World Journal of Pharmaceutical Science and Research

www.wjpsronline.com

Research Article

ISSN: 2583-6579
SJIF Impact Factor: 6.916
Year - 2026
Volume: 5; Issue: 8
Page: 15-23

IMPACT OF SPEED, AGILITY, AND QUICKNESS (SAQ) TRAINING ON AEROBIC AND ANAEROBIC FITNESS IN JUNIOR NETBALL PLAYERS AT GALAHITIYAWA CENTRAL COLLEGE

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Article Received: 10 June 2026 | | ***Article Revised: 01 July 2026*** | | ***Article Accepted: 22 July 2026***

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DOI: https://doi.org/10.5281/zenodo.21703911

How to cite this Article: M. D. C. Dushmanthi, Dr. P. Buvanendiran (2026) IMPACT OF SPEED, AGILITY, AND QUICKNESS (SAQ) TRAINING ON AEROBIC AND ANAEROBIC FITNESS IN JUNIOR NETBALL PLAYERS AT GALAHITIYAWA CENTRAL COLLEGE. World Journal of Pharmaceutical Science and Research, 5(8), 15-23.

ABSTRACT

Speed, agility and quickness (SAQ) training is used to improve the performance of players but evidence of the impact of SAQ on the aerobic and anaerobic fitness of junior netball players is limited. The nine week SAQ training intervention program on the aerobic and anaerobic fitness was observed in junior netball players from Galahitiyawa Central College in Sri Lanka. 20 female players, ages 12 to 15, played junior netball were assigned a quasi-experimental pre and post-test design. The participants went through a structured training program of 9 weeks with the SAQ and the performance was evaluated by the 30m sprint test, 5/10/5 agility test, Yo-Yo Intermittent Recovery Test Level 1 and Running Based Anaerobic Sprint Test (RAST). Data were analyzed and compared for pre and post intervention performance. Significant improvements were observed in sprint performance (7.04 ± 1.04 s to 6.59 ± 0.74 s, $p = 0.006$), Agility (8.04 ± 0.60 s to 7.26 ± 0.50 s, $p < 0.001$), and fatigue index (1.36 to 0.91, $p = 0.008$). maximum power reduced significantly (127.96 W to 106.93 W, $p = 0.005$), while aerobic capacity remained unchanged (402m). significant correlations were identified between body mass index (BMI) and sprint performance ($r=0.511$. $p=0.021$), and between sprint performance and Yo-Yo IR1 distance ($r=-0.555$, $p=0.011$). A nine-week SAQ training program was able to significantly enhance fatigue tolerance, agility and sprint speed in junior netball. To maintain maximum anaerobic power and increase aerobic capacity, SAQ training alone was not enough, indicating that resistance and anaerobic training should be combined in school based netball training programs to improve player development.

KEYWORDS: Speed. The five core components of fitness for netball are agility, quickness, anaerobic fitness, aerobic capacity and netball.

INTRODUCTION

Netball is a team game of high intensity which involved the players having to perform repeated sprints, jumps, rapid acceleration, slow down and change of direction movements, quick decision making during a game. Netball requires a different of fitness components consisting speed, agility, quickness (SAQ), aerobic endurance and anaerobic power to be integrated in order to perform successfully. On one end of the scope, aerobic fitness supports players' ability to sustain play and recovery between their repeated, high intensity efforts, while on the other end, anaerobic fitness is what is required for players to execute sprinting, jumping, intercepting and quick changes of direction (Mcnnes, S.E., Carlson, J.S., Jones, C.J., & McKenna, M.J., 1995). In addition, the acquisition of these physical attributes at the adolescent stage is essential to continued athletic development and injury prevention (Faihenbaum, A.D., Kraemer, W.J., Blimkie, C.J.R., Jeffreys, I., Micheli, L. j., Nitka, M., & Rowland, T.W., 2009).

