



The effect of a training program accompanied by mental training in developing sensorimotor perception and overcoming learning stability in improving the skills of Spiking and Blocking for female volleyball players.

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Abstract

Mental training constitutes a fundamental component in preparing athletes for competition. It involves the visualization of movements, their sequence, situational contexts, objectives, and all dimensions of competitive performance. The first aim of the current study was to examine the impact of a training program accompanied by mental training on the development of selected perceptual-motor abilities related to the skills of spiking and blocking, and the second aim was to investigate the effect of a training program accompanied by mental training in overcoming the learning plateau in the skills of spiking and blocking among the female volleyball players of Sanharib (Sennacherib) Sports Club. Using an experimental approach, the program was tested on eight players (excluding setters and liberos) during their 2022–2023 preseason preparation for a regional championship. The results revealed notable improvements: participants significantly boosted their spiking accuracy and perceptual-motor skills (e.g., coordination, timing) after the intervention. However, blocking skills showed only marginal gains, suggesting this technique may require more specialized training. Crucially, the combined mental-physical regimen helped athletes push past the “learning plateau,” a common hurdle in skill mastery. These findings highlight the importance of mental training in sports not just for focus but for reshaping how athletes process complex movements. By blending cognitive exercises with practice, coaches can foster resilience and adaptability, offering a blueprint to refine training programs for competitive athletes. The study underscores the value of holistic approaches in sports science, where mindset and mechanics work hand-in-hand to unlock peak performance.



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تأثير برنامج تدريبي مصحوب بالتدريب العقلي في تطوير بعض القدرات الادراكية الحس - حركية والتغلب على ثبات (هضبة) التعلم لمهارتي الضرب الساحق وحائط الصد بالكرة الطائرة

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المخلص

يُعدّ التدريب العقلي عنصراً جوهرياً في إعداد الرياضيين لخوض المنافسات، إذ يتضمن استحضار الحركات بصرياً، وتسلسلها، وسياقاتها الموقفية، وأهدافها، وجميع أبعاد الأداء التنافسي. حيث يمثل الهدف الأول للدراسة الحالية في:

- معرفة أثر برنامج تدريبي مصحوب بالتدريب العقلي على تطوير بعض القدرات الإدراكية الحس-حركية المرتبطة بمهارتي الضرب الساحق وحائط الصد، فيما يمثل الهدف الثاني في:

- التحقق من أثر البرنامج ذاته في تجاوز هضبة التعلم لمهارتي الضرب الساحق وحائط الصد لدى لاعبات نادي سنحارب الرياضي بالكرة الطائرة.

استخدمت الدراسة المنهج التجريبي، وطُبق البرنامج على ثماني لاعبات من الفريق (باستثناء اللاعبتان المعدتان والليبرو) خلال فترة التحضير للموسم الرياضي ٢٠٢٢-٢٠٢٣ قبل المشاركة في بطولة اندية العراق، وأظهرت النتائج تحسناً ملحوظاً، حيث سجلت المشاركات زيادة معنوية في دقة الضرب الساحق وفي بعض القدرات الإدراكية الحس-حركية (مثل التوافق والتوقيت) بعد تنفيذ البرنامج. في المقابل، حققت مهارة حائط الصد تحسناً طفيفاً فقط، مما يشير إلى أن هذه المهارة قد تتطلب تدريباً أكثر تخصصاً. والأهم أن المزج بين التدريب العقلي والبدني مكن اللاعبات من تخطي "هضبة التعلم"، وهي مرحلة شائعة تمثل تحدياً في عملية إتقان المهارات.

وتؤكد هذه النتائج أهمية التدريب العقلي في المجال الرياضي، ليس فقط في تعزيز التركيز، وإنما أيضاً في إعادة تشكيل الطريقة التي يعالج بها الرياضيون الحركات المعقدة. كما يبيّن أن دمج التمارين المعرفية مع التدريب العملي يمكن أن يعزز من مرونة الرياضيين وقدرتهم على التكيف، مما يوفر إطاراً إرشادياً لتطوير البرامج التدريبية للاعبين في المنافسات. وتبرز الدراسة قيمة الأساليب الشمولية في علوم الرياضة، حيث يتكامل الجانب الذهني مع الجانب الميكانيكي لبلوغ الأداء الأمثل.

