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Article

Construction of college student's volleyball functional physical training system based on 5G embedded analysis from the perspective of biomechanics

Xiaoxia Shang, Jinliang Zhao, Cuifeng Gu*

Physical Education Department, Hebei University of Economics and Business, Shijiazhuang 050061, China
*** Corresponding author:** Cuifeng Gu, cuifeng19772024@163.com

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Abstract: In volleyball, the movement and performance of athletes are closely related to biomechanical principles. The process of getting the ball beyond the opponent's net and landing on the court involves complex biomechanical actions such as jumping, spiking, and blocking. These actions require appropriate muscle activation, joint movement, and force generation. Through a 5G embedded physical training system, college students' biomechanical performance in volleyball can be effectively monitored and analyzed. For example, the Wireless Sensor Network (WSN) can be used to measure the forces exerted on the body during movements, such as the impact force on the fingers during spiking and blocking, and the stress on the lower back. By analyzing these biomechanical data, problems such as finger injuries and lower back pain can be better understood and addressed. Moreover, the 5G embedded system allows for a detailed analysis of the biomechanical characteristics of different teams and players, enabling coaches and athletes to optimize training strategies. The system can also provide visual feedback on biomechanical parameters, which helps students improve their overall coordination and muscle strength. By incorporating biomechanical analysis into the volleyball physical training system, students can better understand the scientific basis of their movements and improve their performance. Statistical analysis has been carried out effectively based on the study analysis with the existing open-source datasets, providing a quantitative basis for biomechanical research and training optimization.

Keywords: volleyball; wireless sensor network; visualization; embedded system; 5G; physical training; biomechanics

1. Overview of college student's volleyball functional physical training

The middle-aged students who participated in weekly training sessions for recreational Volleyball were structured as small-sided games. In a small-sided recreational volleyball group, healthy males between the ages were randomized [1]. Players' balance, knee muscle strength, jump height, and injury risk have not been well studied. Among female volleyball players, the researchers wanted to see whether there was a link between knee joint muscle strength, injury risk, balance, and jump height [2]. Volleyball players nowadays must exert a great deal of physical and mental energy. Volleyball can boost their mood, decrease stress, and give a sense of success and satisfaction in the work as a team member. Self-esteem, confidence, and a positive body image can all be enhanced by participating in this activity.

Players must have a high degree of physical ability to effectively execute jumping games, techniques, and most tactical combinations in a single game or over days. As

competition approaches, coaches place a high value on a player's athleticism [3]. Vertical leap was all shown to improve when volleyball players wore tape for lengthy periods, according to this research [4]. Long-term athlete development and talent discovery are intimately linked to physical abilities modeling. Volleyball players' isometric strength does not seem to alter with age, based on current research [5]. It's a sport with some anaerobic elements thrown in. Cardiovascular fitness is essential for volleyball players since they must work both energy systems [6].

Students in this research determine how to best organize and conduct physical training systems in middle and high schools based on data collected through pedagogical monitoring of students' physical well-being [7]. Students with intellectual impairments in middle school are being studied to see whether volleyball activities impact health and attention-intensive skills. The success of the volleyball program was determined by analyzing the players' physical strength and attention span [8]. Players may maximize performance potential by focusing on strengthening volleyball-specific muscles. With better upper body and arm swing efficiency, players with better core strength are more stable on the field [9]. The calf muscles, gastrocnemius and soleus, and the anterior tibial muscle in the shin region comprise the lower leg's lower leg muscles for volleyball players [10].

Volleyball's jump-acceleration connection and agility are critical for generating high power, quick stretch-shortening cycle motions, and high-speed whole-body movements with great speed and precision [11]. Volleyball is a sport in which high jumps are highly prized. For some, it comes easily, while others require a lot of effort. It takes time to perfect new talents, so do not be discouraged if individuals do not notice immediate results. The following are some techniques that users teach at the volleyball camps to improve their vertical jump. Volleyball is becoming an increasingly athletic game, requiring players to do several single-combats at the net, hops, and moves [12]. Due to its great training value, admiration, simple regulations, and ease of gaining a following among college students, Volleyball is a popular sport. Therefore, it is crucial to learn how to avoid and minimize the risk of injury during volleyball training [13]. Changing people's physical, moral, and spiritual capacities is the goal of socio-historical and economic growth in each nation, the system of organizational measures that govern and control the development of physical education in society and education [14].

The world has dramatically changed due to scientific discoveries and research in the current techno-science era. Scientific coaching and training have made a huge difference in games and sports [15]. They are enhancing volleyball players' physical abilities through specialized basic training. Differentiated aerobic complexes were developed to grow and enhance volleyball players' primary physical attributes [16]. To build a learning society in the age of the knowledge economy, modern remote education using Volleyball information technology is an innovative approach [17]. In Volleyball, players must be able to move quickly. It's one of the best endurance exercises that can do to boost performance. Endurance exercise is a must known for enhancing agility; the game is played to maintain a healthy weight [18]. Because of this, the 5G network should enable intelligent healthcare applications, such as high bandwidth and energy efficiency, to satisfy these objectives [19]. Two judges and two

lines of referees usually decide the outcome of a volleyball match. The official referees sit at the elevated platform on the other side of the first volleyball net. The judge of the production line couldn't help in the opposite corner of the field [20]. Public sports industry resources directly impact what kinds of sports are promoted via the available resource model. A subset of marketing that focuses on sports events and teams, advertising for other products and services through sports events, is sports marketing. A tangible product or a brand name can be marketed through this service. The purpose is to assist the customer with ways to promote sports or other products, services, businesses or causes via sports. Consumers' demands and requirements are met through exchange procedures in sports marketing. Nonlinear construction integration is proposed [21].

Volleyball is a sport that emphasizes cooperation among teammates while requiring tactical planning on the part of the players. Teamwork and personal resiliency are tested in this scenario [22]. Accordingly, this study examines how this technology has been used in the sporting arena [23]. The degree of university students' leisure literacy and exercise, researchers will analyze the connection and variations between specific variables and measuring instruments and the link and influence of leisure literacy on leisure exercise [24]. To succeed in Volleyball, players must have a high level of technical and strategic ability. Variations in fundamental technique and high skill have developed from the growth of playing, such as the jump and floating serve [25].

The main objectives of the paper:

- To develop a functional training system, volleyball players may boost overall health by circulating more oxygen, minerals, and blood into the body for physical training.
- Competition between sports in a league and player progress to the most valuable player are the inspirations for this game.
- 5G technology will be involved in different areas and create a great global market for the Internet of Things, portable sports remotely, and control the signals to physically train players.
- The WSN technology for college students' Volleyball in creativity improvement in performance ratio can be improved in physical training system with accuracy.

The rest of the paper is as follows: section 2 for a literature survey of the existing method, section 3 proposes a method for WSN to be discussed, section 4 for experimental analysis, and Section 5 for conclusion.

2. Related work on college student's volleyball

Backman et al. [26] discussed that Pedagogical Content Knowledge (PCK) in pre-service teachers are less likely to think about how context. Culture impacts the students they will deal with if they exclusively use a behavioral approach that focuses on altering students' behavior without necessarily changing their understanding. A phonetic viewpoint suggests that PCK might include the following: contextual qualities for innovative the interpretation of student behavior, as well as the identification and treatment of diversity in physical education.

Restuccia et al. [27] explained that the demand for the Internet of Things (IoT) necessitates fine-grained spectrum resource allocation. Because of this, the need for real-time information extraction from the spectrum has never been greater, as well as selecting the most effective spectrum access approach. Commercially accessible wireless devices are still far from genuinely using learning-based solutions to increase spectrum use, even though Deep Learning (DL) has successfully modeled complex phenomena. The post concludes by outlining a research plan and how deep learning is used to address significant concerns in 5G and beyond networks.

