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Impact of Utilizing Visual Stimuli (BlazePod) on Agility, Vertical Jump, and Visual Reaction Time Speed in Under-19 Volleyball Players

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Abstract: This study aimed to evaluate the effects of Blazepod technology when incorporated with various training regimens on the essential elements of physical fitness in volleyball, such as agility, speed, visual response time, and vertical leap. Thirty-six participants (age :17.33±0.48 y, height: 183.78±6.34 cm, weight: 77.14±5.16 kg) were involved in this study. In randomized design, three equal groups with two experimental groups and one control group were involved in the study over a period of six weeks: (GE1) used Blazepod technology to workout at a low level; (GE2) used Blazepod technology to workout at a higher intensity; (CG) did not employ Blazepod technology, but it adhered to the same fundamental training curriculum. We conducted agility, speed, reaction time, and vertical jump tests before, midway and after the study to determine optimal training volume, intensity, and frequency. A significant main effect of time ($P<0.001$), groups ($P>0.01$), and time×group interaction ($P>0.001$) were found for all tests. Post hoc test showed that the two experimental groups gadget significantly improved in all performance variables ($P<0.05$). However, no significant changes were observed for all variables in CG. In conclusion, our findings indicated that training sessions with higher intensity resulted in more increases in physical fitness. Coaches may develop more productive training plans that will help their athletes become more physically fit and perform better by utilizing the Blazepod technology.

Keywords: blazepod technology; agility; speed visual reaction time; vertical jump; volleyball physical skills

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1. Introduction

Volleyball is a popular team activity that can be played inside or outdoors. Indoor volleyball rallies involve intense movements like leaping, spiking, blocking, and striding [1]. Technological developments in gaming genres and sporting events in general have not occurred by happenstance; rather, enthusiasts, professionals, and scholars have been striving to enhance education on a constant basis to boost output and achieve desired results [2], Volleyball is one of the team sports that has gained enormous global popularity because of its fast growth rate as well as the fun, drama, and excitement it provides. Volleyball demands a high degree of skill, mental, and physical development

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as a result. The physiological demands of the game, in addition to other factors including technical, tactical, and psychological ones, necessitate a high level of fitness [1], Volleyball is an anaerobic, high-intensity activity that combines fast movements in both vertical and horizontal planes with short recovery periods [3].

It is vital to keep up with this development by using educational exercises and auxiliary means in line with planned educational programs developed in a right scientific manner and according to the educational phases that the learner is going through. These techniques aid the student in accurately and correctly acquiring the technical performance of fundamental volleyball skills [2], The current training process is unthinkable without the use of multimedia support for sports. Children participate in a variety of programs to improve their performance during games, and most countries in the world are trying to generate professional athletes to enhance the strength, agility, and flexibility needed for each game [4].

The idea of contemporary training aids and equipment has grown to encompass a wide range of extremely promising tools, equipment, and devices. Their accessibility has contributed to the success of efforts to elevate athletes' game, as players' high caliber of play is largely attributed to their use of these aids and equipment, which are some of the most significant recent developments. Blaze Pods, or light stimulation, are one of the resources and methods a coach can use to create training plans that strategically prepare athletes [5].

According to Ho-Yu Y et al. [6], they study measures the light motor agility of women's volleyball players using an intelligent dynamic photovoltaic system [6]. All sports are using a new technology called BLAZEPOD that monitors reaction time (RT) that is currently available on the market. An example of a creative gadget is the BlazePod simulator. The purpose of this simulator is to improve coordination, speed, accuracy, and reaction time.

The BlazePod is made up of 4, 6, 8, or more wireless LED sensors that are managed by a tablet PC or smartphone app. It is the user's responsibility to deactivate an optical signal that lights on a sensor by touch or proximity. These LED sensors can also be utilized as programmable targets by using a random activation sequence.

The sensors are attached to a variety of surfaces using unique holders, straps, or suction cups. The athlete receives rapid input from the device's software, which enables users to assess outcomes in real-time with an accuracy of 0.001 seconds. The collected information is kept in a database for further examination [7].