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1-Introduction :

1 -1 Importance of Research:

Mental training constitutes a fundamental component in preparing athletes for competition. It involves the visualization of movements, their sequence, situational contexts, objectives, and all dimensions of competitive performance. Accordingly, mental training is regarded as an essential part of athletic preparation and plays a critical role in the learning process—no less significant than physical preparation for competition. Moreover, it enhances the athlete's ability to anticipate and perform effectively in future events. (Shimon , 1996 , p 30–31) and (Alkadhimi ,(2000 , p145). In addition, mental training also contributes to skill development, as accurate mental imagery by the athlete strengthens neural pathways, thereby facilitating correct performance execution . (Saudi et al, 2018, p. 257–258).

However, the process of motor learning aligns closely with sports training in terms of the transmission of information from the coach or instructor to the athlete, as well as in the behavioral changes that occur because of actual practice. Both the educational and training processes share the common objective of developing the learner's or athlete's physical attributes, motor and technical skills, and tactical abilities(Anoya, 2002,p.100)

Therefore, it is essential to implement mental and psychological training programs that support athletes in visualizing motor skills, thereby achieving optimal outcomes in both learning and training. From this perspective, mental training primarily concerns the regulation of self-imagery related to skill performance (Abdullah & Arab. 2017, p. 188).

Also, perceptual-motor cognition plays a vital role in achieving precision and distinction in the spatial and temporal characteristics of movement. Determining the temporal relationships within motor actions and coordinating movements are considered complex perceptual processes, which rely on precise coordination between muscle contraction and relaxation. Spatial perception, in particular, holds significant importance in motor performance, with vision playing a central role in this domain. Through spatial perception, many skill-based and planning-related tasks can be effectively executed (Mahmoud, 2019, p. 262).

The level of motor abilities reflects the capacity of the nervous system to control the movements intended for learning. Additionally, motor experience significantly influences the speed at which new skills are acquired. On the other hand, cognitive level and intellectual capacity play an important role in the learning process, a role that becomes even more evident when learning

complex motor skills that require clear mental engagement. (Al-Suwaidi, 2004. P. 17)

Moreover, Perceptual-motor cognition is a broad and significant topic, as sensation and perception are integral to the nature of every athletic activity. As such, perceptual-motor ability is considered a part of psychological preparation and is essential to any sport or skill. Proprioception, or the sense of muscle movement, represents the core component of perceptual-motor abilities. Developing this capacity—particularly in the fine muscles of the arm—is especially crucial for male and female volleyball players (Abdulrahman, 2016, p. 44).

Therefore, the process of motor learning requires a clear understanding of the goal and purpose of the movement, as these form the core of the learning process. This understanding enables the learner to grasp the motor task assigned to them. Moreover, the motor tasks given to the learner or athlete—expressed in appropriate language—must align with the individual's age and motor experience (Ibrahim, 2001.p.24).

“The learning plateau represents a temporary phase of stability in the development of motor skills, during which significant improvement in athletic

performance comes to a halt despite ongoing training”.

(Wulf,&Adams,2022.p132)

In learning curves, there may appear a period during which no noticeable improvement occurs in the performance of the athlete or learner, despite continued practice. During this time, the learning measure remains constant, showing no significant change across several consecutive attempts. This period is referred to as the "plateau"—the ceiling or point of learning reached by the athlete or learner—where performance stabilizes and progress or improvement becomes zero. There are individual differences of the learning plateau due to varying abilities. It is often preceded by modifications in performance. Notably, learning plateaus are not considered a necessary phenomenon in all learning curves (Al-Dilemi, 2016, p. 119).

In many cases, this plateau may represent the physiological limit, which is a type of plateau where the athlete or learner experiences a state of performance stagnation, ceasing to improve or progress. This limit may only be overcome by adopting a different method or approach to training or learning. The physiological limit represents the most challenging phase in the training or learning process—a critical period that may lead to loss of motivation, desire, and enthusiasm on the part of the athlete or learner. It is the highest point the individual can reach, beyond which further improvement

becomes unattainable, and performance may begin to decline. (Mahgoub , 1998, p.116) and (Twana & Araz,2024.p287-288)

To overcome the learning plateau, it is preferable to introduce new methods or approaches to training to develop the motor program of the skill. The development of the motor program occurs by subjecting it to new and challenging demands, allowing the athlete or learner to adapt to the new conditions. One such method, for enhancing the motor program of a specific skill involves performing it under unfamiliar or non-routine conditions for the athlete or learner (shalash, 2011, p. 179).

