

Investigation of the Effects of Air Alert III Exercises on Some Physical Parameters in Midi Girls Volleyball Players

Air Alert III Egzersizlerinin Midi Kız Voleybolcularda Bazı Fiziksel Parametrelere Etkisinin İncelenmesi

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ABSTRACT

This study aims to examine the effect of modified Air Alert III exercises, a jump training program in basketball, on vertical jump, agility and balance performance in middle school female volleyball players. Sixteen 13-year-old female athletes, including 8 in the experimental group and 8 in the control group, participated after completing at least three years of regular volleyball training. The Air Alert III program applied to the experimental group includes exercises where the types and rest periods between sets remain constant, but the number of repetitions and sets reduced by 50%. The program continued for 15 weeks, while the control group maintained their regular training routine. Statistical analyses, performed using SPSS 25.0, show differences between the pre-test and post-test results of the groups, assessed using the Two-Way ANOVA. The significance level set at $p < .01$. When the values between the two groups were analyzed, significant differences were observed in the vertical jump, agility test, and left foot balance parameters between the Air Alert III group and the control group ($p < .01$). However, no significant difference was found in the right foot balance parameter ($p > .01$). These findings indicate that the Air Alert III program serves as an alternative training method for enhancing vertical jump, agility, and balance in volleyball players.

Keywords: Volleyball, vertical jump, balance, agility, air alert III

Öz

Bu çalışma; Basketbol branşında sıçrama programı olan Air Alert III egzersizlerinin modifiye edilerek midi kız voleybolcularda dikey sıçrama, çeviklik ve dengeye olan etkisinin incelenmesi amacıyla yapılmıştır. Katılımcılar 13 yaşında en az üç yıl düzenli olarak voleybol antrenmanlarına katılan 16 (8 çalışma-8 kontrol) kız sporcudan oluştu. Çalışma gurubuna Air Alert III programı uygulandı. Uygulanan antrenman programında, egzersiz türü ve setler arası dinlenme süreleri sabit tutulurken, modifiye olarak tekrar sayısı ve set sayısı %50 azaltıldı. Program on beş hafta uygulandı. Kontrol grubu ise rutin antrenmanlarına devam etti. İstatistik Analiz SPSS 25.0 ile yapıldı. Gurupların ön testleri ve son testleri arasındaki farklar Two-Way ANOVA ile değerlendirildi. İstatistiksel anlamlılık düzeyi $p < .01$ olarak kabul edildi. İki grup arasındaki değerler analiz edildiğinde zamansal olarak Air Alert III ve kontrol grubu arasında dikey sıçrama, çeviklik testi ve sol ayak denge parametrelerinde anlamlı farklılıklar tespit edildi ($p < .01$). Fakat sağ ayak denge parametresinde ise anlamlı farklılıklar tespit edilmedi ($p > .01$). Araştırma sonucunda Air Alert III programının voleybolcularda dikey sıçrama, çeviklik ve denge gibi özelliklerin geliştirilmesinde kullanılabilecek alternatif bir program olduğunu gösterdi.

Anahtar Kelimeler: Voleybol, dikey sıçrama, denge, çeviklik, air Alert III.

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Introduction

The ultimate goal of team sports and their athletes involves enhancing performance through systematic training (Van Mierlo & Van Hooft, 2020). The most popular team sports, which are included in the Olympic Games (e.g., football, basketball, volleyball), require different skills but share significant similarities, benefiting from improvements in physical performance (Khlifa et al., 2010; Sedano et al., 2011; Daşkesen et al., 2024).

Volleyball, a team sport played and watched by people from various backgrounds today, combines explosive movements, which occur in both vertical and horizontal directions, with short recovery periods, making it an intense anaerobic sport (Gabbett & Georgief, 2007). Volleyball also involves versatile movements that include 250 to 300 explosive jumps repeatedly performed during a match (Tramel et al., 2019). It has been found that elite players execute over 40,000 spikes annually (Sarvestan et al., 2020). This highlights the importance of implementing training programs that aim to enhance physical performance, focusing on high-intensity actions like jumping and serving (Ramirez-Campillo et al., 2020). In volleyball, maintaining balance, which is crucial for landing after spikes and blocks without contacting the net, contributes to overall performance. Today, volleyball, which has become a sport requiring quick decision-making and fast-paced play at all levels, emphasizes the need for athletes to remain physically ready.