Speed, Agility and Quickness (SAQ) is now a common conditioning approach being adopted in sports to develop athletic performance in various sports (Miller, M.G., Herniman, J.J., Ricard, M.D., Cheatham, C.C., & Michael, T.J., 2006). There has been a lack of studies conducted on the effects of SAQ training in young athletes who participate in sports that involve a high level of running, such as netball. Specifically, there has been limited study on the effects of SAQ training in netball players in the context of school sports in Sri Lanka. The Galahitiyawa central college junior netballers have demonstrated good netball skills but have found some problems with their physical fitness, agility and speed. Physical pressures could adversely impact game performance and therefore injuries are a potential risk. The SAQ training program in netball may be structured to enhance physical performance and promote long-term development for young netball players in school. The study therefore focused to find impact of speed, agility and quickness training for a period of 9 weeks on aerobic and anaerobic fitness of junior netballers of Galahitiyawa central college. The changes in sprint performance were studied with 30-metere sprint test, while the changes in agility were studied using 5/10/5 agility test, changes in aerobic capacity were studied using the Yo-Yo IR1 test, and changes in anaerobic capacity were studied using the Running Based Anaerobic Sprint Test. Based on findings, coaches, physical education teachers and sports practitioners are expected to get evidence based recommendations for implementing SAQ training program for junior netball players in Sri Lanka.

MATERIAL AND METHODS

This study was a one group quasi experimental pre-test post-test design with the aim of observing the effect of a nine-week speed, agility and quickness (SAQ) training program on the aerobic and anaerobic fitness of junior female netball players. A quasi experimental design was chosen due to the inability to randomize the participants given the structure of a school team. Physical performance was observed before and after the intervention to document changes in physical performance as a result of the SAQ training program (Thomas, K., French, D., & Hayes, P., 2017). Potential threats were minimized as a result of standardized testing procedures throughout the study.

The population of the Study comprised 20 female junior netball players (aged 12-15) from Galahitiyawa central college, Sri Lanka. The following requirement criteria were used to identify participants: Currently representing school junior netball team, cleared to participate in physical activities by a medical doctor, regular attendance at training sessions in school. There are no recent injuries affecting performance (past 3 months). All the participants were need to complete the training program and both pre and post intervention assessments.

Training Intervention The training program was delivered the nine-weeks, twice pre weeks, 45-60minutes per sessions, for nine consecutive weeks and was presented in table 1. Warm-up light jogging, mobility activations, dynamic stretches, and main SAQ training session demonstrated improvements in speed, agility, neuromuscular activations, reaction time and movement efficiency in young and adult athletes (Miller, M.G., Herniman, J.J., Ricard, M.D., Cheatham, C.C., & Michael, T.J., 2006). The SAQ exercises for this training session include 2 feet forward hop with 20m sprint, in out in out with 10m sprint, ickey shuffle with 10m sprint and lateral shuffle with diagonal sprint. These drills will be based on Multi-directional movement, Coordination and Quickness. (Fig.1)

The following standardized instruments are chosen based on their validity, reliability, feasibility and sustainability in conducting school based sports testing for this study. Those are; 20-meter sprint using to measure linear speed, 5/10/5 agility (pro agility) test measured to assess change of direction performance, to evaluate aerobic capacity use Yo-Yo Intermittent Recovery Test Level 1 (Yo-Yo IR1), and to assess anaerobic power and fatigue index measured with Running Based Anaerobic Sprint (RAST) presented in Table 2.

Data collection process includes three phases, the pre-test data collection, secondary training attendance and compliance recording, and lastly, post-test data collection procedure. The order of the tests conducted were the 5/10/5 agility test, 30-meter sprint test, the RAST test and the Yo-Yo IR1 test. To reduce fatigue, adequate recover periods were provided between tests. After the nine weeks of intervention, all tests were repeated with the same equipment, under the same environmental conditions and with the same observer that the first tests were performed.

SPSS is the main software using a analyzed the all collected data. The following statistical methods be used; Descriptive statistics, Paired sample t-test for to compare pre and post-test values; 30m, Yo-Yo distance, 5/10/5 agility, RAST; fatigue index and maximum power, and significance level set at $p < 0.05$. To determine relationship between BMI and 30m sprint, 30m sprint and Yo-Yo distance, Yo-Yo distance and maximum power, BMI and Yo-Yo distance, BMI and maximum power, and 30m sprint and maximum power, Pearson's correlations coefficient were used.

The study was consistent with ethical principles for the protection and rights of all involved. All requests for permission made by school authorities and informed consent received from parents/guardians for each athlete. All participants were well informed about the aim of the study, procedure, risk and benefit of the study. Participants fully voluntary, with the they can withdraw at any time without any consequences. All data collected confidential and only use for research purpose. The study will not involve any harmful procedures, any injury preventative measures that are taken, e.g. warm up routines and medical assessment, and the main point of the participant's well-being (WHO, 2011).