The importance of the current research lies on determining the extent to which a training program accompanied by mental training contributes to the development of selected perceptual-motor cognitive abilities, and to what degree it can be utilized to overcome the learning plateau in the skills of spiking and blocking among the female volleyball players of Sanharib (Sennacherib) Sports Club.

1 –2 Research Problem:

Through the researcher's review of numerous studies and research addressing the topic of overcoming the learning plateau, no study— to the best of his knowledge—has explored the use of mental training as a method

for overcoming the learning plateau in volleyball, specifically among female athletes.

As a lecturer in motor learning and volleyball at the College of Physical Education and Sport Sciences at the University of Duhok, and with years of coaching experience across all age groups and both genders, the researcher has closely observed the players of Sanharib (Sennacherib) Sports Club over several seasons. He has identified a recurring barrier that hinders the athletes from progressing in their technical, physical, and skill levels, thereby preventing them from achieving optimal results. Specifically, he observes a lack of attention to the mental aspect of training and the development of perceptual and perceptual-motor abilities—despite their crucial role in enhancing player performance.

Accordingly, the research problem centers on answering the following question:

Will a training program accompanied by mental training contribute to the development of certain perceptual-motor cognitive abilities, and how can this impact help in overcoming the learning plateau in the skills of spiking and blocking among the female volleyball players of Sanharib (Sennacherib) Sports Club?

1 – 3 Research Objectives:

The study aims to:

1- examine the impact of a training program accompanied by mental training on the development of selected sensory-motor related to the skills of spiking and blocking among the female volleyball players of Sanharib (Sennacherib) Sports Club.

2-investigate the effect of a training program accompanied by mental training in overcoming the learning plateau and developing the skills of spiking and blocking among the female volleyball players of Sanharib (Sennacherib) Sports Club.

1 – 4 Research Hypotheses:

The study hypothesizes that:

1- there are statistically significant differences between the pre-test and post-test results regarding the impact of the training program accompanied by mental training on the development of certain Sensory-motor in favor of the post-test.

2-There are statistically significant differences between the results of the pre- and post-test in overcoming learning plateau and improving the skills of spiking and blocking in favor of the post-test.

1 – 5 Scope of the Research:

-human Scope: Sanharib Sports Club Womens Volleyball Team 2022-2023 Season.

- Time Scope: 22/ 11/2022 – 28 /1 / 2023 .

- Place Scope: Sanharib Sports Clubs Indoor Hall .

2 –Methodology:

The researcher employed the experimental method due to its suitability for the nature of the study.

2-1 Research Population and Sample:

The research population included 12 players female volleyball players from Sanharib (Sennacherib) Sports Club during the season 2022-2023, and the research sample was deliberately chosen consisted of 8 players, after excluding 4 players from the total, two libero players and two players due to the injuries. The intervention was conducted during the team's preparation period for the championship held in Duhok Governorate, at the Sanharib (Sennacherib) Sports Club's court. Thus, the sample represented 66.66% of the research population.

2-3 Experimental Design:

The researcher must select an appropriate experimental design that ensures a minimum level of internal and external validity in the research findings. Experimental work involves formulating hypotheses and testing them, and the use of a suitable design is essential in any study, as it enables the researcher to obtain valid answers to the research questions, therefore the researcher chose the single-group experimental design with pre- and post-test

The research design represents the strategy set by the researcher for gathering the necessary information while controlling for the factors and variables that may influence this information. (Thomas&Silverman,2023,p184) and (Hasanin,2022,p127).

2-4 Data and Information Collection Tools:

- Scientific Sources
- Tests
- Questionnaire to Identify the Most Important Perceptual-Motor Ability

Tests for the Research Sample

The researcher developed a questionnaire, which was presented to a panel of experts specialized in motor learning, measurement and evaluation, sports psychology, and volleyball. The purpose was to determine the most

appropriate tests related to perceptual-motor abilities for the study sample.(

Al-Hayani & Al-Aaraji , 2023.p122) and (Shimon, 2017. p 167-168)

After collecting and analyzing the experts' responses, the researcher obtained an agreement rate of 75% or higher, as shown in Table (1).

