Impact of endurance training on vo$_2$max, sprint ability, and lactate in youth female basketball players

Impacto del entrenamiento de resistencia en VO_2max, sprints y lactato en jugadoras juveniles de baloncesto

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How to cite in APA

Chumvangvapee, P., Taweekarn Vannajak, P., Vannajak, K., Kanpetta, Y., Kokittipong, W., & Luesopha, P. (2025). Impact of endurance training on vo$_2$max, sprint ability, and lactate in youth female basketball players. *Retos*, *68*, 2072–2081. https://doi.org/10.47197/retos.v68.116686

Abstract

Introduction: Basketball is an increasingly popular sport characterized by rapid movements and frequent positional changes. These movements demand high speed and stamina, with players exhibiting exertion levels comparable to short-distance sprinters. To meet the physiological demands of the sport, athletes require enhanced aerobic capacity, sprinting ability, and lactate regulation.
Objective: This study aims to investigate the effects of speed endurance training (SET) on maximum oxygen uptake (VO_2 max), repeated sprint ability, and blood lactate levels in young female basketball athletes from Buriram Province. Additionally, it seeks to compare the pre-and post-training impacts of SET on these physiological parameters.
Methodology: A total of 16 young female basketball athletes were selected through purposive sampling. They were divided into two groups: an experimental group (n=8), which underwent speed endurance training in addition to regular basketball practice, and a control group (n=8), which engaged only in regular practice. The intervention lasted six weeks.
Results: Post-training assessments revealed that the experimental group showed statistically significant improvements ($p < 0.05$) in Yo-Yo Intermittent Recovery Test Level 1 distance, VO_2max, average sprint time, speed, and blood lactate levels (L2) compared to the control group.
Discussion: The results indicate that SET enhances both aerobic and anaerobic performance indicators.
Conclusion: Speed endurance training is effective in improving speed, stamina, and physiological performance among junior female basketball players in Buriram Province.

Keywords

Blood lactate levels; maximal oxygen uptake; repeated sprint ability, speed endurance.

Resumen

Introducción: El baloncesto es un deporte cada vez más popular, caracterizado por movimientos rápidos y cambios de posición frecuentes. Estos movimientos exigen alta velocidad y resistencia, y los jugadores exhiben niveles de esfuerzo comparables a los de los velocistas de corta distancia. Para satisfacer las demandas fisiológicas del deporte, los atletas requieren una mayor capacidad aeróbica, capacidad de sprint y regulación del lactato.
Objetivo: Este estudio tiene como objetivo investigar los efectos del entrenamiento de resistencia a la velocidad (SET) sobre el consumo máximo de oxígeno (VO_2 max), la capacidad de sprint repetido y los niveles de lactato en sangre en jóvenes atletas de baloncesto de la provincia de Buriram. Además, se busca comparar los impactos pre y post-entrenamiento de SET sobre estos parámetros fisiológicos.
Metodología: Se seleccionaron un total de 16 jóvenes atletas de baloncesto femenino a través de un muestreo intencional. Se dividieron en dos grupos: un grupo experimental (n = 8), que se sometió a un entrenamiento de resistencia a la velocidad además de la práctica regular de baloncesto, y un grupo de control (n = 8), que se involucró solo en la práctica regular. La intervención duró seis semanas.
Resultados: Las evaluaciones posteriores al entrenamiento revelaron que el grupo experimental mostró mejoras estadísticamente significativas ($p < 0,05$) en la distancia de la prueba de recuperación intermitente Yo-Yo Nivel 1, VO_2 max, tiempo promedio de sprint, velocidad y niveles de lactato en sangre (L2) en comparación con el grupo control.
Discusión: Los resultados indican que el SET mejora los indicadores de rendimiento aeróbico y anaeróbico.
Conclusión: El entrenamiento de resistencia a la velocidad es eficaz para mejorar la velocidad, la resistencia y el rendimiento fisiológico entre las jugadoras de baloncesto junior en la provincia de Buriram.

Palabras clave

Niveles de lactato en sangre; absorción máxima de oxígeno; Capacidad de sprint repetido, resistencia a la velocidad.

