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The effect of High Intensity Interval Training (HIIT) tuja shuttle run model on agility and speed of female volleyball school athletes bank Jatim Surabaya

Dwi Subekti Wicaksono, Irmantara Subagia, Moh Amrullah Albaitomi, Adi Pranoto and Andri Suyoko *

Department of Sports Coaching Education, Faculty of Sport and Health Science, Universitas Negeri Surabaya, Surabaya, East Java 60213, Indonesia.

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Abstract

This study aims to evaluate the effectiveness of high-intensity interval training (HIIT) using the Tuja Shuttle Run model in enhancing agility and speed among volleyball athletes. The research employs a quasi-experimental non-equivalent control group design, involving 24 female volleyball athletes from Bank Jatim Surabaya, consisting of 12 athletes in the treatment group and 12 in the control group. Data were collected through pre-test and post-test assessments to measure changes in agility and speed variables. Data analysis was conducted using paired sample t-test and independent sample t-test. The results indicate that the treatment group experienced an average increase in agility of 3.31% and speed of 5.76% following the HIIT Tuja Shuttle Run intervention, while the control group showed no significant changes. These findings conclude that the HIIT Tuja Shuttle Run model is effective in improving agility and speed among athletes (particularly in speed), thereby supporting the application of this method within training programmed to optimize volleyball athlete performance.

Keywords: HIIT; Speed; Agility; Volleyball; Tuja Shuttle Run

1. Introduction

Sports are currently very popular in society, including volleyball. Volleyball is a team sport that involves six people in a group and is limited by a rope or net (Saputra & Aziz, 2020). Initially, volleyball was played as a pastime for leisure and as a way to feel satisfied after a hectic day. In addition, the sport is also in high demand to improve fitness and health (Puspodari et al., 2022). Over time, the purpose of playing volleyball evolved into an effort to achieve.

To achieve good performance, volleyball athletes need to master physical abilities and basic techniques. Both are essential for success in this sport. However, this mastery requires time and intensive training. Therefore, sports coaching is the key to accelerating mastery of this branch. The role of the coach is very important in guiding and developing the potential of athletes to achieve peak performance. The coaching process must be carried out continuously and systematically to produce skilled athletes (Putera et al., 2023).

The achievements obtained from the sport of volleyball are not easy to achieve, it requires a process of effort and hard training to achieve it. Therefore, in forming an athlete to be able to achieve good achievements must start early. Scouting an athlete's talent from an early age can bring up potentials that will function optimally. With the guidance of competent trainers and the right training methods, it is expected to give birth to outstanding athletes. Volleyball sport is currently growing rapidly, with many teams appearing in various regions every year. This increases competition among athletes to try harder to achieve achievements. Efforts to improve athlete achievement need to be carried out continuously. With good coaching from the coach, athletes have the potential to achieve higher achievements.

* Corresponding author: Andri Suyoko

In volleyball, which is a team sport, good cooperation is needed to produce a strong team. Efforts to form an outstanding team cannot be separated from the role of a coach who must be able to prepare a special training program for his athletes. The coach must develop individual abilities and teamwork to create a successful team. One important factor in improving the ability to play volleyball is physical condition. Improving physical condition is very important, in addition to the preparation of techniques, tactics, and mental aspects in various sports disciplines (Bafirman & Sujana, 2018). Physical condition is one of the main factors that influence and improve an athlete's performance. Given the dynamics of the current volleyball game which emphasizes speed and accuracy, athletes must be able to perform movements optimally. The purpose of physical condition training is to maintain or improve the level of physical fitness, to achieve optimal physical work capacity (Yudiana et al., 2019).

In its development, the sport of volleyball is currently very modern, seeing from the game which is very fast and precise. Therefore, a coach must be able to keep up with the development of the current volleyball game to make athletes excel. A coach must develop training models in planning training, so that the team's volleyball game can compete following the current modern volleyball game. Not only the pattern of play in the team, the physical abilities of athletes must also be developed. As for some components of physical conditions that play an important role in the sport of volleyball, namely including strength, endurance, speed, slipperiness, agility and explosive power. Agility in a deep sense, refers to a high ability to maintain or regulate the stability of body position when changing direction with extreme speed and accuracy during a series of movements (Susila, 2021).