To ensure accurate results, the researcher established a homogeneous group concerning the relevant research variables. This homogeneity is presented in Table (1)

(Table 1)

Statistical Landmarks	Kolmogorov-Smimov			Shapiro – Wilk			Significance
	Statistic	Df	Sig	statistic	Df	Sig	
Spike skill	0.166	8	0.200	0.973	8	0.921	Not Significant
Block skill	0.253	8	0.140	0.900	8	0.288	Not Significant

2-5 Equipment and Tools Used in the Research:

- ASUS laptop
- Regulation of volleyball
- Volleyball court
- Whistle

- Cones (10 pieces)
- Adhesive tape
- Measuring tape

2-6 Time Plan for the Training Program:

The training program included 32 training sessions over a period of two months, with a frequency of 4 sessions per week, mental training was used in the main section of the training unit and lasted for 5 minutes and included performing the required mental exercises during the mentioned period.

2-6 -1 Pilot Test:

Experimental research requires the implementation of pilot studies to ensure the scientific validity and reliability of the tests, as well as to verify the suitability of the exercises and assessments to be applied in the study. Therefore, the researcher conducted a pilot study on two players from the population but outside the main sample on Wednesday, November 23, 2022.

The purpose of the pilot study was to identify potential challenges or obstacles that the researcher and the supporting team might encounter, to verify the clarity of the test items and scenarios, and to determine the time required to administer the tests effectively.

2-6-2 Pre-Test:

The researcher conducted the pre-test to assess the performance of the spiking and blocking skills on Saturday, November 26, 2022.

2-6- 3 Main Experiment:

The implementation of the training program, which was supported by mental training and motor imagery, began on Monday, November 28, 2022, and continued until Wednesday, January 25, 2023. The program consisted of four training sessions per week over a period of two months.

The training content was aligned with the team's training schedule, and the program was applied during the practical section of each training unit by the coach, under the supervision of the researcher.

2-6- 4 Post-Test:

The post-test was conducted after the completion of the training program, on Saturday, January 28, 2023.

2-7 Statistical Methods:

The researcher used the Statistical Package for the Social Sciences (SPSS) to process the data and analyze the results. The following statistical tools were employed:

Percentage (%)

Arithmetic Mean

Standard Deviation

Wilcoxon test

3-Results:

Statistical Description of the Sample Individuals for Testing Some sensory-

motor:

Table (2)

Statistical Landmarks Abilities	Unit of Measur ment	Mean		Standard Deviation		Minimum Value		Maximum Value	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post
Kinesthetic Perception Test for Vertical jump Distance	Cm	17.750	14.625	1.832	1.187	15	13	21	16
Kinesthetic Perception Test for Lateral Distance	Cm	17.250	13.624	1.669	1.407	15	12	20	16
Kinesthetic Perception Test for Approach run distance	Cm	22.125	16.625	3.044	2.503	18	14	28	22

Wilcoxon Test to Determine the Difference Between Pre-Test and Post-Test

for Some Perceptual-Motor Abilities:

The values for the (Z-test), significance (p-value), and statistical significance are presented in Table (3).

Table (3)

Statistical Landmarks Tests	Z Test	Sig	Significance
Kinesthetic Perception Test for Vertical jump Distance (Pre-post Test)	2.263	0.024	Significant
Kinesthetic Perception Test for lateral Distance (Pre-post Test)	2.585	0.010	Significant
Kinesthetic Perception Test for Approach run distance (Pre-post Test)	2.388	0.017	Significant

Statistical Description of the Sample Individuals for Testing Spiking and Blocking Skills:

Table (4)

Statistical Landmarks Skills	Unit of Measurment	Mean	Standard Deviation	Minimum Value	Maximum Value
Spike Skill (Pre)	Degree	7.250	2.915	3.00	12.00
Spike Skill (Post)	Degree	12.750	3.150	8.00	18.00
Block Skill (Pre)	Degree	3.875	1.642	1.00	6.00
Block Skill (Post)	Degree	7.375	1.846	4.00	9.00

Wilcoxon Test to Determine the Difference between Pre-Test and Post-Test for Spiking and Blocking Skills.