Introduction

Basketball is currently gaining popularity, as evidenced by the numerous national and international competitions held worldwide. Thailand is also giving priority and growing interest in basketball. The sport has been continuously promoted and developed, with basketball competitions being organized at various levels within the country and teams being sent to compete internationally. The game lasts for 40 minutes, separated into 4 quarters with each being 10 minutes long. When it comes to the break, there are 2-minute interruptions among the 1st and 2nd quarters (first half) & between the third and fourth quarters (second half). Additionally, there is a 15-minute halftime break between the second and third periods. Before each overtime period, there is also a break. During the competition, players constantly move and change positions, at a fast pace whether it be the offense or the defence. The velocity of movement is comparable to short-distance sprinters, and passes can reach speeds of up to 66 kilometres per hour. The game demands strong physical stamina. In such an intense and fast-paced game, players often run at high speeds repeatedly throughout the game, covering distances of 6.4 to 8 kilometres (Kavaliauskas, 2022). They are also required to be able to shoot accurately. Basketball is a fastest and most chaotic team sports, requiring excellent team coordination and well-rounded individual skills. These skills include ball possession, passing, shooting, dribbling, defence, and continuous movement (Gottlieb et al., 2021). Therefore, when an athlete has a high greatest oxygen acceptance (VO2 max) and excellent repeated sprint aptitude, their playing skills will be significantly more effective, leading to a clear impact on the game. Other than having excellent basketball skills, players must also possess good physical fitness since the game requires a variety of movements, such as running sprints short, high-speed runs, jogs, jumps, and continuous directional changes during the game. Moreover, physical contact is frequent throughout the four quarters of the match. Every type of physical fitness training is vital to basketball players so that they can improve their physical performance that plays a key role in executing skills. This can be attested with Rampinini et al. (2022) who tested the impacts of strength training and high-intensity interval training. As a result, Yo-YoIR1 increases running distance, aerobic capacity maximal aerobic capacity and enhanced muscle strength. It also aligns with Wong et al. (2024) who studied High-intensity Interval training (HIIT). It found that it develops muscle to burn fat for energy better, and results in the ability to use maximum oxygen (VO2 max) as well as the aerobic performance (Aerobic performance) and anaerobic performance (Anaerobic performance) of athletes' improvement. Moreover, there is also another form of training called Speed Endurance Training (SET), which enhances muscle resilience to lactic acid accumulation, a major cause of muscle fatigue (Reuter et al., 2023). SET accelerates lactic acid removal and inhibits its formation. Moreover, it helps athletes maintain higher-intensity workloads for longer periods, thereby improving sports performance, especially in team sports like basketball, soccer, hockey, and rugby. These athletes gain benefits from repeated sprints and high-intensity, rapid movements (Maciel et al., 2024). Additionally, SET training can also help increase the activation of enzymes in the glycolysis process, anaerobic glycolysis, and the rate of lactate elimination (Lactate clearance) causing the reduction of the accumulation of lactate, which is an important cause of fatigue in the muscles, making athletes have better fatigue resistance (Yang et al., 2025). This results in an enhanced capacity to run at high speeds frequently (Repeated sprint performance) (Hostrup & Bangsbo, 2023).

Based on the study of Speed Endurance Training (SET) in junior female basketball athletes, there has been no research on this training method either domestically or internationally. Furthermore, in Thailand, research on the greatest oxygen uptake, repeated sprint ability, and blood lactate levels in basketball athletes, is also lacking, with very few studies conducted internationally (Di Domenico & Raiola, 2021). Therefore, the researchers are interested in studying the effects of SET on maximal oxygen uptake & recurrent dash aptitude in junior woman basketball sportspersons. The research objectives are to inspect the effects of speed stamina training on greatest oxygen uptake, repeated sprint ability, and blood lactate levels, and to compare the pre-and post-training effects of speed stamina training on these limits in junior female basketball athletes in Buriram Province. Research hypothesis

The hypothesis of the study is that speed stamina training enhances maximal oxygen uptake & recurrent dash ability in junior female basketball players.

Method

Population and sample

The population for this research consisted of female youth basketball players enrolled at Tessaban 1 'Burirat Darunwittaya' School who were actively participating in regional-level competitions and training programs in Buriram Province during the 2021 academic year. Eligible participants were aged between 13 and 18 years and were actively involved in structured basketball training programs at the school. A total of 16 athletes were selected through purposive sampling, a non-probability method chosen to ensure the inclusion of participants who met the specific physiological and training-related criteria relevant to the study's objectives. While this approach enabled targeted participant selection, it may limit the generalizability of the findings to broader athletic populations. The selection process involved measuring maximal oxygen uptake (VO_2 max) using the Yo-Yo Intermittent Recovery Level 1 test, with values calculated according to the following validated formula:

$$\mathbf{VO_2}\ \boldsymbol{max}\ =\ \text{distance (m)} \times 0.0084 + 36.$$

Based on these VO_2 max values, participants were stratified into two groups of equal size.