Table 1: Structure of the nine week SAQ training intervention

Week	Drill	Reps/ Sets
0	Pre- Test	
1-4	Two feet forward hop + 20m sprint In out in out + 10m sprint Icky shuffle + L sprint (10m) Lateral shuffle + Diagonal sprint	96 (24*4)
5	Two feet forward hop + 20m sprint In out in out + 10m sprint Icky shuffle + L sprint (10m) Lateral shuffle + Diagonal sprint	16 (8*2)

6-8	Two feet forward hop + 20m sprint In out in out + 10m sprint Icky shuffle + L sprint (10m) Lateral shuffle + Diagonal sprint	96 (32*2)
9	Two feet forward hop + 20m sprint In out in out + 10m sprint Icky shuffle + L sprint (10m) Lateral shuffle + Diagonal sprint	16 (8*2)
10	Post- Test	

Table 2: Description of performance test and measurement parameter.

Test	Variable Measured	What it Measures	Equipment Used	Unit of Measurement
30-meter sprint test (Balsalobre-Fernandez, C., Marchante, D., Bazett-Jines, D. M., & Otten, E. , 2014)	Linear speed	Measure maximum running speed over a short distance	Measuring tape and stopwatch	Seconds
5/10/5 agility test (Harman, E., & Garhammer, J. , 2008)	Change of direction	Measures ability to accelerate, decelerate, and change of direction rapidly	Cones, measuring tape, and stopwatch	Seconds
Yo-Yo Intermittent Recovery test level 1(Yo-Yo IR1) (Bangsbo, J., Iaia, F, M., & Krustrup, P. , 2008)	Aerobic capacity	Measures intermittent recovery aerobic endurance and recovery ability	Audio recording, cones and measuring tape	Distance (meter)
Running based anaerobic sprint test (RAST) (Zagatto,A.M.,Beck, W.R., & Gobatto, C, A., 2009)	Anaerobic power and fatigue	Measures anaerobic power output and fatigue during repeated sprints	Measuring tape, cones, stopwatch, and weighing scale	Seconds

Table 3: Descriptive Statistics.

	N	Minimum	Maximum	Mean	Std. Deviation
PRE-AGE	20	12	14	12.40	.598
PRE-WEIGHT kg	20	27.0	72.0	42.265	10.1579
PRE-BMI	20	12.80	30.80	17.64	3.92
POST-WEIGHT kg	20	27.0	72.0	42.265	10.1579
POST-BMI	20	12.80	30.80	17.64	3.92
PRE-H-M	20	1.37	153.00	9.1190	33.86614
PRE-YO-YO DISTANCE M	20	200	640	402.00	132.649
PRE-30M SPRINT Sec	20	6.1	10.2	7.035	1.0373
PRE-5/10/5 AGILITY sec	20	7.2	9.5	8.035	.5994
PRE- MAIMUMPOWER	20	64.13	196.02	127.9645	35.77608
PRE-FATIGUEINDEX	20	.42	2.46	1.3585	.65116
POST- H.M	20	1.37	153.00	9.1190	33.86614
POST-YO-YO DISTANCE M	20	200	640	402.00	132.649
POST-30M SPRINT sec	20	5.20	9.00	6.5875	.74415
POST-5/10/5 AGILITY sec	20	6.56	8.55	7.2595	.49718
POST-MAIMUMPOWER	20	41.30	211.60	106.9315	37.01959
POST-FATIGUEINDEX	20	.16	2.72	.9120	.55034
VALID N (listwise)	20				

Table 4: Paired sample statistics.

		Mean	N	Std. Deviation	Std. Error Mean
PAIR 1	PRE_MAXIMUMPOWER	127.9645	20	35.77608	7.99977
	POST_MAXIMUMPOWER	106.9315	20	37.01959	8.27783
PAIR 2	PRE_FATIGUEINDEX	1.3585	20	.65116	.14560
	POST_FATIGUEINDEX	.9120	20	.55034	.12306
PAIR 3	PRE_30M SPRINT Sec	7.035	20	1.0373	.2320

	POST_30M SPRINT Sec	6.5875	20	.74415	.16640
PAIR 4	PRE_5/10/5 AGILITY Sec	8.035	20	.5994	.1340
	POST_5/10/5 AGILITY Sec	7.2595	20	.49718	.1117
PAIR 5	PRE_YO-YO DISTANCE M	402.00[a]	20	132.649	29.661
	POST_YO-YO DISTANCE M	402.00[a]	20	132.649	29.661

a. The correlation and t cannot be computed because the standard error of the difference is 0.

Table 5: Paired sample correlation.