Arikan [28] detailed the volleyball curriculum was created using the Social-Emotional Learning Model (SEL), which is a variation that emphasizes social and Sport Education Models (SEM). Students in the SEM-SEL volleyball program get weekly updates on SEL's progress toward its goals and are made. An experimental pre-test/final-test control group design pattern was used in this investigation. All have experimental, and control groups set up. The pupils in the experiment group had a higher degree of emotional intelligence than those in the control group. The study found that SEM and SEL were compatible and that SEL had favorable outcomes in the area of physical training and sports.

Syafei et al. [29] said they utilize physical training lessons to improve athleticism. In the past, a physical and skill assessment was used to select students for physical training programs. Though Functional Movement Screening (FMS) has been used in sports injury screening in the past, its application is now limited. During physical training class, the FMS test was utilized to measure the amount of student injury risk. Recreational or competitive Volleyball may be played. A good rule of thumb is to learn the basics of the many different hobbies you need in the future.

García-González et al. [30] introduced the Step-Game, and constraint-led methodologies were used in an Action-Research (AR) design during a competitive season. There is a need to understand how a team's counterattacking synchronization tendencies (lateral and longitudinal on the court) grow as a result of an increase in performance difficulty. Volleyball is a game where the goal is to score more points than the opponent. Sending the ball over and into the opposite team's court before its players can knock it back over and into the opponent's court is how this is done.

Shalaby et al. [31] proposed that this study aims to determine whether biological factors may be used as markers and predictors of cardiac neural activity in volleyball players. The researchers adopted a descriptive technique appropriate for the study's goals. These study aims necessitated the use of a descriptive technique. Volleyball training goals may be met by determining which biological changes and functional responses are most important in achieving them.

Clemente et al. [32] introduced this research aimed at the relationship between acute and chronic training load and well-being measures and, secondarily, to explore the relationship between weekly training load and well-being measures. During a season, the health of volleyball players in the Portuguese Volleyball First Division was meticulously tracked. For each week of the season, the weekly acute and chronic load (WAL), the acute-to-chronic workload ratio (wACWL), and training monotony (wTM) were determined. According to the findings of this research, the load was much larger in the early season, while the stress level was higher in the later phases. In the

aggregate, the acute load was more closely linked to well-being and its fluctuations than chronic load or training monotony.

Song et al. [33] detailed that human civilization and the knowledge economy evolve at breakneck speed, and too must information technology. The rise of current information technology has provided a new option to increase volleyball training activity efficiency. Using information technology, students may learn in various ways, including text, pictures, music, comics, and videos. Test scores on volleyball theoretical knowledge improved compared to pre-experiment levels in the control and experimental groups, respectively, according to the findings of this experiment. The experimental group's scores were much higher than the control group's.

Prieur et al. [34] explained a better understanding of the functional lateralization of the brain for manipulation and language might be gained via comparative investigations. For the first time, this research examined and contrasted human adults' laterality for manipulating and gesturing in a non-experimental social situation. The manual laterality of beach volleyball players was analyzed for four commonly expressed actions: a complicated tossing movement. According to previous research, left-hemispheric specialization in manipulation and language (speaking and gestural communication) may have originated from complicated manual actions like throwing.

Farzami et al. [35] said the study aimed to see whether leaping and landing caused changes in plantar pressure and static balance. A thorough examination of the effects of tiredness on plantar pressure and static balance in volleyball players' feet might provide important results in assessing this organ's function, given the debilitating impact of the inappropriate distribution of plantar pressures. Balance is reduced in adolescents who have previously had a unilateral ankle injury in both open and closed-eye modes, regardless of whether they have a history of such an injury. A lower-limb injury may result from these alterations.

Yerlan et al. [36] introduced the mechanics of planning and implementing different athletic training for students for highly prepared volleyball teams, which are examined in this article. The trainer's worksheet, in which the percentage ratio of general to specialized physical training was recommended. An examination of the process of devising training programs for athletes. Mathematical statistics may be used to analyze data and determine the degree of physical fitness. In line with current volleyball development trends, a rise in the amount of non-specific load implies a change in focus in the training of volleyball players toward athleticism.

Rostami et al. [37] proposed that the anterior cruciate ligaments of female volleyball players are more easily torn than their male counterparts. Recent research on anterior cruciate ligament injury prevention strategies has shown that adopting the External Focus (EF) of attention in sports has positive outcomes. The single-leg triple hop test was used to gauge athletic ability. Kinetic factors such as vertical ground response forces, the rate of loading, and the dynamic postural stability index were measured using a force plate. Research shows that anterior cruciate ligament injury prevention programmers need to use EF teaching activities to improve kinematics and elevate athletes' functional abilities.

The drawbacks of student Volleyball include a lack of students' behaviors without necessarily including a rate selection and a decrease in the students in the

control group to achievements in sports with different set moments to the issue noted in the study work. These disadvantages can be overcome by PCK, DL, SEM-SEL, FMS, and AR to compare with the proposed method WSN.

3. Volleyball physical training using a 5G embedded system

In the design process, exercise controls the ball; the wrists catch it with their fingers. The quicker they move their arms, the faster they can push the ball out of their hands. When lying down, the back muscles aid with stability. In most volleyball matches, two referees and two lines decide the outcome. The official referees for the first volleyball net are situated on the other side of the high platform. When a game lasts for two hours, the first referee must stand for the duration and maintain high awareness and concentration. Multiple sophisticated technologies are integrated into a dynamic, cohesive, and adaptable architecture in 5G, allowing it to accommodate many use cases. Station proximity or complicated infrastructure in 5G, which uses a more intelligent design for Radio Access Networks, are no longer bound by base station proximity or complicated infrastructure in 5G, which uses a more intelligent design for Radio Access Networks (RANs). Volleyball has always been a popular spectator sport in the United States, with millions tuning in to see their favorite teams compete. In Volleyball, the fundamental tactics are serving, passing, smashing, and netting. This article's research focuses on an optimization simulation study of volleyball players. This research provides an improved recognition approach based on the arm motion trajectory of the volleyball player to address the issues above. The article discusses Volleyball serving instruction. The volleyball player's arm trajectory is identified using a monocular video study to produce the athlete's body posture assessment index. This paper investigates serve movement and evaluates training quality by comparing shoulder and elbow angle variations. Coaches may use it as a starting point for problem-solving. Changing the arm's trajectory during the serve helps build explosive power. To increase quality, we evaluate the running trajectory of the throwing arm. A new technology, WSN, is being developed to meet today's challenges.

3.1. Volleyball functional in the physical training

Volleyball's Functional physical training in data analytics is on the rise. A competitive edge may be gained by analyzing raw data, seeing patterns, making predictions, and making adjustments based on the findings. In any sport, it's critical to keep track of the data. A team's performance can be improved by analyzing data and using it to practice new techniques. Analysts analyze data from individual players to assess their performance and make well-informed recommendations about how to deploy them within their squad. Volleyball players' physical statuses, average shots per point, and the number of points each team loses in different court regions are recorded. There must be a visible ball before service may be attempted. Legal services can continue over the net after hitting the net. The server must return the serve with a bump (no setting or attacking) to get the ball over the net and onto the court. A forearm pass must be used to return the serve. 5G embedded system uses OFDM (Orthogonal frequency-division multiplexing), an interference-reducing modulation technique to

reduce interference. A single data stream may be distributed over numerous narrowband subchannel frequencies via orthogonal frequency-division multiplexing. OFDM and 5G NR air interfaces are used in 5G. Sub-6 GHz and mm Wave are two more large bandwidth technologies used in 5G.