Physical fitness is a prerequisite for participation in all sports. It has to do with being able to satisfy environmental requirements, particularly those relating to preservation, stress tolerance, and fatigue resistance [8], a variety of jumping-related skills are required of players, including spiking, blocking, jump set, and jump serve [1]. Volleyball requires agility, coordination, and reaction ability for playing and a good suspicion to lift and hit the ball. In volleyball, changes in the speed of game and scoring system the set finishes quickly, so players need a high level of agility, coordination, and reaction ability [9]. Earlier studies analyzing competition performance have shown that accelerations, decelerations, jumping, ball-striking, and multidirectional locomotion's are common movements in volleyball [10]

A volleyball player's ability to jump vertically, accelerate quickly, and exhibit agility are critical factors [1]. Almost all sports require agility, which is the ability to quickly change direction or position of the body while coordinating other activities. Strong agility can help an athlete perform actions more successfully and efficiently. Agility is the physical ability to change one's body position and direction fast and precisely [9]. research on the relationship of flexibility with speed and agility are also limited and have conflicting results [1]. concluded that there are no significant differences in the performance of speed, agility and jump after warm-up using dynamic and dynamic cum static protocols.

High-level reaction and acceleration speed are necessary in volleyball because players must respond quickly due to the ball's high speed and the court's tiny size, which prevents them from moving as fast as possible [11]. Since most accomplishment athletes must run, move, react, or change direction quickly, movement speed is the most crucial skill. In terms of eye movement dynamics,

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volleyball players with experience have an edge [12]. the visuomotor processing capacity to track several moving targets, as well as pattern memory, anticipation, and decision-making [10–13]. In volleyball, according to Mroczek, reaction speed is ranked in the first place among all coordination abilities [14].

The ability of a player to decide and take action is known as reaction speed. It is separated into two halves. "Reaction time" is the first factor to consider; it is the interval of time between being exposed to an auditory, visual, tactile, or kinesthetic stimulus and experiencing the initial muscular reaction. The second element is "movement time" which is the amount of time spent moving [15], the period of time between when we observe something and when we react to it is referred to as response time or reaction time. It is the capacity to recognize, interpret, and react to stimuli. As a result, the data needed to determine the appropriate motor response varies greatly throughout experimental investigations; it may depend on the existence, position, or identification of the target item for example [16,17].

Multiple muscles in the arms, legs, and trunk must synchronize to perform the complex movement of a vertical leap. In volleyball matches, this type of motion is necessary for blocking and spiking and can significantly alter the result of the match [14], Given that a five-set volleyball match requires each player to make more than 250 jumps, jumping ability has been found to be a critical component of excellent success in the sport [3] Point-scoring moves (including serves, spikes, and blocks) are based on jumps, and a normal volleyball team (n~12) makes about 120,000 jumps in a season [18].

The purpose of the study was to determine whether volleyball players under the age of 19 may benefit from a high-intensity training program that used the Blazepod gadget to improve their agility, visual reaction time, and vertical jump. Our hypothesis was that a training program with a higher density and lower intensity using BLAZEPOD would be more effective in improving volleyball players' agility, visual reaction time, and vertical jump than a program with a lower density and higher intensity.

2. Materials and Methods

2.1. Participants

A total of Thirty-six healthy male young volleyball players U19, playing in the Algerian Premier League. Average Age (17.33±0.48), Height (183.78±6.34), with BMI (22.83±0.70), and height difference with raised Arm (44.31±3.08) were assessed (Table 1). Inclusion criteria for participation in the study included being an active licensed volleyball player, (a) having a minimum of 3 years of volleyball practice experience, (b) not reporting any significant injuries that would have prevented them from training or competing in the past 3 months, the exclusion criteria consisted : (a) possessing any recent training in visual stimulation, (b) did not have any disease or illness that could affect performance on various tests, (c) did not use of any medications for any chronic medical condition, consumption of any substance (such as stimulants, narcotics, or psychotropic drugs).