Plyometric training, which is an effective method for improving vertical jump height in volleyball players, has been supported by several studies (Silva et al., 2019; Ramirez-Campillo et al., 2021). A study conducted by Idrizovic et al. (2018) showed significant improvements of 16.9% in block jumps, which were achieved in young female volleyball players (average age 16.6) who underwent plyometric training, compared to a control group following a traditional training program. Another study by Mackala et al. (2020) demonstrated a 7% improvement in the drop jump test after a 4-week plyometric training intervention, which was applied to high school female volleyball players. While plyometric training, which can last between 4 and 12 weeks, leads to positive effects on physical performance in volleyball players (Idrizovic et al., 2018; Valades Cerrato et al., 2018), the frequency of training, which involves two or more sessions per week, has been reported to result in significant improvements in vertical jump height (Ramirez-Campillo et al., 2021). Silva et al. (2019) indicated that plyometric training, applied for six weeks (Martel et al., 2005; Sheikh & Hassan, 2018; Yoo et al., 2010) or twelve weeks (Velickovic et al., 2017; Gjinovci et al., 2017; Radu et al., 2015; Turgut et al., 2016), led to more favorable outcomes when volleyball players trained two to three sessions per week. Based on these results, it is evident that conducting at least three plyometric training sessions per week significantly impacts athletes' performance. Air Alert III, which is a jump training program designed to improve vertical jump performance in basketball players, consists of six exercises performed three days a week over 15 weeks. Reports indicate that when applied to basketball players, this program improved their jumping ability by 20 cm (Tukel T. Air Alert: How to Jump Increase. <http://www.Airalert.com> 2024).

Although plyometric training, which is widely used in volleyball, offers numerous benefits, there is limited scientific information regarding its potential impact on different performance components. This study intends to modify the Air Alert III training program, which has been shown to have positive effects on basketball players, and to examine its effects on specific physical parameters in middle school female volleyball players.

Methods

Research Methodology

The study employed a Static Group Pre-test-Post-test design, which is one of the experimental methods. In this design, there are two groups that differ in terms of intervention, with one receiving the treatment while the other does not. Prior to the implementation, both groups undergo the same tests, which are then repeated after the intervention for the experimental group (Büyükoztürk et al., 2024). The sample chosen for the study consists of participants selected through convenience sampling, which is a method that allows researchers to quickly access participants from environments or communities that are easily reachable (Gravetter & Forzani, 2012). Power Analysis 3.1.9.7 was used to determine the sample size, it has been calculated that a confidence interval of over 0.80 and a margin of error of 0.10 should be taken into account to ensure representativeness. The sample size calculation indicated that two groups of at least eight participants would be sufficient for this study. The study included athletes in the Midi Girls Volleyball category, who underwent a modified Air Alert III exercise program to assess its effects on specific physical parameters such as vertical jump height and lower body strength. Informed parental consent was obtained from all participants' families before the study. Athletes who did not provide consent, those unwilling to participate, and male athletes were excluded to maintain the study's homogeneity. This committee approval was received for this study from the ethics committee of Çanakkale Onsekiz Mart University (Date: 2024, Decision Number: 11/17, Protocol No: 2024-YÖNP-0564). Verbal consent was obtained from all the participants.

Research Design

Data collection involved measuring the athletes' height and weight using a standardized stadiometer and digital scale. Additionally, the Vertical Jump Test, Illinois Agility Test, and Flamingo Balance Test were conducted in accordance with standardized protocols. After the assessments, the athletes were randomly divided into two groups of 8 participants. One group was assigned as the experimental group and underwent a 15-week modified Air Alert III training program. The control group continued their regular volleyball training. Prior to testing, the athletes performed self-directed warm-up exercises. All tests were completed in a single day, with a 3-minute rest interval between each test to minimize fatigue.

Height and Weight Measurement: The height and weight measurements, which were conducted before the start of the study, involved participants who had signed consent forms (Günay et al., 2017).

Vertical Jump Test: In this test, which assesses jump height, the participant stands sideways next to a wall. Chalk or ink is applied to the fingertips so that the highest point reached during the jump can be marked. The difference between the reach height and the jump height is recorded in centimeters. Each athlete performed two trials per test, with a 1-minute rest between trials, and the best score was recorded to ensure reliability.