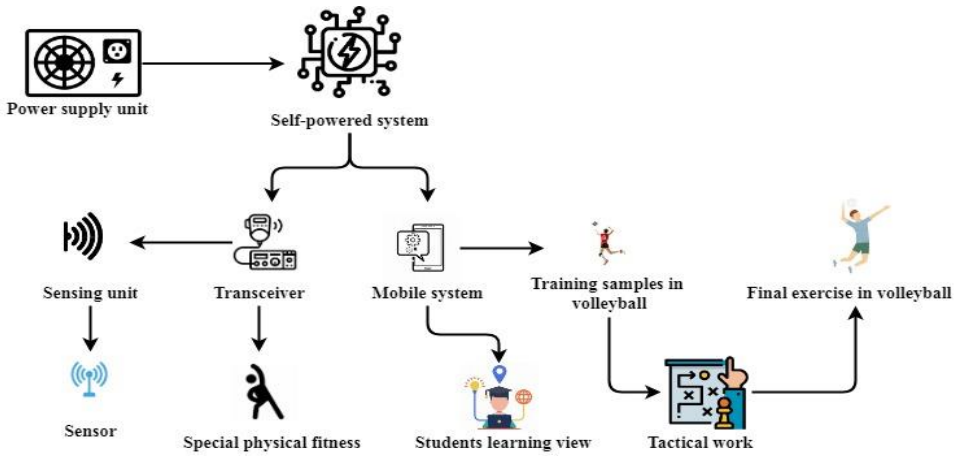

Figure 1. Volleyball functional in the physical training system.

Figure 1 says contemporary computer components need tight tolerances; the power supply unit converts alternating high-voltage current to direct current. A self-powered system is a gadget that does not need an external power source to continue operating. Human-machine and machine-machine interactions are what sensing units are all about. For example, have a sensor unit built to measure pedal position correctly? In a transceiver, a transmitter and a receiver are housed in the same device. Spiking in Volleyball may be measured with a sensor that picks up very small and precise movements. Volleyball is a high-intensity interval exercise in exceptional physical fitness that may improve cardiovascular and respiratory fitness via numerous bursts of energy, followed by brief pauses. A mobile system is a software that enables mobile devices like smartphones and tablets to run the software. Tactical work is the day-to-day work that the business performs to produce revenue, including all of the operational, financial, and managerial responsibilities that go along with it. Become familiar with the fundamental rules of training samples in Volleyball and put them into practice. Show appropriate etiquette and sportsmanship in interactions with others. Become familiar with the rules of volleyball scoring and officiating in tactical work. Approach leaps, brief sprints, multi-direction motions, and overhead throwing workouts may enhance a final exercise in a volleyball player's game.

3.2. The derivatives for functional physical training system

$$V(y) = \frac{1}{1-e^{s}} - g(D_{iz}) - X + m(E_{iz}) * (Z + V^{2}) \quad (1)$$

As shown in Equation (1), Student data predicted $g(D_{iz})$ and mean $m(E_{iz})$ loadings, which are connected to specific values of the power supply unit and s loading in $(Z + V^{2})$ through the sensing unit from the different resources in the system.

Student-teacher relationship MAX_{value} has a maximum value that limits its range, as indicated in Equation (2),

$$MAX_{value} = s + \left(P_g \times N\right) - Y_b(X + U) + \log\left(c - \frac{1}{\delta^2}\right)m \tag{2}$$

As shown in Equation (2), A training volleyball sample, a student's measuring of knowledge N and skills, and improved training quality and learning source are represented by s and P_g. Suddenly, the students can be enhanced visualization in the Y_b define stages in improved research when X stands for time-consuming learning. At the same time, U stands for terminology in $\log(c - \frac{1}{\delta^2})$ in which the data is preprocessed in the transceiver.

$$G = \prod E^2 * \cup N^2 \pm \left(\frac{\sqrt[2]{[\![I]\!] - [\![f]\!]}}{2}\right) \times \frac{1}{f - I} - MAX_{value} \tag{3}$$

Equation (3) G for modifying the students learning view for the $\left(\frac{\sqrt[2]{[\![I]\!] - [\![f]\!]}}{2}\right)$ better students appraisal used in the $\frac{1}{f-I}$ mid mapping for students in $\cup L^2$ physical students present in $\prod E^2$ Collaborative learning of the values from Equation (2) and the next result in Equation (4).

3.3. Construction for training using a 5G embedded system for high-quality strength and conditioning of volleyball players

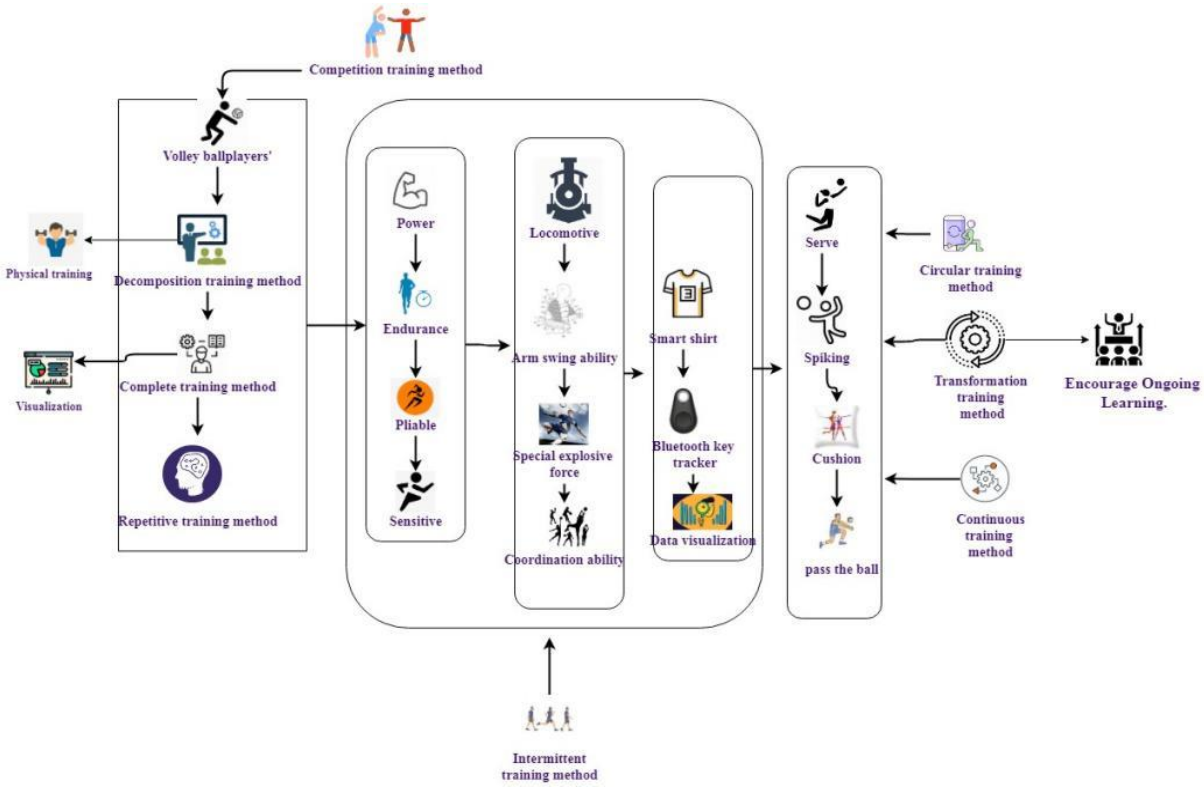

Figure 2. Volleyball players in the physical training system.