They were randomly divided into three equal groups. All their training programs worked on improving the elements of physical fitness (Agility, Speed visual reaction time, Vertical Jump). GE 1: (Training program at a rate of two combined sessions per week using Blazepod technology), the time of each combined session is 15 minutes. GE 2: (Training program at a rate of one combined session per week using Blazepod technology), its duration is 30 minutes. and CG: (A normal training program without using Blazepod technology).

Table 1. Anthropometric characteristic of all participants (n=36).

Groups	Age (years)	Weight (kg)	Height (cm)	BMI (Kg.m-2)	HDRA (cm)
GE1	17.42 ± 0.51	77.80 ± 5.56	184.92 ± 8.14	22.75 ± 0.77	45.25 ± 2.83

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GE2	17.33 ± 0.49	76.48 ± 5.50	184.25 ± 6.09	22.51 ± 0.6	44.92 ± 3.42
CG	17.25 ± 0.45	77.14 ± 4.75	182.17 ± 4.47	23.22 ± 0.57	42.75 ± 2.53

GE1 group experimental 1. GE2 group experimental 2. CG control group. HDRA Height difference with raised arm.

2.2. Experimental Design

Every group was given a unique six-week training regimen created to assist them in reaching the shared goal of improving their physical fitness levels in the areas of agility, speed, visual reaction time, and vertical jump. 36 players were randomly divided into three groups, and then they were informed of the goal. Following instruction of the exam and its procedures, all groups underwent the required anthropometric assessments. The (Illinois Agility Test (IAT), T-Drill Test, Zig-Zag Test, Balsom Run Test, Vertical Jump Test - Sargent Jump, Vertical Jump Run up and double leg take-off) were the physical fitness tests that were next conducted in order to reach a consensus. Before signing the written informed consent form, athletes received information about the experimental process, scheduling, types of workouts, and evaluations they would need to complete. The participants gave their written informed permission after being told of the potential benefits and risks. The first experimental group (GE1), made up of 12 players, uses a training program that makes use of Blazepod technology. As seen in (Figure 1), special exercises are created to meet the objectives of each session and are programmed into the Blazepod application on smartphones (which can be used with various smartphones). This group works at a rate of two combined sessions per week. This tool allows you to find out the duration, frequency, intensity, and training load of the sessions that the trainer selects. In a similar vein, employing Blazepod technology in line with the objectives of the organization's core program, A tailored exercise regimen is created for the 12 players in the second experimental group (GE2). It accomplishes the same goals as the primary training session but is conducted at the rate of one 30-minute combination session per week. 12 athletes made up the third group, dubbed the control group (CG), and they were sticking to their regular training schedule, which included the same goals as the other two groups but excluded the usage of Blazepod or any other form of technology.

The entire research community completed electronic assessments on the Borg RPE 0–10 scale at the conclusion of each direct training session [19]. Following a three-week training period, each group underwent the identical pre-experiment physical testing to ascertain the degree to which the Blazepod technology had affected the athletes' performance. The same physical fitness tests were subsequently administered after the training program had been completed for a further three weeks.

2.3. Experimental Protocol

2.3.1. Anthropometric Measurements

Before the experimental session,36 players divided into Three groups, anthropometric measurements of participants (Age, height, body mass and -HDRA- Height Difference with Raised Arm). The height and the weight of the participants was measured with the electronic Scale for measuring (DHM - 600B) without shoes and with minimal clothes to the nearest 0.5 kg. Standing vertical with raised arm was measured using a standardized scale mounted on the wall with an accuracy of 0.01 m.

2.3.2. Agility Measurements

To measure the Agility component, a Illinois Agility Test (IAT) [20,21] test was used, and T-Drill Test was used using Blazepod technology [22,23], as seen in Figure 2, to become accustomed to how the device works. Every player from every group took a test once they were aware of the exams beforehand. Each player had two attempts at each test before, three weeks after the trial began, and just at the conclusion of the field experiment. The best score was kept for the study.