Experimental Design

Experimental Group

The experimental group consisted of participants who received Speed Endurance Training (SET) in addition to their routine basketball practice. The SET protocol was specifically designed to enhance both aerobic and anaerobic conditioning, drawing on established principles from high-intensity interval training literature, such as those outlined by Maciel et al. (2024) and Idrus and Ockta (2024), which have demonstrated significant improvements in lactic acid clearance and sprint performance through structured high-intensity intervals.

Control Group

The control group followed a standard basketball training regimen without any additional endurance-specific intervention. This group served as a baseline for comparison to evaluate the effectiveness of the SET protocol.

Independent Variables

Speed Endurance Training Program

This intervention involved a structured regimen designed to enhance the participants' anaerobic and aerobic performance. It included high-intensity interval runs over a 20-meter distance, executed in six 30-second bouts with three-minute rest intervals, performed twice per week for six weeks. The protocol aimed to stimulate physiological adaptations related to fatigue resistance and lactic acid clearance.

Regular Basketball Training Program

All participants, including those in the control group, followed a conventional basketball training routine consistent with established standards for youth athletic development. This included structured sessions aimed at enhancing physical conditioning, skill acquisition, tactical understanding, and gameplay readiness—reflecting practices commonly implemented in school-level and regional competitive basketball programs. The regimen consisted of warm-ups, physical conditioning, skill drills (passing, shooting, dribbling), simulated game play, and cool-down sessions. This training was conducted six days per week and served as the baseline training load for comparison.

Dependent Variables

Maximum Oxygen Consumption Rate (VO_2 max)

This variable reflects the aerobic capacity of the athlete and was measured using the Yo-Yo Intermittent Recovery Test Level 1. VO_2 max was calculated using the standardized formula:

$$\text{VO}_2\ max\ =\ \text{distance (m)} \times 0.0084 + 36.4$$

providing an estimate of the subject's maximal oxygen uptake in mL/kg/min.

Repeated Shuttle Sprint Ability (RSSA)

RSSA evaluates the athlete's ability to perform repeated bouts of high-intensity sprinting with short recovery. It was assessed using a series of six 20-meter sprints with 20-second rest intervals. This test simulates the intermittent sprinting demands of basketball gameplay.

40-Meter Sprint Test

This test was employed to assess linear sprinting speed over a standardized distance, commonly used to evaluate explosive acceleration and short-distance speed among athletes.

Maximum Heart Rate (HRmax)

Monitored via the Polar H10 wireless heart rate sensor, HRmax was recorded during maximal exertion tests to quantify cardiovascular stress and recovery efficiency during high-intensity performance.

Fatigue Index

Derived from time differentials in the repeated sprint test, the fatigue index quantifies the decline in performance across successive sprint efforts. A lower fatigue index indicates better endurance and recovery capability.

Agility

Agility was assessed using the standard T-test, which measures the ability to accelerate, decelerate, and change direction rapidly—skills critical to basketball performance.

Blood Lactate Level

Lactate concentrations were measured at two intervals: immediately after the Yo-Yo IR1 test (L1) and ten minutes post-exercise (L2). Measurements were performed using a portable handheld lactate analyzer (e.g., Lactate Pro 2), allowing for accurate field-based assessment of blood lactate levels. These measurements provide insights into anaerobic metabolism and the efficiency of lactic acid clearance.

Inclusion Criteria

Youth female basketball players representing Buriram Province who entered the competition in the National Youth Program under 17 years old, lower northeastern region level Academic year 2023, have at least one year of experience playing basketball; no history of receiving treatment for injuries of muscles, ligaments and joints or any injuries that hinder the training; Additionally, they were willing to participate in the research and provided consent to participate in the research; had a mild menstrual cycle; and were not in the risk group of COVID-19 .

Exclusion Criteria

During sample selection, there are exclusion criteria as follows: involved in a force majeure event that prevents participation in the research whether it be illness, accident, infection with COVID-19, participation in the training program less than 90 per cent, and not voluntarily participating in further research.