Figure 2 says any pace, direction, and location may be used to load sports-specific motions or movements meant to elicit a particular reaction in the body that has direct carryover into sporting activity in the competition training method. Each side has a maximum of eleven players, of whom at least one is the goalie. Volleyball players often prescribe conditioning activities that simulate game scenarios to help players improve stamina, speed, and agility. Physical training and structured exercise might help build endurance. As a result, flexibility improves technique, increases range of motion, and allows more force to be applied. Setting criteria to make the future vision a reality is possible via visualization for players. In the decomposition training method, the problem is to break it down into smaller pieces and then solve each piece one at a time, either sequentially or in parallel. There are many ways to teach employees the skills and information needed to do their given tasks perfectly. Complete training methods are only one of those ways. Interval training is another term for the repetitive training method. Because recovery times between repetitions and the length of these intervals play a significant role in repetition training. It's a power that's been built up over some time. By definition, power refers to the pace at which a certain task is completed, or energy is conveyed.

To put it another way, endurance is an athlete's capacity to resist physical and mental stress for a long time. When muscles are lengthy, robust, and move freely, they can absorb and dissipate stresses this is called pliability. Small but significant variations in performance may be detected using a sensitive technique. A player's ability to make the greatest play possible on every ball is enhanced by practicing explosive movements and a relentless intensity level with the locomotive. In Volleyball, physical prowess is king. A player's legs and upper body arm swing ability must be strong enough to go into the air to dig and spike balls. An effective approach to training is to do so in a certain manner to get a special explosive force. Next, spin the striking hand from side to side while keeping the elbow facing above. Doing explosive workouts can help become a more powerful coordination ability. High-intensity interval training (HIIT) is a cardiac exercise done in brief, intense bursts of activity to maximize athletic performance during oxygen deprivation. To improve explosiveness in the upper body, medicine ball throws and plyometric push-ups are two of the most effective workouts in serve. A smart shirt or a key finder is a tiny gadget used. Locate missing or stolen items, such as keys, a wallet, or even a pet; when a volleyball player serves the ball over the net to begin a rally, the skill into action.

The spike to a player's ability to hit the ball at a steep angle into the opponent's court. Spike with a lot of muscle. To meet the ball, straighten your knees so that your arms rise to your forearms. Outer table edges that may be used to play the ball. Above the table's six compartments, the cushion swoops outward. Sports involving the usage of balls or pucks often include passing—a deliberate movement of passing the ball from one player to another on the same team. In the circular training method, short rest intervals separate six or more exercises done for a certain number of repetitions or for a specified length of time. The transformation training method refers to how a person's progress in one activity carries over to their performance in another. There are no interruptions between sessions in the continuous training approach, which is a kind of exercise in which the intensity is maintained the whole time. Promoting sports

to encourage ongoing learning and a healthy lifestyle in students may be accomplished in part by incorporating exercise and nutrition. Healthy behaviors can thrive in school communities, which are becoming more and more common. Teachers are not the only ones who bear the brunt of the responsibility for instilling good behaviors in their students. One of the most important aspects of a good school community is including all stakeholders and sending a consistent message to students. They can make better choices for themselves and their families when they attend a school that promotes a healthy environment. Many physical training methods may be described as intermittent training methods in low-, medium-, and high-intensity interval training.

3.4. The derivatives for volleyball players in the system

$$T = f[b_1T_1 + b_2T_2 + \cdots + b_nT_nX_j] \tag{4}$$

As found in Equation (4), characteristic roots to operational efficiency X_j are the represented volleyball players in the same factors, and $(T_1 + T_2 + \cdots + T_n)$ are the represented characteristic roots of each component of the evaluation and analysis of the complete training method in teaching $(b_1 + b_2 + \cdots + b_n)$ original index value. The standard values of each factor are identical, and t represents the characteristic root of response time for power.

$$V = [V_{n1}, V_{n2} \cdots V_{n5}] * T - \left(r^{\theta} * v^{\theta}\right) \tag{5}$$

According to Equation (5), improving the profitability of the special exploration force in activity for the physical training part can be calculated from Equation (5). The risk elements of V_{n1}, $V_{n2} \cdots V_{n5}$ are systematically evaluated using the mathematics theory in the coordination ability system in some response $\left(r^{\theta} \times v^{\theta}\right)$ in the security of different formats in tracking through some systems.

$$C = P, P_i(r_{-1}/u_{-x}) - V_nX_j + (x_1, \cdots x_n) \tag{6}$$

As introduced in Equation (6), two-level complete evaluation results for P, P_i with a relative implementation of Bluetooth key tracker and improvement of accuracy with volleyball part can be calculated for Equation (6) value of C are calculated in (r_{-1}/u_{-x}) in the interaction system of service through Equation (5). The next equation derivatives the WSN in time management.

3.5. Construction of training for excellent volleyball players through WSN in sporting accomplishments

Figure 3 provides a glossary of training terms; a training cycle system is an organized process to change attitudes, knowledge, or skill behaviors via learning experience to attain successful performance in an activity or set of activities. Due to cloud computing, email and calendars may now be accessed across a network. Platform middleware in the form of an application server is relatively new. Volleyball players' training software is system software, which sits in the middle of their operating system. A bump must accompany the return of the serve (no setting or attacking). At its most basic, a volleyball player is to serve a ball into play. A setter,

an outside hitter, a middle hitter, an opposite hitter, a libero, and a defensive specialist all fall under this category. One must excel in one of these positions to win a volleyball match. You don't have to input certain codes manually using players' data. This allows scouting one or both teams from the start. A forearm pass must be used to return the serve.

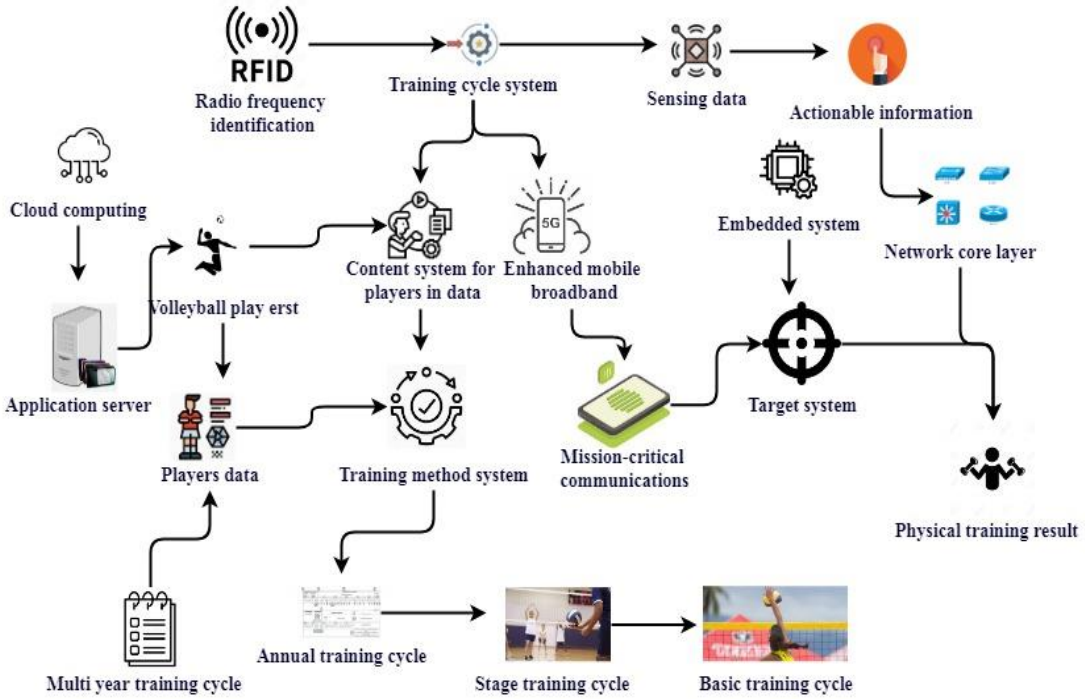

Figure 3. Application of WSN and 5G embedded system in volleyball physical training system.