The current volleyball game is also carried out with fast movements due to developments in modern volleyball games. Therefore, volleyball athletes are required to train their ability to increase speed, starting from the movement when defending when the ball moves in a certain direction an athlete must be able to reach the ball so that it can be received perfectly, and then when attacking, an athlete is required to make a very fast movement when smashing in order to get ahead of his opponent so that the opponent cannot reach the athlete's movement. In every sporting discipline, this capacity plays a crucial role in determining the outcome of the competition, whether it is a competition or a match. Thus, the speed of movement is transformed into a fundamental element in determining the achievement of the expected achievement (Bafirman & Sujana, 2018). Thus, every athlete or sports player, especially the coach, is expected and must really understand the ability of speed in volleyball because it is very important to increase attack and defense when in the game, especially in a competition so that it can support the athlete's achievements.

Physical ability is very important as a support for the ability of psychomotor activities. So in planning a training program a coach must be able to plan the program well. Training with high intensity can spur the athlete's heart harder than usual, so that oxygen consumption in the body will also increase, HIIT training provides an athlete's body with simple movements but the movements are getting more and more and the reactions received in the body are getting better. High Intensity Interval Training (HIIT) is a form of physical regimen characterized by extreme intensity, exceeding conventional training speeds and accompanied by a relatively short recovery period. This method is gaining popularity among athletes thanks to its significant efficacy potential. With consistent and proper execution, HIIT is believed to be able to produce a stunning impact on the progress of muscle development as well as overall body health (Susila, 2021). With the training method and its development, athletes are expected to understand the basics of training so that training can be easier to do. Thus, if an athlete master's the correct training method, the athlete will gain proficiency in carrying out movements with perfection. The athlete will be able to perform movement skills with high speed and with stunning and precision techniques.

From the description described above, the researcher deigns to uphold the problem to become a research entitled "The Effect of High Intensity Interval Training (HIIT) Model Tuja Shuttle Run on Agility and Endurance of Women's Volleyball School Athletes Bank Jatim Surabaya".

2. Material and methods

This study aims to reveal the impact of certain treatments on other variables under strictly maintained conditions (Sugiyono, 2013). In an effort to examine the nature of the cause-and-effect relationship, an experimental setting is set up that examines the interconnectedness by placing one or more experimental groups in various treatment conditions. The results are then compared with the control group that did not experience the treatment, in order to gain a deeper understanding of the impact of the treatment given (Suryabrata, 2013). This investigation uses a quantitative approach through a quasi-experimental design, known as a *non-equivalent control group* design. Quasi-experimental design approaches the essence of real experimental research. The following is a schematic of the *non-equivalent control group design* in a more detailed form:(Sugiyono, 2016)

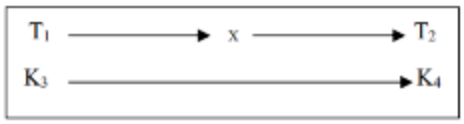

Figure 1 Research Design Non-Equivalent Control Group Design

2.1. Descriptive value test

In examining the numbers collected, descriptive statistics were used to describe the observed data. Through these numbers, a more in-depth picture is obtained in the form of the mean value, the lowest number, the highest number, and the standard deviation, which reveals the degree of deviation from the average value.

2.2. Normality test

Normality test serves as a means to examine and assess the extent to which the variables under study are aligned with the desired normal distribution pattern, whether the data collected follows this pattern or vice versa. SPSS software is assisted by applying the Shapiro-Wilk normality test as a measuring tool. To assess the normality of data with Shapiro-Wilk, especially in small samples (<50 data), the decision is formulated based on: if the significance value is > 0.05, the data is considered normal; if the value is < 0.05, the data is not normal (Sugiyono, 2016).

2.3. Hypothesis test

In the realm of mean comparison analysis, the tool chosen was the independent sample t-test run through SPSS software. To test the difference between two means of non-independent samples, hypothesis testing in this study was. carried out under the condition that the alternative hypothesis (Ha) is considered accepted if the calculated t value exceeds the t table at the 0.05 significance level, with N-1 degrees of freedom. If the significance value of t is less than 0.05, it can be concluded that the independent variable partially shows a significant effect. If the results of normality testing show that the data does not comply with the normal distribution pattern, then to test the hypothesis, a non-parametric statistical method, namely the Mann-Whitney U test, will be applied as a reliable alternative (Kusmiati & Sumarno, 2018).

3. Results

The results of the speed and agility assessment before and after for each group are presented in Figure 2 and Table 1.