		N	Correlation	Significance	
				One-sided p	Two-sided p
PAIR 1	PRE_MAXIMUMPOWER & POST_MAXIMUMPOWER	20	.673	<.001	.001
PAIR 2	PRE_FATIGUEINDEX & POST_FATIGUEINDEX	20	.371	.054	.108
PAIR 3	PRE_30M SPRINT Sec & POST_30M SPRINT Sec	20	.791	<.001	<.001
PAIR 4	PRE_5/10/5 AGILITY Sec & POST_5/10/5 AGILITY Sec	20	.714	<.001	<.001

Table 6: Paired samples test.

		Paired Differences			95% confidence interval of the.	
		Mean	Std. Deviation	Std. Error Mean	Lower	
PAIR 1	PRE_MAXIMUMPOWER & POST_MAXIMUMPOWER	21.033	29.453	6.586	7.248	
PAIR 2	PRE_FATIGUEINDEX & POST_FATIGUEINDEX	.446	.679	.151	.128	
PAIR 3	PRE_30M SPRINT Sec & POST_30M SPRINT Sec	.447	.639	.142	.148	
PAIR 4	PRE_5/10/5 AGILITY Sec & POST_5/10/5 AGILITY Sec	.775	.425	.095	.576	
		95% confidence interval of the.	t	df	Significance	
		Upper			One-sided p	Two-sided p
PAIR 1	PRE_MAXIMUMPOWER & POST_MAXIMUMPOWER	34.817	3.194	19	.002	.005
PAIR 2	PRE_FATIGUEINDEX & POST_FATIGUEINDEX	.764	2.940	19	.004	.008
PAIR 3	PRE_30M SPRINT Sec & POST_30M SPRINT Sec	.746	3.130	19	.003	.006
PAIR 4	PRE_5/10/5 AGILITY Sec & POST_5/10/5 AGILITY Sec	.974	8.154	19	<.001	<.001

Table 7: Correlation.

		POST_BMI	POST_30M SPRINT Sec	POST_YO-YO DISTANCE M	POST_MAXIMUM POWER
POST_BMI	Pearson correlation		.511*	-.249	.097
	Sig. (2-tailed)		.021	.290	.683
	N		20	20	20
POST_30M SPRINT Sec	Pearson correlation	.511*		-.555*	-.445*
	Sig. (2-tailed)	.021		.011	.049
	N	20		20	20

POST_YO-YO DISTNACE M	Pearson correlation	-.249	-.555*		.419
	Sig. (2-tailed)	.290	.011		.066
	N	20	20		20
POST_MAXIMUM POWER	Pearson correlation	.097	-.445*	.419	
	Sig. (2-tailed)	.683	.049	.066	
	N	20	20	20	

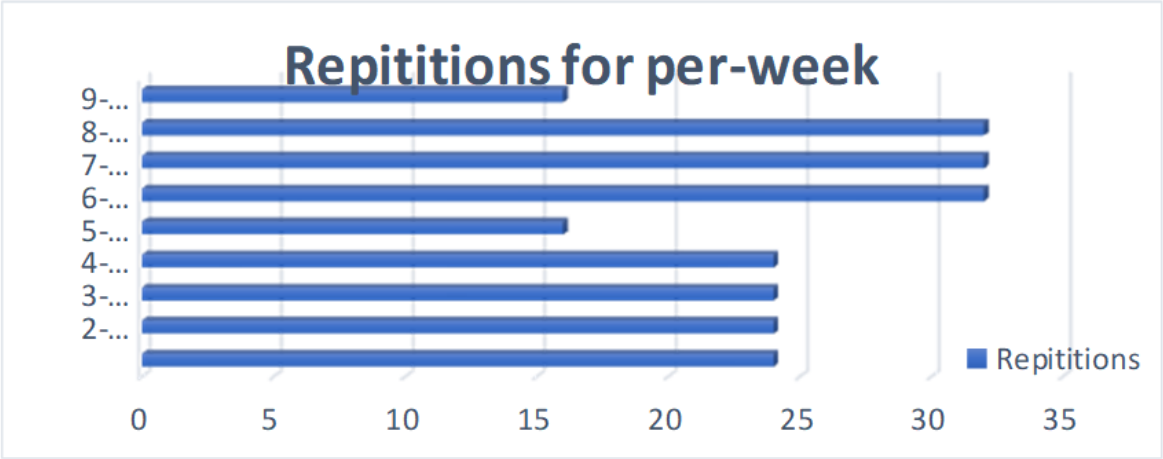

Figure 1: Training load distribution.