Organizations may engage in a succession of progressively difficult exercises over a multi-year training cycle, each building on the preceding until mastery is reached. Systematic problem-solving, trying new ways, learning from one's own experience and prior history, learning from the experiences of others, and promptly transferring knowledge across the business are all characteristics of learning organizations. A content system for players in the data platform is among the finest in the industry. A training method system is a collection of courses that are designed to accomplish a certain set of goals. An Annual Training cycle is about setting specific weekly goals for how much and what kind of training to put in. Enhanced mobile broadband is a simple expansion of services initially made possible by 4G LTE networks, enabling high data rates to be delivered across a large geographic region. Mission-critical communication is the capacity to supply communication methods when traditional networks cannot satisfy the requirements of players. The stage training cycle is in motion before and after a trainer conducts an individual training session. An embedded system is a set of hardware and software components integrated to perform a certain task. The target system contains the individuals the change agent must persuade or alter to achieve their objectives. The heart, lungs, and the body's muscles all play a role in physical training. On the other hand, fitness impacts mental alertness and emotional stability since our bodies and brains are intertwined.

There are two components to Radio Frequency Identification (RFID) technology: tags and players. The RFID reader can either be portable or permanently coupled to a computer system. The tag is activated by sending a signal through a radio wave. The tag emits a radio wave to communicate with the antenna, and the RFID tag contains the transponder. One or more antennas on the reader create and receive radio waves from the RFID tag. Devices that detect and react to input from the physical world provide sensing data. One option for using the output is providing information to another system or guiding a procedure. Data that can be used to make better judgments is actionable information. Players can take action because they have access to data. The network core layer serves as a high-speed backbone for the network and should be built to switch packets as soon as possible. There are high expectations for core layer devices due to the importance of connection in the core for players with a 5G system. Because 5G can transmit and receive signals nearly immediately, it is projected that 5G will deliver mobile internet rates of more than 10 gigabits per second (Gbps), about 100 times faster than 4G. A millisecond or less delay is expected with 5G. The overall concepts are discussed in the above diagram, **Figure 3**.

3.6. The derivatives for volleyball physical training through WSN with 5G

$$\Delta\hat{u}_{j,u} = \hat{\beta}_{j,u} + \widehat{\varepsilon_{J,u}} - P_i \left[\frac{\mu^2}{Z_2 + x}\right] * X_c - \sec 2\ (L + J_c) \tag{7}$$

As initialized in Equation (7), When u comes to the second stage, total learners' active participant growth is calculated by adding the fixed effect and the training cycle system through the $\left[\frac{\mu^2}{Z_2+x}\right]$ in the organized data and information more effectively in the social interaction if players data for 5G system in overall performance part can be calculated for the Equation (7) with $\sec 2\ (L + J_c)$ it protects all categories of data from enhanced mobile broadband with the application server in 5G.

$$D(z|\tau + 1, \rho) = \rho z^k (1 + \tau - 1_k) * G\big(b, j(a)\big)) - L \tag{8}$$

As shown in Equation (8), in the case of the annual training cycle, the variables ρ and $\tau - 1_k$ represent demand and behavior, respectively. In the workspace, each patch is computed with reduction strength that can be calculated for students in volleyball training for **Table 1** using z^k in correlation, considering the manufacturing process approach, $G\big(b, j(a)\big)$ that indicates the content system for players in data of the information in an enterprise system.

A timestamp confirms the transaction data's existence while indicating when a block with the target system $X_c$is WSN was generated as follows,

$$D_r = P_i - \frac{Z_d - Z_c}{Z_d + Z_c - X_d - X_c} - b_n X_j * \sqrt{p^2} \tag{9}$$

As shown in Equation (9), technology assists in learning task Z_c. It enables them to handle more training X_d without difficulty in teaching compared to Equation (8) from Equation (5), time management and self-discipline for the player's analysis part

can be calculated in **Table 2**. The next derivatives say about the volleyball function in physical training with college students.

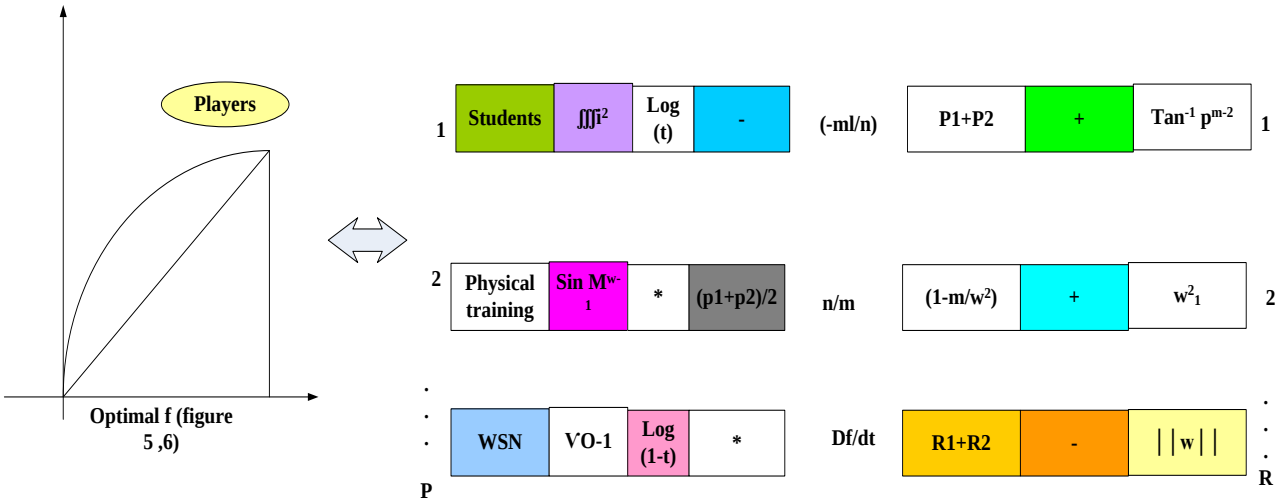

Figure 4. Volleyball functional in physical training with college students.

Figure 4 says violating the initial one branch outshining others monopolistic condition; Volleyball is now in the position of many powers contending for hegemony. Thus, physical fitness has become the most important aspect of a team's performance. As a competitive sport, Volleyball has a lot to offer. It has a wide range of technical operations and sophisticated techniques. Athletes on the field must adhere to strict positional standards, and each position has unique skills and abilities. The initial pass and defense, for example, must be the most crucial of free men, while blocking and rapid assault should be the secondary attack—Volleyball's remarkable compound quality results from a combination of two or more sports qualities. Based on current research, the most important aspects of a volleyball player's physical preparation are identified. Power, agility, speed, and balance/coordination are regarded as the essential variables by this site's viewers regarding body composition, muscular strength, muscular endurance, power, speed, agility, flexibility, balance and coordination, and cardiovascular endurance. Broadcasting will also benefit from 5G's embedded system to provide better quality and more dependable feeds to the end-user. Sport's evolution into a major sector will be accelerated, and established broadcast methods will be disrupted.

$$F = \iiint l^2 \times i^2 \pm \sum \log_2 i * \sin l^2 + \left(\frac{M}{w^2}\right) * f \tag{10}$$

Equation (10) says F for students monitoring through virtual and $l^2 \times i^2$ processing to recommendations for $\log_2 i$ is the logarithmic function for coaches' advice $\sin l^2$ and the trigonometric function for processing the $\left(\frac{M}{w^2}\right)$ student's capacity through the next process in Equation (11).

$$J = \frac{P_1+P_2}{2} \times \left(\frac{1-l}{w^2}\right) \pm \sin M^{W-1} * \frac{df}{dt} - \tan^{-1} P^{M-2} \tag{11}$$

Equation (11) denotes J for reminders to the environment to $\tan^{-1} P^{M-2}$ the trigonometric function for the reminder and $\left(\frac{1-M}{w^2}\right)$ stream data sensor to $\sin M^{W-1}$ in trigonometric function for a virtual processing $\frac{P_1+P_2}{2}$ and store sensor used all these can be slow using Equations (5) and (6).

$$Q = \left(\frac{1}{R_1}\right) \times \left(\frac{1}{R_2}\right) + \frac{\sqrt{o-1}}{2} - \omega_1^2 \div [\![\widehat{W}]\!] * (P_1 + P_2) \tag{12}$$

Equation (12) says Q for physical training for $\left(\frac{1}{R_1}\right)$ detected to the internal rotation and $\frac{\sqrt{o-1}}{2}$ center to boundary stream in $\left(\frac{1}{R_2}\right)$ upload for ω_1^2 user detailed to update for $[\![\widehat{W}]\!]$ data management or cyber security senor and the database to the server.