Agility (Illinois) Test: The test involves a track that consists of a series of 10-meter lengths and cones placed 3.3 meters apart, requiring participants to make sharp 180° turns and complete slalom runs. Two electronically timed photocell gates, which are placed at the start and finish lines, measure the completion time. Participants receive explanations and a warm-up session before the test, after which they perform two trials, with the better result being recorded (Miller et al., 2006; Hazir et al., 2010).

Flamingo Balance Test: The test, which uses a stopwatch and a wooden balance beam, measures the ability of participants to maintain balance while standing on one leg. The athlete focuses on a fixed point 5 meters away and the errors made during the test are counted. The average error count from three tests is recorded as the score (Jakobsen et al., 2011).

Air Alert III: This exercise program, designed for individuals seeking to improve their jump height, is an enhanced version of Air Alert II, which includes an additional exercise. The program consists of a 15-week cycle, alternating between single and double weeks. Athletes who adhere to this program report improvements of 10-25 cm in their jump height (Tukel, 2024).

Exercises Performed by the Air Alert Group

The list of exercises, which was prepared using the video titled "How To Jump Higher - The 9 Steps of Air Alert" from Tukel's (2024) YouTube channel, is detailed below (<https://www.airalert.com/en/jump-training-online?slg=step-9-cooling-down>; January 17, 2024).

1. *Leaps ups*, which can be performed with or without a rope, involve the athlete starting from a ¼ squat position and jumping at least 8-10 inches. 2. *Calf Raises*, which require the athlete to stand on one leg, are performed by pushing up on the toes and returning to the starting position slowly. 3. *Step Ups* involve placing one foot on a box, jumping as high as possible, switching feet, and repeating the movement in rapid succession. 4. *Thrust Ups*, which are performed with feet shoulder-width apart, involve jumping as high as possible without allowing the heels to touch the ground. 5. *Burnouts* involve quick, small jumps without bending the knees, with feet kept shoulder-width apart. 6. *Squat Jumps* involve holding a basketball at chest level and performing a squat jump, with the final jump being the highest possible (Table 1).

Modified Air Alert III Training Program Applied to the Experimental Group

The exercise plan, which spans 15 weeks, is divided into single and double weeks. During single weeks, training takes place on Mondays, Wednesdays, and Fridays, while in double weeks, training occurs on Tuesdays, Wednesdays, and Thursdays (<https://www.airalert.com/en/jump-training-online?slg=step-9-cooling-down>; January 17, 2024). **In the training program applied to the experimental group, which includes the Air Alert III exercises, the types of exercises and rest periods between sets are maintained as constant, **but the number of repetitions and sets is reduced by 50% (Table 1).

Data Analysis

SPSS 25 (IBM SPSS Corp., Armonk, NY, USA) software was used for data analysis. Initially, the normality of the data was assessed using the Shapiro-Wilk test. As a result, the data showed normal distribution. Descriptive statistics for the measurements included mean and standard deviation. Differences between the pre-tests and post-tests of both the Air Alert III group and the control group were analyzed using the Paired-Sample T-Test. The statistical significance level was set at $p < .01$.