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2.3.3. Illinois Agility Test

A field measuring 5 meters in width and 10 meters in length was needed for the test. Four cones, spaced 3.3 meters apart, marked the beginning, end, and two turning points of the field. When the signal to "Go" was given, participants were to run as fast as they could between the cones. If the test subject crossed the finish line and went through the course without running into any cones, the trial was considered successful. Two people were present at the start and finish lines to precisely record the starting and finishing times using the Q&Q stopwatch. The task was carried out on a volleyball court. Throughout the functional evaluation, participants wore the same volleyball shoes and clothes. Three successful trials were completed with a 2-min rest period between each trial, and the best trial was selected for further analysis [20].

2.3.4. T-Drill Test

For the T-Drill course test we used BLAZEPOD device, we put 4 pods up of 4 cones of 30 cm were arranged at the points of the required directional changes. When the test began, the participants were required to sprint forward along Course A (9.14 m) until they could touch the tip of the first pod with their right hand. They then side-shuffled leftward along Course B (4.75 m) until touching the tip of the second pod with their left hand. Next, they side-shuffled rightward along Course C (9.5 m) until touching the tip of the third pod with their right hand. They then side-shuffled leftward along Course D (4.75 m) until touching the tip of the fourth pod with their left hand. Finally, they back-pedaled over Course E (9.14 m) until reaching the finishing point (which was the original starting point). [22] (Figure 2)

2.3.5. Speed Visual Reaction Time Measurements

The Zig-Zag Test by using the Blazepod device (Figure 3) [22,24], and Balsom Run Test [25], one of the best helpful tests to measure the speed of reaction and movement of volleyball players. The tests were explained well to the players, then the two tests were conducted in three different stages. (Before, middle and after the experiment), and after repeating two attempts for each player, the best performance was saved for the study.

2.3.6. Zig-Zag Test

The Zig-Zag agility test involved running as fast as possible across a 4 x 5 m zig-zag course. Using a Blazepod gadget, we timed the participant's touches of each pod starting with a sound signal and ending when they touched the final pod [22].

2.3.7. Balsom Run Test

putting up the cones to indicate the three turning places, the start, and the finish. The course is 15 meters long (but it's unclear how far it is to the cones at B, C, and D). The player begins at point A, sprints to point B's cones, then turns around and goes back to point A. After that, the subject runs through the cones at C, turns around at D, and runs back through C. The subject makes a right turn, passes past the finish line, and around the cones at B. There can be two trials, with the quickest time being recorded [25].

2.3.8. Vertical Jump Measurements

The two best tests that can measure vertical jump in volleyball players are the Sargent Jump test as described by [26,27], and the Run up and double leg take-off by using the Vertec for Measuring Vertical Jump device [26,28]. The two tests were explained to all players, after a good warm-up and training on moving up for five minutes, the pre-test was conducted in two attempts and the best performance was saved for the study, then the same process in the middle and at the end of the experiment.

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2.3.9. Sargent Jump

Reaching up with the hand closest to the wall, the athlete stands side by side with the wall. Mark or record the point of the fingertips while keeping the feet flat on the ground. We refer to this as the standing reach height. The athlete then takes a step back from the wall and launches himself as high as he can in the air while projecting his body upward with the help of his legs and arms. At the peak of the jump, the participant made contact with the wall. The score is the difference in height between the standing reach height and the jump height. The three finest attempts are recorded [27].

2.3.10. Run Up and Double Leg Take-Off

The participant's standing height is measured by having them place both feet flat on the ground precisely beneath the equipment, then reaching up with one arm as high as they can. When ready, the person takes three steps or so before jumping off both legs as high as they can while maintaining the proper distance from the device' base (about fifteen feet), using their arms to help project their body higher. The three finest attempts are recorded [26].

2.3.11. Borg RPE 0-10 Scale

Based on studies by Gunnar Borg from Stockholm University, this table (Figure 4) is useful for measuring exercise intensity. It can also be employed in training programs to characterize the level of intensity in training sessions, as it is in certain study for that purpose [19]. After every session, the players' responses were gathered to assess how well the training program was working with them.

Figure 2: T-drill test scale by using Blazepod.

Figure 3: Zig-Zag test by using Blazepod.