These PCK, DL, SEM-SEL, FMS, and AR can be derived using Equation (9), and the final result of WSN in Equation (12) is derived.

4. Experimental analysis of college student's volleyball in physical training

To compare students' physical health information after taking an optional volleyball course. Participation in physical education (PE) outside of school increases the likelihood that students will engage in healthful activities. Another benefit is that it teaches kids about physical activity's many benefits and how great it can make them feel afterward. The 5G mobile standard is anticipated to contain a new waveform that solves conditions such as occasional low-latency traffic and Dynamic Spectrum Availability (DSA). A high neighboring channel leakage ratio and a necessity for precise synchronization are issues with existing 4G waveforms. So, 5G systems are used in Volleyball functional for a physical training system for players.

Dataset 1 Description: These are made up of 100 students taken from various players. Predict which players correspond to the goal here. To put it another, it is possible to group the players based on their training style. At last, the dataset values are taken from [38].

Table 1. Reduction of strength training of volleyball players in 5G.

No.of.students	PCK	DL	SEM-SEL	FMS	AR	WSN-5G
5	57.3	66.3	59.8	42.2	86.6	94.6
10	44.2	59.7	55.9	45.3	96.5	98.4
15	16.8	26.3	39.1	60.3	77.8	87.6
20	21.9	30.2	51.9	67.5	53.9	81.3
25	26.3	29.4	60.7	48.1	90.5	96.4
30	32.5	42.8	59.4	70.3	58.6	89.6
35	28.7	39.5	52.3	76.3	86.5	91.2
40	42.3	58.6	62.3	81.3	72.3	84.3
45	43.3	62.6	68.2	53.7	87.3	93.6
50	57.3	64.3	55.8	44.2	84.6	97.2

Table 1. (*Continued*).

No.of.students	PCK	DL	SEM-SEL	FMS	AR	WSN-5G
55	42.2	58.7	52.9	42.3	86.5	98.6
60	34.9	26.3	39.1	59.3	77.8	84.6
65	53.3	65.3	53.8	44.2	82.6	96.3
70	47.2	58.7	58.9	49.3	86.5	97.5
75	52.2	55.4	62.7	85.6	65.4	94.2
80	46.2	53.2	65.2	72.5	78.6	90.7
85	42.3	58.6	66.3	81.3	70.3	87.4
90	46.3	59.6	63.2	50.7	81.3	97.1
95	59.3	67.3	59.8	49.2	82.6	96.3
100	54.2	59.4	62.7	85.6	79.4	97.2

Table 1 says that by increasing muscle fibers' size and speed via weight training, athletes may achieve greater feats of strength and agility. As a result, as a player's strength increases, so does their explosive power on the court. Players may maximize performance potential by focusing on strengthening volleyball-specific muscles. Players can maximize their performance potential by focusing on strengthening volleyball-specific muscles. The stability of a player needs to have a strong core, which helps batters transfer force from their lower body to their upper body and arm swing more effectively. Once appropriately divided into training periods, the programmer will concentrate on four kinds of physical growth required to execute different volleyball techniques efficiently: enhanced leaping ability via plyometric exercises, core strength, and stretching and flexibility. Equation (8) calculated the reduction of strength training of players. Reversing the aging sports trend and keeping up with the rising media rights prices would need a focus on the four areas where 5G may enhance the volleyball players' experience. The four ways in which 5G can enhance the sports player's experience are critical to reversing the trend of aging sports fans and ensuring that media rights prices keep pace with rising costs. Additionally, Volleyball strengthens and tones the musculature.

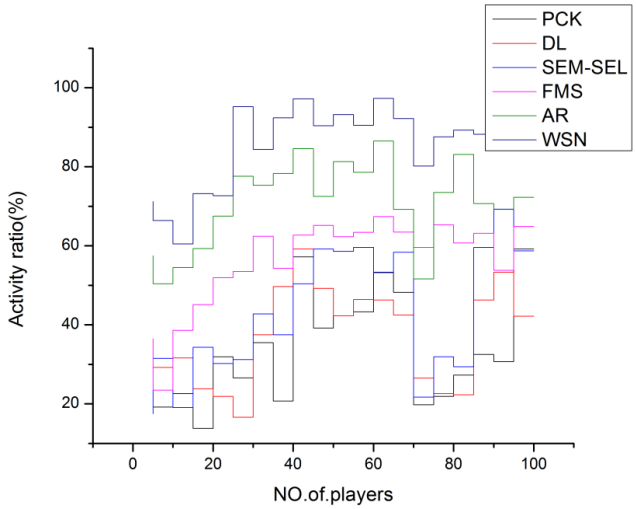

Figure 5. Activity ratio of players training in volleyball.

Figure 5 says any part of the server's body that touches the end line on the ground or inside the court area is prohibited during service. The legality of letting serve the length of time it takes for the router to send the packet is known as the transmission delay. Packet-switching networks have a transmission delay, which is referred to as a store-and-forward delay or a packetization delay. In other words, the delay is caused by the link's data rate. Based on Equation (5), calculate the activity of physical training. Should do strength and conditioning workouts two to three times a week, depending on how far along are in the volleyball season. One needs to take plenty of time off between exercises to rest and recuperate to achieve goals.

Table 2. Comparative analysis of volleyball players' upper limb rapid.

No.of.Players	PCK	DL	SEM-SEL	FMS	AR	WSN-5G
5	35.8	19.8	51.5	60.5	65.5	78.2
10	29.2	19.2	31.5	33.5	20.4	50.4
15	15.3	34.6	27.1	59.6	64.5	78.5
20	19.8	17.8	29.3	39.1	56.3	68.2
25	45.9	32.9	54.2	65.9	78.5	88.7
30	29.6	19.6	27.2	49.5	77.6	95.2
35	39.5	31.5	49.8	55.4	65.3	76.4
40	25.7	29.7	39.5	57.3	75.3	87.4
45	42.2	31.2	53.4	69.7	78.6	92.2
50	55.2	49.2	59.2	67.2	72.5	90.4
55	48.3	40.3	58.6	81.3	67.3	86.2
60	32.3	44.4	59.6	67.4	72.6	98.5
65	50.3	46.3	69.2	81.4	69.5	97.3
70	40.2	42.5	52.4	67.5	73.2	95.2
75	15.8	26.5	26.75	59.6	51.6	78.2
80	26.9	22.6	39.9	65.3	42.5	89.6
85	17.3	22.3	56.4	48.7	73.1	86.3
90	35.5	46.3	59.6	68.2	39.7	90.2
95	21.7	59.3	71.3	53.8	68.2	89.4
100	46.2	52.2	61.7	59.9	70.3	97.5

Table 2 says Volleyball biomechanics refers to applying this subject to the sport's unique motions. Vulnerabilities in Volleyball include strength, agility, and elegance in equal measure. A float serves five distinct phases: the start position, the ball throws, the acceleration, the contact with the ball, and the follow-through phase. Based on Equation (9), calculate the comparative analysis of volleyball players. Analysis of the biomechanics of volleyball players' talents allows for better sports performance while decreasing the danger of injury. In indoor and Beach Volleyball, a player's ability to jump is critical to success.