RESULTS AND DISCUSSION

This study was conducted a nine-week period and twenty female netball players completed the intervention. The descriptive statistics of the demographic and anthropometric characteristics of the participants taken during the pre-test and the post-test included in Table 3. The average age of the participants was 12.40 ± 0.60 years, with the distribution of the participants slightly skewed to the lower end of the age range, which indicates that the participants were distributed slightly more towards the lower end of the age range. Mean height was 1.55 ± 0.07 meter with the range of heights from 1.32 to 1.64 meter and the skew was negative with higher heights clustered. The average body weight of the participant was 42.27 ± 10.16 kg and it is between the range of 27kg and 72kg with skew value of positive implying that are few heavier participants. The average BMI value was 17.64 ± 3.92kg/m^2, ranging from 12.80 to 30.80kg/m^2, and was positively skewed indicating variability with a few having high BMI.

The descriptive statistics of all participants' pre and post-test performance scores are presented in Table 3, which also includes minimum, maximum, mean and standard deviation values for Yo-Yo distance, 30meter sprint time, agility 5/10/5, maximum power and fatigue index. All the pre and post-test performance and then result was summarized using descriptive statistics including measurement of aerobic endurance, speed, agility and anaerobic power. The average distance of the Yo-Yo test was 402.00 ± 132.65m for pre and post-test, and the distance is in near-normal distribution, with a range of 200m 640m and skewing value is not high (0.182). No significant impact of the SAQ program on aerobic capacity.

The mean change in sprint time for the 30m sprint test was 7.04 ± 1.04s in the pre-test and 6.59 ± 0.74s in the post-test indicating an improvement in sprint performance. Likewise, there was an improvement in agility performance as

observed by the 5-10-5 test whereby the meantime dropped to 7.26 ± 0.50s after the intervention versus 8.04 ± 0.60s when measured before the intervention.

As for anaerobic performance using the aid of RAST, the mean maximum power for pre-test was 127.96 ± 35.78 w while the maximum power for post-test was 106.93 ± 37.02 w, the skewness value indicated the distribution shifted towards positively skewed distribution. The fatigue index as well exhibited a decrease in the mean of fatigue index 1.36 ± 0.65 to 0.91 ± 0.55 indicating resistance to fatigue. Overall, the descriptive results can be used to determine that the performance measures of speed, agility and fatigue have noted changes between pre and post-test.

The paired sample statistics was conducted to the compare mean value of the pre and post-test performance measurements of participants presented in Table 4. The paired sample statistics of the pre-and post-test of the specific variables of 20. The results indicated that the mean of the pre- and post-test is the same for the age, height, weight and BMI, so the correlation coefficient and paired t-test could not be calculated because the standard error of the difference was equal to zero. Performance related variables show measurable differences in the measurement of variables. The 30m sprint also had a reduction with the mean time down to 6.59s from the pre-test of 7.04s while the agility test (5/10/5) had a reduction with the mean time down to 7.26s from the pre-test mean time of 8.04s. On the same note, the RAST peak power dropped to 106.93 against 127.96, and the RAST fatigue index dropped to 0.91 and compared to 1.36 indicating that there were changes in anaerobic output and fatigue levels due to the intervention. Overall, the descriptive statistics indicate that there are improvements in speed, agility, and fatigue related outcomes from pre-test to post-test.

The pre and post-test were compared by using paired sample correlation analysis. The results of this study showed that most of the pre and post-test variables had a positive correlation (Table 5). The many participants who performed well in the pre-test generally repeated to perform well in post-test. This shows improvement of the performance levels after training periods. The results reflect the strong positive correlation between the majority of pre and post-test parameters, between the sprint and agility, between maximum power and both test performance and between fatigue index and both test performance and maximum power. The results of paired sample t-test are shown in table 6.

The study findings were primarily used to focus several important performance changes in the course of the training intervention. Significant improvement in sprint performance, agility and fatigue tolerance, suggesting improved speed and movement efficiency and endurance capacity. Improved power was found in Maximum power, as there was a significant difference between pre and post-test showing a decrease in explosive strength. The Pearson correlation was analysis among the study variables is presented in Table 7. But there was no change in aerobic endurance performance (Yo-Yo distance), suggesting no change in aerobic capacity in the training program. Finally, the findings suggest the intervention program was more effective in improving speed, agility based components, and it did not enhance aerobic endurance and result in decreased power output.