Borg CR10 Scale

Scoring	Level of Exertion
0	No Exertion
0.5	Very very Slight
1	Very Slight
2	Slight
3	Moderate
4	Somewhat Severe
5	Severe
6	
7	Very Severe
8	
9	Very very Severe
10	Maximal

Figure 4: Borg RPE 0-10

2.4. Training Program

A thorough training program was created after technical staff consultation to guarantee that all groups were working toward the same objectives. The training program sessions were overseen by physical trainers and certified trainers who had received training in BlazePod technology. The agreed-upon exercise schedule was established by us. During a period of six weeks (12 sessions), the first experimental group employed the BlazePod technology for 15 minutes right after the warm-up procedure, twice a week, with at least two days off in between. The BlazePod phone app was used to do this. Over the course of six weeks, the second experimental group used the BlazePod technology once a week for 30 minutes right after warming up, with a lengthy rest period in between sessions. The BlazePod mobile app was also used to handle this. The third group, known as the control group, did not use any assistance technology and instead adhered to a standard training regimen.

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The application's workouts were all designed to achieve the same objectives: vertical jump, agility, speed, and visual reaction time. The intensity of the training load during each combined session was the only variable that separated the groups.

2.5. Statistical Analysis

The statistical analysis was performed using Statistical Package for the Social Sciences version 22.0 software (SPSS Inc., Chicago, IL, USA). Values for continuous variables are expressed as the mean ± standard deviation (SD). The Kolmogorov-Smirnov test was applied to confirm normality. The homogeneity of variance was tested with the F-test. Two-way analysis of variance (ANOVA) with repeated measures was used to determine the interaction effect for group by time (three groups: two experimental groups training with BlazePod technology vs. control group × three times: before, middle, and after intervention program). Post-hoc tests (i.e., dependent-sample t-tests) were performed to examine the difference between before- and after-values in each group where a significant interaction existed. Partial Eta squared (ηp2) effect sizes were calculated for the time × group interaction effects. T-tests for independent samples were used to compare variables between groups. To determine the magnitude of the training effect, effect sizes (ES) were determined by converting partial eta squared to Cohen's d. The magnitude of effect size was classified as trivial (< 0.20), small (0.20–0.49), medium (0.50–0.79), and large (0.80 and greater). The significance level was $P \leq 0.05$ for all calculations.

3. Results

Physical Fitness

Mean value from before, middle to after test, main effect of time and group, and time×group interactions for all variables analyzed are reported in Table 2,whereas a significant main effects of time was observed for all tests respectively (IAT) Illinois Agility Test ($F(1.68, 55.28) = 113.55$, $P < 0.001$, ηp2= 0.78), T-Drill Test ($F(1.87, 61.53) = 193.04$, $P < 0.001$, $\eta p^2 = 0.85$), Zig-Zag Test ($F(1.86, 61.46) = 66.77$, $P < 0.001$, ηp2 = 0.67), Balsom Run Test ($F(2, 66) = 206.88$, $P < 0.001$, $\eta p^2 = 0.86$), Sargent Jump test ($F(1.91,63.18) = 360.33$, $P < 0.001$, $\eta p^2 = 0.92$), Run up and double leg take-off ($F(2, 66) = 975.57$, $P < 0.001$, $\eta p^2 = 0.97$). As the time effects results we showed a significant main effects of group, for all tests also, respectively the (IAT) Illinois Agility Test ($F(2, 33) = 68.67$, $P < 0.001$, $\eta p^2 = 0.81$), T-Drill Test ($F(2, 33) = 40.23$, $P < 0.001$, ηp2 = 0.71), Zig-Zag Test ($F(2, 33) = 19.40$, $P < 0.001$, $\eta p^2 = 0.54$), Balsom Run Test ($F(2, 33) = 10.65$, $P < 0.001$, ηp2 = 0.39), Sargent Jump test ($F(2, 33) = 6.72$, $P = 0.004$, $\eta p^2 = 0.29$), Run up and double leg take-off ($F(2, 33) = 160.73$, $P < 0.001$, ηp2 = 0.91). according to those results we conclude and observe For all tests a significant main effects of time×group Interaction as follows, for the (IAT) Illinois Agility Test ($F(3.35, 55.28) = 17.57$, $P < 0.001$, $\eta p^2 = 0.52$), T-Drill Test ($F(3.73, 61.53)= 39.39$, $P < 0.001$, $\eta p^2 = 0.71$), Zig-Zag Test ($F(3.73, 61.46)= 13.87$, $P < 0.001$, $\eta p^2 = 0.46$), Balsom Run Test ($F(4,66) = 45.13$, $P < 0.001$, $\eta p^2 = 0.73$), Sargent Jump test ($F(3.83, 63.18) = 46.23$, $P < 0.001$, ηp2 = 0.74), Run up and double leg take-off ($F(4, 66) = 116.92$, $P < 0.001$, $\eta p^2 = 0.88$).

