’’, the fastest time was 4’78’’and the average time was 5’14’’. After the program implementation, the longest time was 5’11’’, fastest time was 3’96’’and the average time was 4’63’’, recording a 0.51 second improvement on an average.
- For 50-meter run, the longest time was 7’55’’, the fastest time was 6’80’’and the average time was 7’15’’. After the end of the program, the longest time was 7’12’’, the fastest time - 6’10’’and the average time was 6’43’’, a 0.72 second improvement on an average.
- For the 100-meter run, the longest time was 13’01’’, fastest time was 12’20’’and the average time was 12’52’’. At the end of the program, the longest time was 12’30’’, the fastest time - 11’90’’and the average time was 12’16’’, with a 0.36 second improvement on average.

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Table 5. Static average of general speed of high school students

Movement test	Test period	Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean	t	Sig.(2-tailed)
30м run (sec)	BT	5.14	16	.20421	.05105	7.895	0.000
	AT	4.63	16	.31035	.07759		
50м run (sec)	BT	7.14	16	.18343	.04586	7.649	0.000
	AT	6.43	16	.32562	.08141		
100м run (sec)	BT	12.51	16	.23709	.05927	5.421	0.000
	AT	12.15	16	.15251	.03813		

PS: BT- before training, AT- after training

Statistical processing results revealed that the content and methodology of the program for the development of general speed capacity of the male students participating in the study are appropriate. As a result of the training, the indicators of 30m, 50m, and 100m running tests have improved, and there is a statistically significant improvement (p≤0.000).

Here it can be concluded that the implementation of running exercises in different ways, straight, uphill, and inclined paths with difficulty, resistance, repeated, stair, and with change of direction in the test program, produced results.

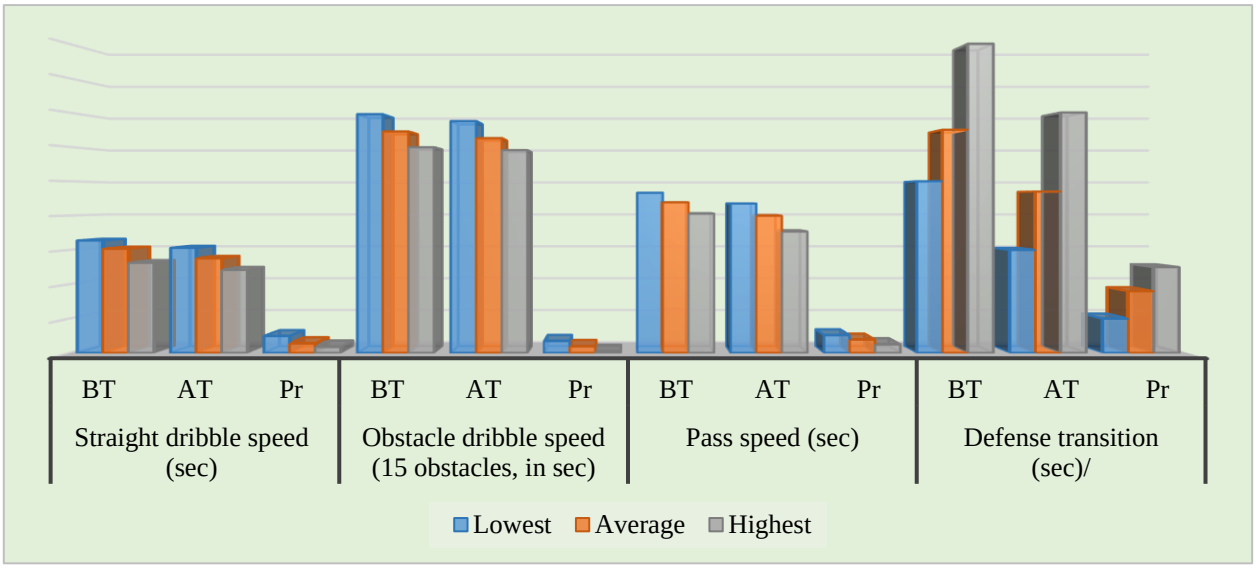

Figure 4. Comparison of average performance of basic technical speed of basketball among high school basketball students

PS: BT- before training, AT- after training, Pr-Progress

Looking at results of basic basketball techniques of all senior students who participated in the study, the following were found:

- Straight dribble speed before the commencement of the program was, the lowest 6’55’’, highest - 5’25’’ and the average time was 6’07’’; whereas after

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the program lowest time became 6’12’’, highest - 4’84’’ and average came to 5’51’’, a 0.56 second improvement on an average.