DISCUSSION

The purpose of this study was to observed the impacts of 9 weeks of speed, agility and quickness (SAQ) training on aerobic and anaerobic fitness of a group of junior netball players. Results showed, the intervention had a significant effect on sprint speed, agility and fatigue resistance. Aerobic capacity did not change, however, maximum anaerobic power did significantly decrease.

The improvement in 30m sprint performance indicates that SAQ training positively improved the acceleration and running speed of the netball players in this study who were playing at a junior level. The agility measurers also showed a marked increase with the time taken in the 5/10/5 agility test dropping. These results showed that SAQ training positively impacts changes of direction, reaction time and movement control in netball, key areas that are required for netball performance. The other measures of the fatigue index also improved significantly, such as fatigue resistance and sustaining repeated high-intensity efforts. Maximum anaerobic power, however, did significantly decrease, indicating that SAQ training may not be sufficient to improve explosive power. Most training sessions were conducted on speed, agility and coordination skills rather than strength and plyometric. Thus, no improvements in aerobic capacity measured by the Yo-Yo IR1 test were noted, such as the intensity of the training and duration of the exercise were apparently insufficient to induce cardiovascular adaptations.

Lastly, the results revealed that the SAQ training is a practical and effective way of conditioning junior players in school environment in Sri Lanka without the need for extensive equipment and can be easily implemented. Future training programs should incorporate aerobic conditioning, resistance training, and plyometric to increase aerobic endurance, maximal power output, and promote more well-rounded physical development.

CONCLUSION

The focused of this study was to determine the impact of a nine week structured speed, agility, and quickness (SAQ) training program on aerobic and anaerobic fitness in a group of junior netball players. This finding showed that SAQ training significantly improves sprint speed, agility and fatigue resistance; particularly the ability to perform repeated high intensity efforts, movement efficiency and neuromuscular coordination for acceleration, deceleration and changes of direction are important in netball.

Therefore, the aerobic capacity did not significantly increase and the maximum anaerobic power decreased after the intervention. These observations indicate that using SAQ training as the sole method may be sufficient to improve speed and agility related performance, but not be sufficient to create the appropriate stimulus for improvement in cardiovascular endurance and explosive power. So, future trainings should include aerobic conditioning, resistance training, and plyometric to promote greater balance physical development to the training program.

The study also pointed out that the SAQ training is a practical and effective conditioning method for the junior netball players as it can be performed in Sri Lankan school system and minimal equipment is required for this method.

Coaches and physical education teachers are encouraging to follow structures SAQ training with recommend performance monitoring and related conditioning methods. The overall findings of this study indicate that SAQ training is an effective training procedure to enhance the most important physical performance variables in young netball players and offer practical recommendations to optimize training programs and assist in the long-term development of sports.

REFERENCES

1. Balsalobre-Fernandez, C., Marchante, D., Bazett-Jines, D. M., & Otten, E., Realibility and validity of field-based performance tests in youth athletes; A systematic review. *Journal of strength and conditioning research*, 2014.
2. Bangsbo, J., Iaia, F, M., & Krustrup, P., The Yo-Yo Intermittent recovery test: A useful tool for evaluation of physical perfomance in intermittent sports. . *Journal of strength and conditioning research*, 2008.
3. Faihenbaum, A.D., Kraemer, W.J., Blimkie, C.J.R., Jeffreys, I., Micheli, L. j., Nitka, M., & Rowland, T.W., Youth resistance training: Upadted position statement paper from the national national strength and conditioning association. *Journal of strength and conditioning research*, 2009.
4. Harman, E., & Garhammer, J., *Biomechanical basis of human movement.* . Lippincott Williams & Wilkins, 2008.
5. Mcnnes, S.E., Carlson, J.S., Jones, C.J., & McKenna, M.J., The physiological load imposed on basketball plyers during competition. . *Journal of sports science*, 1995.
6. Miller, M.G., Herniman, J.J., Ricard, M.D., Cheatham, C.C., & Michael, T.J., The effects of a 6 - week plyometric training program on agility. . *Journal of sports science and medicine*, 2006.
7. Thomas, K., French, D., & Hayes, P., The effect of SAQ training on youth team sports players. *Journal of sports science and medicine*, 2017.
8. WHO., Ethical standards and procedures for research involving human participation. *WHO Press*, 2011.
9. Zagatto, A.M., Beck, W.R., & Gobatto, C, A., Validity of the running anaerobic aprint test for assessing anaerobic power and predicting short-distance perfomance. . *Journal of strength and conditioning research*, 2009.