Data Collection Procedure

The data collection procedure was as follows: 1) Preparing the places, equipment, and practice schedules for data collection, 2) explaining the particulars of the testing procedures, & 3) demonstrating the training to the research participants until they understood. The research contestants gave their agreement to contribute to the research including general data measurements such as weight, height, and maximum heart rate. A sprint test was performed at distances of 10, 20, 30 and 40 m., execution of the agility t-test, execute the RAST test program (Running at maximum speed for a distance of 20 m, then resting for 20 seconds, which was counted as one trip, running for a total of 6 trips, and recording the time of each trip), perform a test with the Yo-YoIR1 test program (running a distance of 20 m round trip according to the rhythm of the sound signal by running as distant as possible) (Dobbin et al., 2021). After six weeks of training, the same test was performed as previously described; then, information obtained before and after six weeks of training to statistically analysed to draw conclusions

Research Instruments

The equipment was as follows: stopwatch, computer to record data, weighing scales and measure height, wireless Heart Rate Monitor (Polar H10), RAST TEST program and YO-YOIR1 TEST program.

Training program

1. The details of the speed endurance training program were as follows: warm up for 10 min, then practice a speed endurance training program consisting of running at maximum speed back and forth with a distance of 20 m in a straight line for 30 s, counted as one round, in a total of six rounds, a three-minute break between the rounds, training two days a week on Mondays and Thursdays for six weeks (Idrus and Ockta, 2024).
2. The details of the regular basketball training program were as follows: warm-up 15 minutes, physical fitness training 30 minutes, skills training 30 minutes, competition style practice 30 minutes, light exercise (Warm Down) 15 minutes, regular basketball training program 6 days a week, Monday-Saturday, closed on Sunday. As of 5:00 p.m. to 7:00 p.m.

Data Analysis

The collected data were statistically analysed as follows:

1. Mean and SD of the dependent variables, namely age, weight, and $VO_{2\ max}$, in the experimental & control groups.

2. Statistical differences in the mean and SD of the dependent variables within the group before and after six weeks of training were determined using the paired sample t-test.

3. Statistical differences in the mean and SD of the dependent variables after six weeks of training among the experimental & control groups were resolute using an independent sample t-test.

Ethical Considerations

This research was conducted under the ethical principles outlined in the Declaration of Helsinki. Approval for the study was granted by the Human Research Ethics Committee of Buriram Rajabhat University. All participants and their guardians were informed about the study's objectives, methods, and procedures. Written informed consent was obtained from all participants and their legal guardians before enrolment.

Results

Symbols used in the data analysis:

N represents the number of samples

$\bar{x}$ represents mean

S.D represents the standard deviation

NS represents no difference

S represents difference

In this research, the researchers gathered data and showed data about the influence of speed stamina training on aerobic & anaerobic acts of adolescent woman basketball players in Buriram Province, both before & after training of the experimental & control groups in tables and words as follows:

Table 1. Mean and standard deviation of the pre-training basic data of the experimental and control groups

Parameter	Experimental Group ($\bar{x}$ ± SD)	Control Group ($\bar{x}$ ± SD)	p-value	Sig.
Age (Years)	15.75 ± 1.48	15.75 ± 1.39	0.778	NS
Weight (Kg)	57.29 ± 12.03	57.81 ± 11.05	0.924	NS
VO_2 max (mL/kg/min)	41.96 ± 2.33	42.07 ± 1.87	0.917	NS

P ‹ .05, statistically significant difference * $VO_{2\ max}$ = distance (m) × 0.0084 + 36.4.

From Table 1, it was found that there was no difference in mean and standard deviation before training amongst the experimental & control groups in terms of age, weight, and VO2 max at a statistical significance level of .05

Table 2. Mean and standard deviation of Distance, $VO_{2\ max}$, L1 and L2 Test of the experimental group before and after six weeks of training

Variable	Before Training ($\bar{x}$ ± SD)	After Training ($\bar{x}$ ± SD)	p-value	Significance
Distance (m)	663 ± 277.75	1065 ± 443.48	0.003	S
VO_2 max (mL/kg/min)	41.97 ± 2.33	45.56 ± 3.56	0.003	S
Lactate L1 (mmol/L)	12.80 ± 2.01	10.96 ± 1.23	0.020	S
Lactate L2 (mmol/L)	11.36 ± 5.46	9.38 ± 1.44	0.378	NS

P ‹ .05, statistically significant difference Distance = distance from the yo-yo test, $VO_{2\ max}$ = maximum oxygen consumption rate, L1=Blood lactate concentration level immediately after Yo-YoIR1 running, L2=Blood lactate concentration level after 10 minutes of Yo-YoIR1 running.