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Table 2. Physical tests results, before, middle and after the experiment.

	GE1			GE2			CG			Time effect			Groups Effect			Interaction between time and groups		
	before	**middle**	**After**	**before**	**middle**	**After**	**before**	**middle**	**After**	**F**	**p**	**ηp^2**	**F**	**p**	**ηp^2**	**F**	**p**	**ηp^2**
IAT test	18.96 ± 0.30 +	18.29 ± 0.37 *¥+	16.93 ± 0.84 *+	19.27 ± 0.35 µ	18.94 ± 0.41¥ µ	17.49 ± 0.71 * µ	19.86 ± 0.34 + µ	19.65 ± 0.32+ µ	19.51 ± 0.28+ µ	113.55	<0.001	0.77	68.67	<0.001	0.80	17.57	<0.001	0.52
T-drill test	11.28 ± 0.35	10.10 ± 0.32 *+	9.46 ± 0.27 *+ µ	11.30 ± 0.30	10.25 ± 0.35 * µ	9.70 ± 0.23 *	11.32 ± 0.44	11.24 ± 0.44+ µ	11.20 ± 0.43+ µ	193.04	<0.001	0.85	40.22	<0.001	0.70	39.39	<0.001	0.71
Zig-zag test	14.96 ± 0.39	13.71 ± 0.34 *+	12.28 ± 0.41 *¥+	14.75 ± 0.47	14.19 ± 1.28	13.04 ± 0.58 *¥ µ	14.70 ± 0.46	14.5 ± 0.40+	14.44 ± 0.35+µ	66.76	<0.001	0.66	19.39	<0.001	0.54	13.87	<0.001	0.46
Balsom test	14.96 ± 0.27+	13.64 ± 0.27 * +	12.61 ± 0.29 *¥+	14.55 ± 0.39 µ	13.77 ± 0.27 * µ	13.09 ± 0.37 *¥ µ	14.21 ± 0.31+ µ	14.08 ± 0.27+ µ	14.01 ± 0.31+ µ	206.87	<0.001	0.86	10.64	<0.001	0.39	45.13	<0.001	0.73
Sargent test	41.33 ± 3.47	43.83 ± 2.48	51.92 ± 2.54 *¥+	39.92 ± 1.78	41.83 ± 2.52	48.08 ± 2.68 *¥ µ	41.33 ± 2.46	42.08 ± 2.15	43.58 ± 2.06 µ+	360.33	<0.001	0.91	6.71	<0.001	0.28	46.23	<0.001	0.74

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Run up and double leg take-off	59.25 ± 4.78+	65.42 ± 4.52 *+	71.58 ± 3.80 *+	57.08 ± 2.68 µ	62.75 ± 3.09 * µ	68.67 ± 2.67 * µ	43.00 ± 1.65+ µ	44.33 ± 2.02+ µ	45.75 ± 2.26+ µ	975.57	<0.001	0.96	160.72	<0.001	0.90	116.92	<0.001	0.88

* Significant difference between tests $p<0.05$ (Before vs Middel, Before vs After). $p<0.05$ ¥ **(**between GE1- GE2)**.** $p<0.05$ + (between GE1- CG). $p<0.05$ µ **(**between GE2- CG). GE1: group experimental 1; GE2: group experimental 2**;** CG: control group.