Table 1.
Modified Air Alert III Training Program

Week	Type of Exercise	Repetitions	Sets	Rest Time Between Sets
1	1-2-3-4-5-6	10-5-5-7-50-7	1-1-1-1-1-2	2mn- 25sec-2mn-1mn-1mn-2 mn
2	1-2-3-4-5-6	10-7-7-10-100-10	2-1-1-1-1-2	2mn- 25sec-2mn-1mn-1mn-2 mn
3	1-2-3-4-5-6	12-10-7-12-150-10	2-1-1-1-1-2	2mn- 25sec-2mn-1mn-1mn-2 mn
4	1-2-3-4-5-6	15-12-10-15-100-15	2-1-1-1-1-2	2mn- 25sec-2mn-1mn-1mn-2 mn
5	1-2-3-4-5-6	12-15-10-17-125-12	2-1-1-1-1-2	2mn- 25sec-2mn-1mn-1mn-2 mn
6	1-2-3-4-5-6	25-17-12-20-150-15	2-1-1-1-1-2	2mn- 25sec-2mn-1mn-1mn-2 mn
7	1-2-3-4-5-6	15-20-12-25-150-12	2-1-1-1-1-3	2mn- 25sec-2mn-1mn-1mn-2 mn
8	1-2-3-4-5-6	25-22-15-30-100-12	2-1-1-1-2-3	2mn- 25sec-2mn-1mn-1mn-2 mn
9	1-2-3-4-5-6	25-25-15-35-150-15	2-1-1-1-2-3	2mn- 25sec-2mn-1mn-1mn-2 mn
10	1-2-3-4-5-6	20-25-17-40-125-15	3-1-1-1-2-3	2mn- 25sec-2mn-1mn-1mn-2 mn
11	1-2-3-4-5-6	25-15-17-45-130-15	3-2-1-1-2-3	2mn- 25sec-2mn-1mn-1mn-2 mn
12	1-2-3-4-5-6	35-17-20-50-150-15	2-2-1-1-2-3	2mn- 25sec-2mn-1mn-1mn-2 mn
13	---	---	---	---
14	1-2-3-4-5-6	15-15-20-15-125-10	2-1-1-1-1-2	2mn- 25sec-2mn-1mn-1mn-2 mn
15	1-2-3-4-5-6	50-25-10-50-250-25	2-2-1-1-2-3	2mn- 25sec-2mn-1mn-1mn-2 mn

Mn: minute, sec: second, Note: The numbers in the Exercise Type column indicate the identification of the exercises used in the training program. Details on the exercises corresponding to these numbers can be found in the section "Exercises Performed by the Air Alert Group" in the Materials and Methods part.

Results

Table 2.
Distribution of Physical Characteristics for the Air Alert III and Control Groups

	Air Alert III Group (n=8) $\bar{x}\pm Sd$	Control Group (n=8) $\bar{x}\pm Sd$
Age (Year)	13.0 \pm 0.0	13.0 \pm 0.0
Height (cm)	158.62 \pm 7.19	154.50 \pm 9.19
Body Weight(kg)	50.87 \pm 3.44	51.50 \pm 5.07
BMI (kg/m ²)	20.80 \pm 1.89	21.69 \pm 2.59

Cm: centimeter, kg: kilogram, m²: square meter

As shown in Table 2, it is observed that the mean height of the participants in the Air Alert III group was 158.62 \pm 7.19 cm, their mean body weight was 50.87 \pm 3.44 kg, and their mean body mass index (BMI) was 20.80 \pm 1.89 kg/m². In the control group, the mean height was 154.50 \pm 9.19 cm, mean body weight was 51.50 \pm 5.07 kg, and mean BMI was 21.69 \pm 2.59 kg/m².

Table 3.
Comparison of Pre-Test and Post-Test Results between the Air Alert III and Control Groups

Variable		Pre-Test $\bar{x}\pm Sd$	Post-Test $\bar{x}\pm Sd$	ES	F	p
Vertical Jump (VJ)	AAG	33.25 \pm 4.74	41.62 \pm 4.74	.839	67.513	.000*
	CG	28.75 \pm 3.45	30.00 \pm 3.02			
Illionis Agility Test	AAG	21.14 \pm 1.26	20.09 \pm 0.91	.941	206.678	.000*
	CG	22.38 \pm 1.68	22.18 \pm 1.66			
Flamingo Balance (Right)	AAG	3.12 \pm 1.24	1.00 \pm 1.19	.429	9.763	.008
	CG	3.37 \pm 0.51	2.50 \pm 0.53			
Flamingo Balance (Left)	AAG	3.62 \pm 0.74	1.25 \pm 0.70	.596	19.175	.001*
	CG	4.00 \pm 0.75	3.37 \pm 1.06			

*= p<.01, ES: Effect Size, AAG: Air Alert III Group, CG: Control Group.

As shown in Table 3, significant differences were found between the pre-test and post-test results in the Air Alert III group ($p < .01$). The observed changes in vertical jump performance indicate a positive increase in the mean vertical jump height for the Air Alert III group. In the Illinois agility test, participants completed the test in a shorter time. Moreover, in the Flamingo balance test, participants demonstrated fewer error scores on both the right and left foot. In contrast, when examining the control group's pre-test and post-test data, no significant differences were identified in the assessed parameters ($p > .01$).

Discussion

This study, aiming to investigate the effects of the Air Alert III exercise program on specific physical parameters of young female volleyball players, focused on participants who had engaged in regular volleyball training for three years, practicing three days per week. The findings indicate significant improvements in vertical jump, agility, and balance for the Air Alert III group over the 15-week period.