From Table 2, it was found that the mean and SD of distance, VO_2 max and L1 before and after training were significantly different at the .05 level. However, the mean and SD of L*2* we're not significantly different (level < .05.).

Table 3. Mean and standard deviation of distance, $VO_{2\ max}$, L**1** and L**2** Test of the control group before & after six weeks of training

Parameter	Before Training ($\bar{x}$ ± SD)	After Training ($\bar{x}$ ± SD)	p-value	Sig.
Distance (m)	675 ± 222.20	787 ± 257.09	0.028	S
VO_2 max (ml/kg/min)	42.07 ± 1.87	43.17 ± 2.21	0.016	S
L1 (mmol/l)	12.29 ± 2.14	13.25 ± 1.93	0.277	NS
L2 (mmol/l)	9.85 ± 3.30	8.08 ± 1.96	0.192	NS

P ‹ .05, statistically significant difference Distance = distance from the yo-yo test, $VO_{2\ max}$ = maximum oxygen consumption rate, L1=Blood lactate concentration level immediately after Yo-YoIR1 running, L2=Blood lactate concentration level after 10 minutes of Yo-YoIR1 running.

From Table 3, it was found that the mean and SD of distance and VO2 max before and after training were significantly different at the .05 level. However, the mean and SD of L1 and L*2* we're not significantly different (level < .05.)

Table 4. Mean and standard deviation of Distance, VO**2** max, L**1** and L**2** Test of the experimental and control groups before six weeks of training

Parameter	Experimental Group ($\bar{x}$ ± SD)	Control Group ($\bar{x}$ ± SD)	p-value	Sig.
Distance Yo-YoIR1 (m)	663 ± 277.75	675 ± 222.20	0.917	NS
VO_2 max (mL/kg/min)	41.97 ± 2.33	42.07 ± 1.87	0.917	NS
L1 (mmol/L)	12.80 ± 2.01	12.29 ± 2.14	0.609	NS
L2 (mmol/L)	11.36 ± 5.46	9.85 ± 3.30	0.487	NS

P ‹ .05, statistically significant difference Distance = distance from the yo-yo test, $VO_{2\ max}$ = maximum oxygen consumption rate, L1=Blood lactate concentration level immediately after Yo-YoIR1 running, L2=Blood lactate concentration level after 10 minutes of Yo-YoIR1 running.

From Table *4*, it was found that before the training the mean and SD of distance, $VO_{2\ max}$, L*1* and L*2* of the experimental group and the control group were not different at statistically significant level of .05.

Table 5. Mean and standard deviation of Distance, VO**2** max, L**1** and L**2** of the experimental and control groups after six weeks of training

Parameter	Experimental Group ($\bar{x}$ ± SD)	Control Group ($\bar{x}$ ± SD)	p-value	Sig.
Distance Yo-YoIR1 (m)	1065 ± 443.48	787 ± 257.09	0.124	NS
VO_2 max (mL/kg/min)	45.56 ± 3.56	43.17 ± 2.21	0.124	NS
L1 (mmol/L)	10.96 ± 1.23	13.25 ± 1.93	0.010	S
L2 (mmol/L)	9.38 ± 1.44	8.08 ± 1.96	0.129	NS

P ‹ .05, statistically significant difference Distance = distance from the yo-yo test, $VO_{2\ max}$ = maximum oxygen consumption rate, L1=Blood lactate concentration level immediately after Yo-YoIR1 running, L2=Blood lactate concentration level after 10 minutes of Yo-YoIR1 running.

From Table 5, it was found that the mean and SD of L*1* after training were significantly different at the .05 level. However, the mean and SD of distance, $VO_{2\ max}$ & L*2* we're not significantly different (level < .05.).

Table 6. Mean and standard deviation of TER, F, S1 และ S**2** Test of the experimental group before and after six weeks of training

Parameter	Before Training (x̄ ± SD)	After Training (x̄ ± SD)	p-value	Sig.
TER (s)	3.68 ± 0.25	3.66 ± 0.25	0.000	S
F (Watt)	3.42 ± 3.26	1.73 ± 5.58	0.355	NS
S1 (s)	6.86 ± 1.59	6.41 ± 1.56	0.002	S
S2 (s)	11.24 ± 0.69	10.88 ± 0.69	0.044	S

P ‹ .05, statistically significant difference TER= average time of running **6** trips, F= Fatigue Index, S1= Sprint 40 m, S2= Shuttle run

From Table 6, it was found that the mean and SD of TER, S1 and S*2* before and after training were significantly different at the .05 level. However, the mean and SD of F were not significantly different (level < .05.).