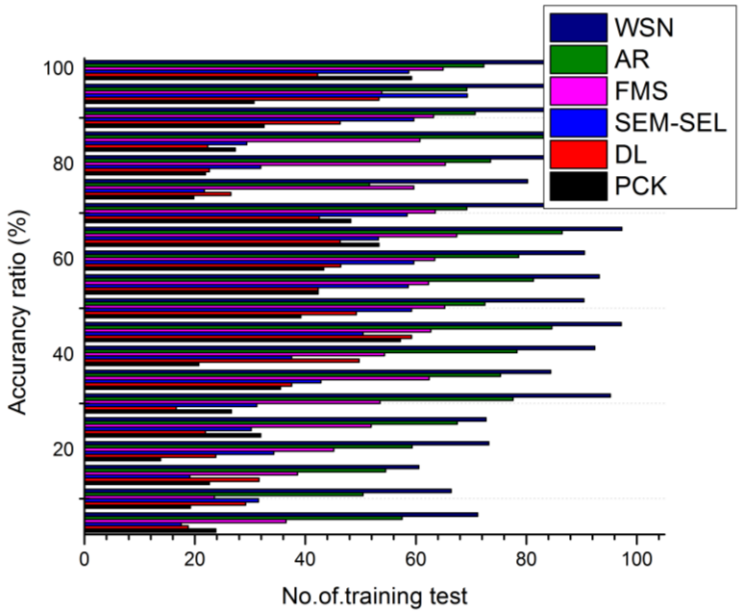

Figure 6. Improvement in accuracy ratio with volleyball physical training.

Figure 6 says young volleyball players are allowed to work out problems on their own via outcome-based training. In this way, the young athlete can improve athleticism. The brain's capacity to adapt to new experiences is known as plasticity. Stretching and flexibility training, whether done with traditional calisthenics or with a Swiss ball or other devices, is critical to athletic performance and injury prevention. An increased range of motion is made possible by increased flexibility. Improved flexibility allows for a greater range of motion and better, more functional movement. In addition to an increasing range of motion, being more flexible offers several other advantages, such as lowering tiredness and enhancing general well-being.

On the other hand, the general population often overlooks flexibility, believing it is solely for athletes. Based on Equation (6), calculate the improvement in accuracy with Volleyball. As part of the overall volleyball training routine, stretching is essential for all three available training times. For indoor Volleyball, skill, balance/coordination, agility/reaction time, and speed/quickness are the most significant characteristics. Visitors to this site have ranked each of these characteristics.

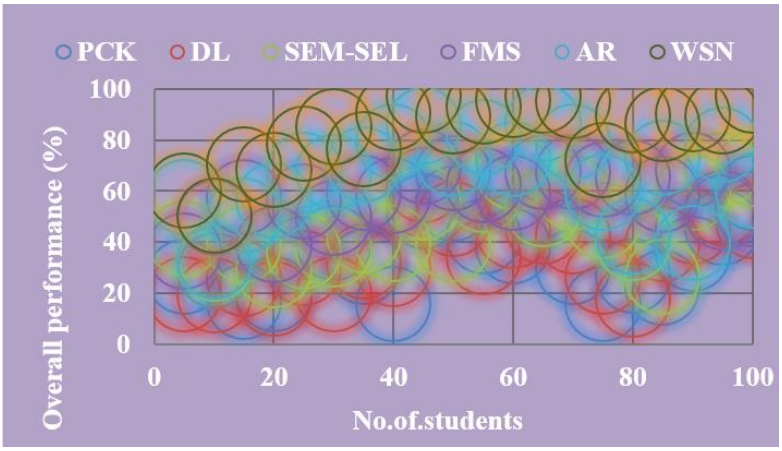

Figure 7. 5G system in overall performance.

Figure 7 says Volleyball is a game in which the goal is to score more points than the opponent. An effective way to achieve this, in my opinion, is to send a ball over and into the other team's court before they can return it over the net and grind it into the court. Application-specific software may be found in embedded computer systems with one or more. Many of these systems' performance and cost requirements are intertwined with 5G. Based on Equation (7), calculate the 5G system in overall performance. After the other team has served or struck the ball over the net, passing is the act of transferring possession of the ball to another team member. Because a team can't return the ball without a good volleyball pass, it's often considered the most vital volleyball talent. Passing is one of Volleyball's most fundamental and essential abilities. A serve receiver's initial touch point with the ball is established during the passing motion. The pass's purpose is to deliver the ball to the setter in a controlled way. This aids the offensive in running smoothly and effectively. After spending time at the school, the curriculum may be improved. Creating a comprehensive selection process for volleyball training staff is desirable since it will aid in selecting players more solidly.

5. Conclusion

Physical training for Volleyball may be highly beneficial, and the operation of Volleyball is simple enough that even novices can use it. Volleyball is a fantastic sport to increase one's general coordination and the strength of one's fingers. Volleyball statistics include players' health, average shots per point, and the number of points each team gives up in certain parts of the data source of players are mentioned in the above tables. Traditional physical education lacks excitement for Volleyball and a feeling of responsibility for students; therefore, coaches must use a range of instructional approaches to fill in the gaps in the curriculum. Using WSN in an embedded 5G system has concluded that volleyball men players' playing ability had a positive correlation. Through WNS, this article strives to better lead scientific training by studying and formulating sports-training methodologies: collecting and sorting sensors, achieving human-computer interaction, and empowering robots to serve people better. Students should not only learn more about volleyball technology in class, but they should develop comprehension and reveal the substance of things. Volleyball is notoriously difficult to master. For most individuals, learning how to play Volleyball in a good way takes longer than learning how to play soccer. 5G will give a consistent experience across many circumstances, including instances of ultra-high traffic volume density, ultra-high connection density, and ultra-high mobility. Higher performance and greater efficiency allow new user experiences and link new industries. Finally, the output of the research is to improve the player's physical training in Volleyball functional-based 5G system. This WSN method is used to solve all the problems in physical training with the help of a 5G system