In volleyball, the key to success revolves around scoring points, which requires teams to execute effective spikes and blocks. For these techniques to be efficient, the ability of athletes to perform vertical jumps holds critical importance. Previous studies, such as those by Lidor and Ziy (2010), highlighted how vertical jump performance serves as a significant component in volleyball success. This explains why much of the research in the field has concentrated on enhancing vertical jump abilities in volleyball athletes (Silva et al., 2019). Over time, various methods have been tried to develop jumping skills, with plyometric exercises being the most commonly used today (Markovic, 2007). Research on vertical jumping shows that, following a four-week plyometric training program conducted on female players under the age of 14, an improvement of 3.9 cm in vertical jump was observed (Martel et al., 2005). In players under the age of 15, a six-week regular plyometric training program conducted on a gym floor resulted in a 9.2% improvement in vertical jump. Similarly, a 12-week plyometric training protocol conducted on female players under 17 led to a 16.9% increase in block jumps (Lehnert et al., 2009). For players under 22 years, a 12-week plyometric training program yielded a 27.6% improvement in the same test (Gjinovci et al., 2017). Given that most previous studies employed plyometric jump training, it becomes evident that alternative methods are required for enhancing vertical jump abilities. With this in mind, the Air Alert III method, which has been more commonly applied in basketball-related studies (Maravi Aredo, 2018), was selected. However, its relevance in volleyball remains crucial, as vertical jumping constitutes a fundamental factor for success in this sport.

The results suggest that there were significant differences between the pre-test and post-test scores in the Illinois agility test for the Air Alert III group. Although primarily focused on jump training, the Air Alert III program incorporates fast leg movements, necessitating a rapid contraction-relaxation cycle in the muscles. This cycle eventually leads to physiological adaptations that enhance agility. In a prior study, one group participated in plyometric exercises, while another engaged in skill-based exercises. The findings revealed that the plyometric group showed greater improvements in agility and speed compared to the skill-based group (Gjinovci et al., 2017). When considering this perspective, jump training appears to be more effective for agility development than skill-based training. According to a systematic review, various methods of plyometric training had positive effects on agility and speed in volleyball players (Turgut et al., 2016; Lehnert et al., 2009; Hrženjak et al., 2016; Markovic, 2007; Özgül, 2018; Velickovic et al., 2017).

Another significant finding suggests that the Air Alert III exercise program positively impacted balance. Limited research has explored the effects of plyometric exercises on balance (Silva et al., 2019). One study, which involved one group performing a plyometric training program and another engaging in dynamic stabilization and balance exercises, revealed that both groups showed similar results (Myer et al., 2006). From this, it can be inferred that plyometric exercises contribute to balance improvement. Additionally, other studies on volleyball players have demonstrated that plyometric exercises positively influence balance (Kanbak & Dağlıoğlu, 2020). Further supporting evidence comes from studies in the literature (Eylen et al., 2018; Sabin & Alexandru, 2015; Kim & Park, 2016; Makhoul et al., 2018).

The Air Alert III program has been introduced into the literature as an alternative plyometric training method, and research on this topic is still in its nascent stages. Existing studies indicate that the program increases individuals' vertical jump power while having no significant effect on explosive power (Maravi Aredo, 2018; Barrote, 2022). Furthermore, another study reported that the Air Alert program enhances jumping ability (Strelnikova & Melnyk, 2024). However, there is a notable lack of studies investigating the effects of the Air Alert III program on balance, highlighting the significance of our research in addressing this gap. Additionally, while the Air Alert program has predominantly been applied to basketball players in prior studies, our research focuses on its effects on volleyball players (Maravi Aredo, 2018; Barrote, 2022).

Conclusion and Recommendations

The Air Alert III program, based on the findings, can be considered an alternative method for improving vertical jump, agility, and balance in volleyball players. Given that vertical jump is one of the essential components of success in volleyball, the Air Alert III program presents a valuable addition to the literature as a method distinct from plyometric training. However, the limitation of this study lies in the need for further research to generalize these findings. Future studies could include a plyometric exercise group in addition to the Air Alert III and control groups. Comparing these three groups would provide insights into which method is more effective, offering valuable contributions to the literature.

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Hakem Değerlendirmesi: Dış bağımsız.

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