Table 7. Mean and standard deviation of TER, F, S1 และ S**2** Test of the control group before and after six weeks of training

Parameter	Before Training (x̄ ± SD)	After Training (x̄ ± SD)	*p*-value	Sig.
TER (s)	3.71 ± 0.28	3.74 ± 0.33	0.001	S
F (Watt)	4.27 ± 5.28	3.95 ± 6.02	0.389	NS
S1 (s)	7.27 ± 0.65	7.19 ± 0.62	0.268	NS
S2 (s)	11.39 ± 0.78	11.32 ± 0.85	0.480	NS

P ‹ .05, statistically significant difference TER= Average time of running **6** trips, F= Fatigue Index, S1= Sprint 40 m, S2= Shuttle run

From Table 7, it was found that the mean and SD of TER before and after training were significantly different at the .05 level. However, the mean and SD of F, S1 and S**2** we're not significantly different (level < .05.).

Table 8. Mean and standard deviation of TER, F, S**1** and S**2** from testing RSSA of the experimental and control groups before six weeks of training

Parameter	Experimental Group (x̄ ± SD)	Control Group (x̄ ± SD)	p-value	Sig.
TER (s)	3.66 ± 0.25	3.74 ± 0.33	0.892	NS
F (Watt)	1.73 ± 5.58	3.95 ± 6.02	0.195	NS
S1 (s)	6.41 ± 1.56	7.19 ± 0.62	0.010	S
S2 (s)	10.88 ± 0.69	11.32 ± 0.85	0.245	NS

P ‹ .05, statistically significant difference TER= Average time of running **6** trips, F= Fatigue Index, S1= Sprint 40 m, S2= Shuttle run

From Table *8*, it was found that before the training the mean and SD of TER, F, S*1* and S*2* of the experimental group and the control group were not different at a statistically significant level of .05.

Table **9**. Mean and SD of TER, F, S**1** และ S**2** from testing RSSA of the experimental and control groups after six weeks of training

Parameter	Experimental Group (x̄ ± SD)	Control Group (x̄ ± SD)	p-value	Sig.
TER (s)	3.66 ± 0.25	3.74 ± 0.33	0.892	NS
F (Watt)	1.73 ± 5.58	3.95 ± 6.02	0.195	NS
S1 (s)	6.41 ± 1.56	7.19 ± 0.62	0.010	S
S2 (s)	10.88 ± 0.69	11.32 ± 0.85	0.245	NS

P ‹ .05, statistically significant difference TER= Average time of running **6** trips, F= Fatigue Index, S1= Sprint 40 m, S2= Shuttle run

From Table 9, it was found that the mean and standard deviation of S1, the experimental group and the control group after training were significantly different at the .05 level. However, the mean and standard deviation of TER, F and S*2*was not significantly different (level < .05.).

Discussion

In this research, the researcher used the Yo-YoIR1 test to evaluate the aerobic capacity of young female basketball players in Buriram Province due to the testing format being like basketball. Previous studies also found that the running distance obtained from the Yo-YoIR1 test (Distance Yo-YoIR1) was strongly related to the maximum oxygen use capacity (VO2 max) and blood lactate level (L2). It serves as an indicator that can indicate the endurance of the circulatory system while exercising (Dobbin et al., 2021). The research found that after 6 weeks of training, the control group had Distance Yo-YoIR1 and

VO_2 *max* significantly different from before training. Statistically, significant at the .05 level, this may be because the regular training program includes passing ball training and offensive and defensive movement training that are continuous for a long time, resulting in Distance Yo-YoIR1 and VO_2 *max* improved. In addition, after 6 weeks of training, it was found that the experimental group had Distance Yo-YoIR1 values, VO_2 *max* values, and blood lactate (L2) values different from before training. Statistically, significance at the .05 level and blood lactate (L2) values differ from the control group at the .05 level, indicating that training with SET helps improve aerobic capacity and blood lactate levels. This is consistent with the hypothesis that endurance speed training can help improve the aerobic and anaerobic capacity of woman youth soccer players (Gottlieb et al., 2022). This research result is consistent with Iaia and Bangsbo (2010) who found that SET training stimulates the muscles' ability to use oxygen more efficiently. In addition, it also found that Two types of anaerobic endurance speed training in soccer athletes make the ability to accumulate running (YoYoIR2) more efficient.