- The 15-mark obstacle course speed before the program had a minimum time of 13'90", a maximum of 11'98", and an average of 12'90", while the minimum after the program was 13' 50" seconds, with a peak of 11'81" and an average of 12'51", an average improvement of 0.39 seconds.
- Defence transition speed was 15'98" seconds before the implementation of the program, the maximum speed was 11'45" seconds, the average was 13'90" seconds, and the minimum after the program was 13'65" seconds, with a maximum of 10'82" seconds and an average of 12'02" seconds with an average of 1'88" second improvement.
- The minimum speed of 2 students running and passing the ball to each other on a 28-meter court was 9'33" seconds before the program, the maximum value was 8'11" seconds, and the average value was 8'77" seconds, while the minimum value was 8'70" seconds at the end of the program, the maximum value was 8'11" seconds, and the average value - 8'77" seconds, an average improvement of 0.77 seconds.

Table 6. Statistics of high school students' basic technique speed ability in basketball

Movement test	Test period	Paired Samples Statistics								
		Mean		N	Std. Deviation		Std. Error Mean		t	Sig.(2-tailed)
Speed of straight dibbling (sec)	BT	6.0725	0.56	16	0.3162	0.184	0.079	.4607	12.155	.000
	AT	5.5125		16	0.392		0.098			
Speed of dibbling in obstacles (running around 15 markers) sec	BT	12.899	0.39	16	0.6042	0.17	0.151	.170	9.093	.000
	AT	12.511		16	0.5569		0.1392			
Transfer speed (sec)	BT	9.375	3.62	16	2.16	0.806	0.5401	.2016	17.985	.000
	AT	13		16	2.029		0.5072			
Defensive transition (times)	BT	8.765	0.77	16	0.5445	0.212	0.1925	.212	10.304	.000
	AT	7.99		16	0.6964		0.2462			

PS: BT- before training, AT- after training

Statistical processing results confirm the appropriateness of the content and methodology of the program for the development of general speed capacity of the male students participating in the study. As a result of the training, the dibbling skill improved by 0.47 ($p<0.000$), defensive transition speed improved by 3.62 times ($p<0.000$) and passing skill improved by 0.77 s ($p<0.000$), showing a statistically significant progress.

CONCLUSIONS

Basketball is a rapidly developing from amateur to professional sport in the world, and it has also become a type of sport that children and youth of Inner Mongolia like to engage in and play more. The technical and tactical skills of players have increased dramatically, requiring physical development, general and special training from players. In connection with this, the issue of professional basketball training has been raised a lot in foreign countries, and scientific- and evidence-

based training and coaching have been organized to prepare athletes, which is seen from study documents.

- The results of the program aimed at increasing the speed capacity of high school male students by increasing muscle strength and developing speed capacity were measured by a short distance running test. The 30-meter running speed is 0.51 seconds, 50-meter running speed is 0.72 seconds, 100-meter running speed is 0.36 seconds, or an average of 0.52 seconds, according to the results of running statistics, this is significant for t-statistics ($p<0.05$).
- As a result of the program to develop the speed capacity of high school students through basketball training, the speed during straight dribble increased by 0.56 seconds, the speed of the obstacle dribble by 0.38 seconds, the speed of the pass by 0.78 seconds, and the speed of the defense transition up to 4 times or 69.2%.

The general speed and speed of basic basketball techniques of high school male students of Horinger County National Secondary School in Hoh Hot in Inner Mongolia have improved markedly, and the effect of team and personal success was observed in the implementation of tactics in many scenarios of offence and defense during games.

The improvement in individual player success is observed from the improvement in basic basketball techniques, and the team success is observed in the results of the competitions played throughout the season. We consider that the capacity of targeted exercises, tools, and exercise selection in the curriculum and planning models used in our study have been effective and efficient. During a basketball game, the player performs many actions on the court, such as powerful starts, sudden acceleration, high jumps, quick transitions, sudden stops, and rapid changes of running, which are performed in tandem with the actions of the opposing team members, which is the main feature setting basketball apart from other sports. In this context, we devised a program to develop the speed ability of high school students and conducted a test study.

In the future, there is a need for teachers and coaches to develop the speed ability of athletes, who will compete at a professional level from an amateur's level, in combination with other physical abilities and working ability.

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