Table 1 Assessment of speed (s) and agility (s) pre and post between group

Variable	Treatment; n=12	Control; n=12	p-value
Pre-speed (s)	1.43±0.23	1.49±0.18	0.413
Post-speed (s)	1.35±0.25*	1.71±0.26	0.002
Delta-speed (s)	-0.08±0.13*	0.21±0.32	0.009
Pre-agility (s)	13.55±0.85	14.19±1.06	0.118
Post-agility (s)	13.09±0.89*	14.52±0.93	0.001
Delta-agility (s)	-0.45±0.44*	0.33±0.89	0.012

*significant at control p < 0.05. Data are presented as mean ± SD. Assessment of p-value using independent sample t test.

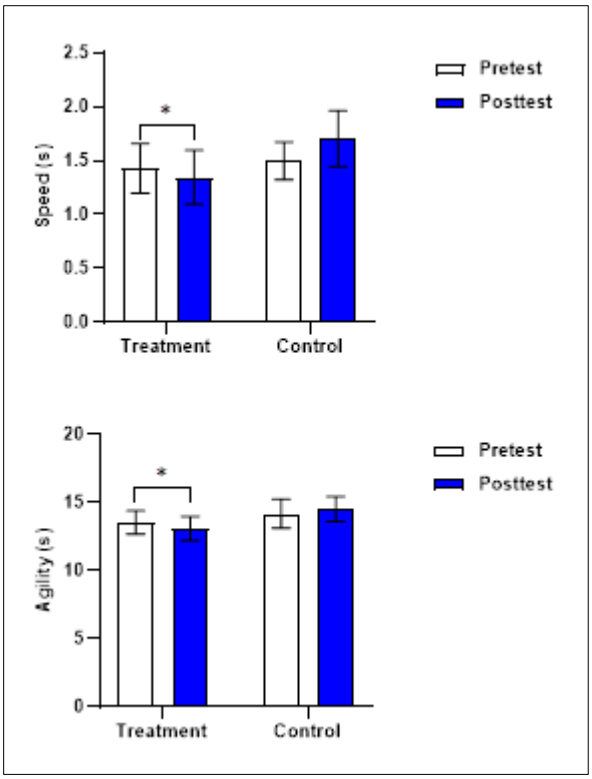

Figure 2 Assessment of speed (s) and agility (s) pre and post in each group. *significant at pretest $p < 0.05$. Data are presented as mean ± SD. Assessment of p-value using paired sample t-test.

4. Discussion

In this study, the results showed that there was a very significant effect of the implementation of high intensity interval training (HIIT) Tuja Shuttle Run model on the agility and speed of Bank Jatim Surabaya female volleyball school athletes. This is evident from the results of the paired sample t-test, where the difference between post-test and pre-test on the speed variable has a significance of 0.049 <0.05 and agility has a significance of 0.004 <0.05, indicating that the hypothesis proposed, namely that there is a significant effect of HIIT training on the agility and speed of athletes can be accepted.

The average increase in speed variables in the treatment group was recorded at 5,76%, higher than the increase in agility which amounted to 3,31%. This data indicates that the Tuja Shuttle Run model of HIIT training is more effective in increasing speed than agility, with the latter being optimal for fast one-way movements that require explosive power. In contrast, the control group showed no significant changes in both variables, so it can be concluded that HIIT training is more effective than no training in increasing speed and agility.

HIIT training is a practice that combines very high levels of intensity with moderate or low intensity in a measurable time span (Susila, 2021). Furthermore, HIIT consists of several cycles of short or medium duration, where each cycle is followed by a rest period or exercise with low intensity. This combination allows the body to work at its maximum capacity in a short duration, effectively improving physical abilities such as speed and agility (Nugraha & Berawi, 2017).

Although HIIT of the Tuja Shuttle Run model provides benefits for both of these abilities, its effectiveness in increasing speed is due to the predominance of activation offast-twitch fibers that support one-way explosive movements, which are relevant for speed more than changes in direction. In addition, this exercise also stimulates cardiovascular adaptations such as an increase in VO2max which contributes to endurance during repetitive fast movements (Nugraha & Berawi, 2017; Tutur, 2023).

5. Conclusion

High-Intensity Interval Training (HIIT) training Tuja Shuttle Run model is proven to have a significant positive effect on increasing the speed and agility of female volleyball athletes Bank Jatim Surabaya. The HIIT method applied in this

study, which combines high-intensity intervals with exercises involving changes in direction and speed, is effective in improving these two important aspects. On average, agility increased by 3.31%, while speed increased by 5.76% after the treatment. This exercise not only improved athletes' speed but also their ability to move quickly and efficiently, which is a crucial skill in the game of volleyball. The results support the success of the Tuja Shuttle Run HIIT method in meeting the specific physical needs of this sport, suggesting that this training approach can be applied to optimize athletes' performance.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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