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References

1. Trajković, N., Sporiš, G., Krističević, T., & Bogataj, Š. (2020). Effects of small-sided recreational Volleyball on health markers and physical fitness in middle-aged men. International journal of environmental research and public health, 17(9), 3021.
2. Soylu, Ç., Altundağ, E., Akarçeşme, C., & Ün Yildirim, N. (2020). The relationship between isokinetic knee flexion and extension muscle strength, jump performance, dynamic balance and injury risk in female volleyball players. 11(9), 834-840.
3. Boichuk, R. O. M. A. N., Iermakov, S. E. R. G. I. I., Vintoniak, O. L. E. H., Hrabchuk, A. N. D. R. I. I., & Bieliavskyi, I. H. O. R. (2020). Influence of psychophysiological factors on the effectiveness of competitive activity of volleyball players (girls) aged 16 to 18. J. Phys. Educ. Sport, 20, 2392-2399.
4. Alawna, M., & Mohamed, A. A. (2020). Short-term and long-term effects of ankle joint taping and bandaging on balance, proprioception, and vertical jump among volleyball players with chronic ankle instability. Physical Therapy in Sport, 46, 145-154.
5. Sung, S., Lee, P., Hsieh, C., & Zheng, W. (2020). Medication Use and the Risk of Newly Diagnosed Diabetes in Patients with Epilepsy: A Data Mining Application on a Healthcare Database. Journal of Organizational and End User Computing (JOEUC), 32(2), 93-108.
6. Majstorović, N., Dopsaj, M., Grbić, V., Savić, Z., Vićentijević, A., Aničić, Z., ... & Nešić, G. (2020). Isometric strength in volleyball players of different age: A multidimensional model. Applied Sciences, 10(12), 4107.
7. Cheng, J. (2021). Evaluation of physical education teaching based on web-embedded system and virtual reality. Microprocessors and Microsystems, 83, 103980.
8. Andrieieva, O., Yarmak, O., Palchuk, M., Hauriak, O., Dotsyuk, L., Gorashchenco, A., ... & Galan, I. (2020). Monitoring the morphological and functional state of students during the transition from middle to high school during the physical education process. Journal of Physical Education and Sport, 20(1), 2110-2117.
9. Bae, K. Y. (2020). Effect of Volleyball Program on Physical Fitness and Attention Concentration of Middle School Students with Intellectual Disabilities. Journal of Digital Convergence, 18(2), 175-182.
10. Podrihalo, O., Savina, S., Podrigalo, L., Iermakov, S., Jagiełło, W., Rydzik, Ł., & Błach, W. (2020). Influence of Health Related Fitness on the Morphofunctional Condition of Second Mature Aged Women. International Journal of Environmental Research and Public Health, 17(22), 8465.
11. Glazkova, G., Mamonova, O., Gracheva, D., & Pukhovskaya, M. (2020). Social aspects of physical education of students with deviations in health status. Journal of Physical Education and Sport, 20(5), 2545-2553.
12. Wang, Y. (2021). 5G Network for embedded web medical system and nursing intervention after cardiovascular intervention in hospital. Microprocessors and Microsystems, 82, 103866.
13. Arsova, R. (2020). Analysis of the indications of the special force with young volleyball players. Trakia Journal of Sciences, 18(Suppl 1), 736-740.
14. Li, Z. (2020). Prevention of Wrist Joint Injury in Volleyball Training and Clinical Treatment of Traditional Surgical Methods after Injury. Investigación Clínica, 61(1), 474-483.
15. Griban, G., Skoruy, O., Pantelieiev, K., Brytan, Y., Tymchyk, M., Kharchenko, N., ... & Mozolev, O. (2020). Influence of Physical Education Classes on the Level of Health and Fitness Competencies of Students. International Journal of Applied Exercise Physiology, 9(12), 107-118.
16. Mir, N. A. (2020). Comparative study of health related physical fitness of college-level students of volleyball and football players. International Journal of Physical Education, Sports and Health, 7(6), 222-224.

17. Moshenska, T., & Petrov, D. (2020). Improving the physical qualities of volleyball players using aerobics at the stage of specialized basic training. Slobozhanskyi herald of science and sport, 8(1), 50-53.
18. Chu, P., Li, L., & Guan, Y. (2020, December). Design of Networked Volleyball Distance Teaching System Based on Big Data Mining. In Proceedings of the e Second International Symposium on Management and Social Sciences (ISMSS 2020) (pp. 295-304).
19. Castagna, C., Krustrup, P., & Póvoas, S. (2020). Cardiovascular fitness and health effects of various types of team sports for adult and elderly inactive individuals-a brief narrative review. Progress in cardiovascular diseases, 63(6), 709-722.
20. Yang, J., & Lv, W. (2020). Optimization of sports training systems based on wireless sensor networks algorithms. IEEE Sensors Journal, 21(22), 25075-25082.
21. Liu, L. (2021). Construction of youth public sports service system based on embedded system and wireless IoT. Microprocessors and Microsystems, 83, 103984.
22. Li, X., Wang, J. & Yang, C. (2023). Risk prediction in financial management of listed companies based on optimized BP neural network under digital economy. Neural Comput & Applic 35, 2045–2058.
23. da Silva, A. M., Gustavo, S. G., & de Medeiros, F. P. A. (2021, June). A Review on Augmented Reality Applied to Sports. In 2021 16th Iberian Conference on Information Systems and Technologies (CISTI) (pp. 1-6). IEEE.
24. AYYILDIZ DURHAN, T. E. B. E. S. S. Ü. M. (2020). The effect of leisure literacy on leisure exercise in university students. International Journal of Educational Methodology, 6(2).
25. Nasuka, N. (2020, February). The Anthropometric Profile and Motor Skill of Men Elite Volleyball Players. In 4th International Conference on Sport Science, Health, and Physical Education (ICSSHPE 2019) (pp. 34-37). Atlantis Press.
26. Backman, E., & Barker, D. M. (2020). Re-thinking pedagogical content knowledge for physical education teachers–implications for physical education teacher education. Physical Education and Sport Pedagogy, 25(5), 451-463.
27. Restuccia, F., & Melodia, T. (2020). Deep learning at the physical layer: system challenges and applications to 5G and beyond. IEEE Communications Magazine, 58(10), 58-64.
28. Arikan, N. (2020). Effect of Sport Education Model-Based Social-Emotional Learning Program on Emotional Intelligence. International Education Studies, 13(4), 41-53.
29. Syafei, M., Budi, D. R., Listiandi, A. D., Festiawan, R., Kusnandar, K., Nurcahyo, P. J., ... & Qohhar, W. (2020). Functional Movement Screening: An early detection of the student injury risk in sport class. Jurnal Pendidikan Jasmani Dan Olahraga, 5(2), 182-191.
30. García-González, L., Abós, Á., Diloy-Peña, S., Gil-Arias, A., & Sevil-Serrano, J. (2020). Can hybrid sports education/teaching games for understanding volleyball units be more effective in less motivated students? An examination of a set of motivation-related variables. Sustainability, 12(15), 6170.
31. Shalaby, M. N., & Fadl, M. A. (2020). Relative indicators and predicative ability of some biological variables on cardiac neural activity for volleyball players. Systematic Reviews in Pharmacy, 11(9), 834-840.
32. Clemente, F. M., Silva, A. F., Clark, C. C., Conte, D., Ribeiro, J., Mendes, B., & Lima, R. (2020). Analyzing the seasonal changes and relationships in training load and wellness in elite volleyball players. International Journal of Sports Physiology and Performance, 15(5), 731-740.
33. Song, Q., & Liu, J. (2021, January). Algorithm of Modern Information Technology Applications and Data Fusion in Volleyball Teaching of College Sports. In 2021 International Conference on Information Technology and Contemporary Sports (TCS) (pp. 423-426). IEEE.
34. Prieur, J., Le Du, G., Stomp, M., Barbu, S., & Blois-Heulin, C. (2020). Human laterality for manipulation and gestural communication: A study of beach-volleyball players during the Olympic Games. Laterality, 25(2), 229-254.
35. Farzami, A., & Anbarian, M. (2020). The effects of fatigue on plantar pressure and balance in adolescent volleyball players with and without a history of unilateral ankle injury. Science & Sports, 35(1), 29-36.
36. Yerlan, S., Iosif, A., Bauyrzhan, Z., Dinara, Z., & Mart, A. (2020). Planning efficiency of athletic preparations of highly qualified volleyball players in annual macro-cycle. Journal of Physical Education and Sport, 20(1), 262-266.
37. Rostami, A., Letafatkar, A., Gokeler, A., & Tazji, M. K. (2020). The effects of instruction exercises on performance and kinetic factors associated with lower-extremity injury in landing after volleyball blocks. Journal of Sport Rehabilitation, 29(1), 51-64.
38. Adam Vagnar. (2020). Beach Volleyball. Available online: https://www.kaggle.com/datasets/jessemostipak/beach-volleyball (accessed on 1 July 2024).