Intragroup analyses for the GE1 (Table 2) showed a significant improvement in Agility factor, the Illinois Agility Test [BvsM (P = 0.09; ES = 0.71), MvsA (P < 0.001; ES = 0.72), BvsA (P < 0.001; ES = 0.85)], and T-Drill Test [BvsM ((P < 0.001; ES = 0.71), MvsA (P < 0.001; ES = 0.72), BvsA (P < 0.001; ES = 0.95)], and a significant improvement in Speed visual reaction time factor, the Zig-Zag Test [BvsM (P < 0.001; ES = 0.86), MvsA (P < 0.001; ES = 0.88), BvsA (P < 0.001; ES = 0.96)] , and for Balsom Run Test [BvsM (P < 0.001; ES = 0.93), MvsA (P < 0.001; ES = 0.92), BvsA (P < 0.001; ES = 0.97)], The Vertical Jump factor results, Sargent Jump test [BvsM (P = 0.12; ES = 0.38), MvsA (P < 0.001; ES= 0.85), BvsA (P < 0.001; ES = 0.87)], Run up and double leg take-off [BvsM (P = 0.01; ES= 0.55), MvsA (P = 0.01; ES = 0.59), BvsA (P < 0.001; ES = 0.89)].

The analysis for GE2 showed a significant improvement in the vertical jump factor, and lower results compared to the first group in Agility and speed visual reaction time factor factors, the Illinois Agility Test [BvsM (P = 0.38; ES = 0.40), MvsA (P<0.001; ES = 0.78), BvsA (P<0.001; ES = 0.85)], and T-Drill Test [BvsM (P < 0.001; ES = 0.85), MvsA (P < 0.001; ES = 0.68), BvsA (P < 0.001; ES = 0.95)], for the Speed visual reaction time factor, the Zig-Zag Test [BvsM (P = 0.35; ES = 0.28), MvsA (P = 0.09; ES = 0.50), BvsA (P < 0.001; ES = 0.85)] , and for Balsom Run Test [BvsM (P < 0.001; ES = 0.76), MvsA (P < 0.001; ES = 0.72), BvsA (P < 0.001; ES = 0.89)], The Vertical Jump factor results, Sargent Jump test [BvsM (P = 0.16; ES = 0.40), MvsA (P < 0.001; ES = 0.77), BvsA (P < 0.001; ES = 0.87)], Run up and double leg take-off [BvsM ((P < 0.001; ES = 0.70), MvsA (P < 0.001; ES = 0.72), BvsA (P < 0.001; ES = 0.97)].

According to the data in Table 2, the Third Group CG there is no significant improvement between tests, For Vertical jump factor, the results showed that the GE2 improved better than both other groups (GE1& CG).

4. Discussion

The purpose of this study was to examine and quantify how BlazePod technology impacts volleyball players' (agility, speed visual reaction time, and vertical jump) as measures of physical fitness. Although it was anticipated that this technology would significantly affect player performance, it proved difficult to figure out the ideal density and intensity for the greatest outcomes. This is because BlazePod is new to the volleyball world and there isn't much research out there, so this is one of the first studies to look into these physical components especially for volleyball's under-19 youth division.

Agility Factor

Agility is important for young volleyball players, but studies on visual impact technologies—like BlazePod—haven't given it much thought. This study showed that BlazePod had a distinct and beneficial effect on agility, especially in the first experimental group, indicating that it could be useful in assisting with training as a whole. The factor of agility was investigated in a related study involving football, and the findings of that study showed that the Blazepod reactive agility device is a valid indicator of reactive agility performance and is in line with the coach's assessment of the athlete's agility performance, proving construct validity [29], This was also the case in the study of Song et al. [30], It was determined that giving volleyball players who are weak and at danger of injury a 10-week physical stability exercise program can effectively improve their speed, agility, functional mobility, and balance. This is thought to lessen or avoid harm [30], and this is what was seen throughout the training regimen and tournaments the athletes did not get any injuries. This is another benefit of using Blazepod technology, as it would produce various favorable circumstances. And this opinion was supported by Ștefan et al. [31] in their studies where He discovered that football players' increased speed and agility would produce the ideal environment for producing excellent work. The workouts used to build lower body explosive strength meant that players would be better able to win one-on-one duels and perform technical attack and defensive maneuvers during a match if they could accelerate, change direction, and decelerate quickly [31].