The researcher used the RSSA test to evaluate the repeated sprinting ability of female youth basketball players in Buriram Province. The testing format is like basketball. In previous studies, it has also been found that the average running distance obtained from the RSSA test has a good relationship with the ability to repeat sprints. This is because it is an indicator that could tell the endurance speed of the muscles while exercising (Dobbin et al., 2021). The research found that after six weeks of training, the control group had. The average duration of the six rounds of running was different from before training. The research found that after 6 weeks of training, the control group showed a statistically significant difference at the .05 level in the average duration of the six rounds of running compared to their pre-training values (Li et al., 2023). Plyometric training has been shown to enhance explosive strength in young female athletes, suggesting its potential applicability in basketball conditioning (Sylvester et al., 2024). This improvement may be attributed to the regular training program, which includes quick counter training and small-size game training, both of which involve fast movements, resulting in improved average running duration over the six rounds. In addition, after six weeks of training, it was found that the experimental group had an average time of running six rounds different from before training. It was statistically significant at the .05 level and had better changes than the control group. It shows that training with SET helps improve sprint repeat performance. This is consistent with the hypothesis that endurance speed training can help improve the sprint repetition ability of young female basketball players in Buriram Province. This research result aligns with Gupta et al. (2025) who also found that SET training can develop a maximum speed of 20 meters Repeated–shuttle-sprint–ability (RSSA) and maximal ability to use oxygen clearly improved in professional footballers and (Rieker et al., 2022) also found that anaerobic endurance speed training two types in football athletes. Recent research highlights the benefits of self-directed training programs on performance metrics in youth basketball players (Grenha et al., 2022). They have improved repeat sprint ability, speed and agility ability. In this research, the researchers used the 40-meter run and shuttle run tests to evaluate the speed and agility of the participants, young female basketball players in Buriram Province since the testing format moves like basketball and is well related to the athletes' ability to speed and agility in playing. Psychological factors, including stress control and concentration, play a significant role in athletic performance and should be considered alongside physical training. The research found that after six weeks of training, the control group and the experimental group were significantly different from before training. It shows statistically significant at the .05 level, this may be because the regular training program and the SET training program move with speed both offensively and defensively during the training period, thus resulting in agility. In addition, after six weeks of training, it was found that the experimental group had a speed value different from before training and the control group It is statistically significant at the .05 level and shows that training with SET can help develop the speed of female youth basketball athletes at the youth level in Buriram Province (Türkarslan & Deliceoglu, 2024).

Conclusions

The present study confirmed that implementing a structured speed endurance training (SET) program over six weeks contributed to significant improvements in the aerobic capacity, repeated sprint ability, and certain blood lactate responses of young female basketball players. The experimental group demonstrated statistically greater enhancements in VO_2 *max*, sprint times, and lactic acid regulation compared

to the control group, indicating that SET effectively develops both aerobic and anaerobic systems relevant to basketball performance. From a practical standpoint, these findings suggest that SET can be a beneficial addition to regular basketball training for adolescent athletes. Coaches and conditioning professionals may consider incorporating such protocols to improve players' endurance, speed, and recovery capacity during high-intensity activities that are typical in competitive games. Although the results are promising, certain limitations must be acknowledged. The small sample size and short training duration reduce the ability to generalize the findings widely or assess long-term impacts. Moreover, the study was geographically restricted to one province and did not include psychological or skill-based performance metrics, which are also important in athletic development. Future investigations should examine broader populations, extend the training period, and integrate multidimensional assessments—physical, technical, and psychological—to better understand the comprehensive impact of SET on young athletes in team sports contexts.

Acknowledgements

The research team would like to thank the Department of Sports Science, Buriram Rajabhat University, for providing sustenance for research grants and kindness in courting tools used in research projects. The investigators would like to thank Tessaban 1 "Buriratdarunwittaya" School, Buriram Province for providing a place to collect the data and to thank all young female basketball players of the Tessaban 1 "Burirat darunwittaya" School team for their cooperation.

Human Research Ethics Code: BRU-rid……..

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