Speed Visual Reaction TIME Factor

As far as we are aware, no prior research has looked into how volleyball players' visual reaction times are affected by BlazePod technology. Our findings show a definite advantage for the first experimental group over the second experimental group and the control group using the Zig-Zag Test and Balsom Run Test. This emphasizes how crucial it is to improve reaction speed with targeted exercises using the BlazePod gadget in all facets of the game, especially defense.

Our findings are corroborated by a recent study conducted in the realm of basketball by Jaro. [32]. According to their research, advanced basketball players' defensive skills more especially, their ability to maneuver as a defender were greatly enhanced by unique exercises created using the BlazePod device. Additionally, their research showed that in terms of improving kinetic response speed, BlazePod-based activities were clearly preferred to conventional coach-designed programs [32].

The study also found that participants' athletic background had a beneficial effect on their ability to focus and use their field of vision.

We placed a strong emphasis on exercise variety in our research while maintaining the predetermined objectives, training load, and intensity. Positive outcomes were obtained with this comprehensive strategy that included physical routines, group activities, and individual BlazePod exercises. An independent study that examined the impact of BlazePod-based Tabata activities on response time lends credence to this strategy. Their results showed that taekwondo athletes' physical and biological parameters were improved, as well as their skill execution speed [5].

Vertical Jump Factor

Physical fitness is one of the most important foundational elements of volleyball attacking and defensive methods. When paired with the right approach techniques, it serves as the cornerstone for strong attack and spike execution as well as efficient blocking at the net. My Sargent Jump, Run-up, and double leg take-off tests were focused on this in order to gauge how well a training regimen intended to inspire, hone, and improve these vital abilities worked.

The main conclusions of this study showed that, in contrast to the control group, which showed only a slight improvement, both experimental groups benefited clearly from the BlazePod-based training program, which was designed to encourage progression. This effect was proportionate to the intensity of the training load. This is consistent with a study of Grădinaru et al. [33] that included 17 female volleyball players and supported the idea that a regimen like this might significantly improve the players' ability to jump vertically [33].

Among players in the first experimental group, who trained with the highest intensity and lowest training volume, one of the study's most important findings is that adding visual exercises to the training program improved their agility, visual reaction time, and vertical jump. This outcome is consistent with previous research by Vasyuk et al. [34], who found that, in comparison to other groups, the experimental group that received two training sessions per week saw the greatest progress [34].

But it's crucial to take into account the results of Theofilou et al. [35], whose research with 38 football players found that, in contrast to conventional soccer training programs for teenagers, a visual stimulus training program did not seem to offer any extra benefit [35].

Limitations

To enhance its applicability to actual sporting circumstances, it is important to acknowledge certain limitations of our research. First off, only male participants were included in this study; both male and female athletes should be included in future research. A broader demographic could be included by extending the age range. The fact that there are some baseline measurement disparities between the groups should also be mentioned as a limitation. One of the biggest limitations is also the athletes' inability to get the rest they require outside of training. One of the other restrictions is that every group was representing a certain team, and these teams don't share the same social circumstances as other teams or teams from different cities.

5. Conclusions

According to the study's findings, volleyball players may find the Blazepod technology to be a useful tool for increasing their physical fitness. Players can increase their agility, speed, and elevation by using technology to create demanding and interesting training routines. The study also discovered that a key determinant of the Blazepod technology's efficacy was the density and intensity of the training sessions.

The study discovered that training sessions with higher densities and intensities generally resulted in larger gains in physical fitness. The results of this study carry significant consequences for volleyball players' coaches and trainers. Coaches may develop more productive training plans that will help their players become more physically fit and perform better by utilizing the Blazepod technology.

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