Table (5)

Statistical Landmarks Skills	Z Value	Sig	Significance
Spike Skill (Pre – Post) Test	2.536	0.011	Significant
Block Skill (Pre- Post) Test	2.636	0,08	Not Significant

4 – Discussion

Based on the results obtained in Tables (1 , 2 and 4), it is evident that there are statistically significant differences between the pre-test and post-test in the development of certain perceptual-motor abilities, specifically in vertical jump distance, lateral distance, and approach run distance all in favor of the post-test. This indicates that the training program had a positive impact on improving these perceptual-motor capacities.

The researcher attributes the observed improvement to the educational and training units that were reinforced by mental training and motor imagery,

accompanied by visual and auditory stimuli, including sound, static and dynamic images, as well as explanatory videos of the skills. All of these components contributed to the development and enhancement of certain perceptual-motor abilities in the research sample. "They provided the learner and the player with the opportunity to expand and unleash their imagination by stimulating cognitive and psychological domains". (Al-Umaeri , 2010 .p152).

Saber (2007) stated that the senses are the first springs that the individual draws direct contact with his external world which is transferred to the nervous system through the various sensitive devices that one receives, monitors, and transfers its effects and the feeling of the individual with the type of these sensations, their degrees and their relationships with other things, it is called a perceptual awareness and through the eye we see things, awareness of the learner's feeling or the individual in a sense that defines the existing relationships between the visuals and their degrees. (Saber ,2007, p16).

The researcher further adds that the process of visually and aurally observing the exercises implemented by the coach—in coordination with the researcher—during the training units contributed to enhancing neural communication through repeated stimuli. This, in turn, led to the development and improvement of perceptual abilities.

This finding aligns with the study by Mohammed (2013), which concluded that the observed improvements in perceptual-motor variables are attributable to the role of visual perception in generating new neural connections through repeated stimulation. This process enhances neuromuscular responses, and the level of progress in perceptual-motor abilities was linked to the balanced targeting of visual perception skills (Mohammed,2013,p.128).

(Saudi et al. 2018) point out that the mental images formed during mental training elicit certain physiological responses. They argue that cognitive processes result in muscular contractions in the muscles involved in the imagined movement. Moreover, physical performance is to varying degrees linked to mental activity. The effect of mental training, therefore, is attributed to the nervous system's capacity to register motor and sensory patterns, recall them, and reorganize them. Accordingly, mental training can lead to changes in the central nervous system that are like those produced through actual physical performance.(Saudi et al. 2018, p. 241) . and (Al-Mufti ,& Rashid . 2003.p 17).

(Abdulrahman 2016) opines "The sense of muscles is the main component in cognitive motor-sensual capabilities, and development of this capacity in the microscopic muscles in the arm is very important for the player whether he or she, as good player exceeds his ordinary colleague, the equivalent of twice,

and describes the movement of the kinetic sense of the muscles of the palms and the arms in addition to the long period of training, players help improve this ability. (Abdul Rahman, 2016: 44)

Mental training provides learners with methods to help them control thoughts , direct attention , modify behavior ,and utilize all senses to form mental experiences . It also aids in acquiring , developing , enhancing ,and refining skills , making decisions, and ultimately succeeding in achievement or attainment of Training Objectives.(Al-Najar&Al-habatri,2021.p.250)

The training units yielded the desired outcomes, as evidenced by the improvement in performance levels for both skills among the study participants. This was clearly demonstrated by the reduced number of errors committed during official matches in the Iraqi Volleyball Club Championship held in Duhok. The culmination of these efforts was the remarkable achievement of the girls' team from Sanharib Sports Club, who won the championship and secured first place at the national level for the first time in the club's history—an accomplishment of great significance. The integration of mental training and motor imagery within the training sessions had a positive impact, contributing significantly to the noticeable improvement in skill execution, particularly in spiking and blocking.

(Magil&Anderson,2003) states that the motor-sensual training is the cornerstone in developing performance where it works to break the learning plateau barrier by reshaping the nerve maps in the initial kinetic cortex and this mechanism is the best solution to the phenomenon of stagnant adaptation, as the nervous system gives unfamiliar challenges to restart the learning cycle again and activate the nerve ring that controls the elasticity of the nerve web and this activation allows the formation of new movement paths. (Magil & Anderson (2003: 151)

The review of literature related to mental (cognitive) training indicates that a substantial number of studies have been conducted to examine the effectiveness of this type of training within both educational and athletic contexts. Numerous specialists in the fields of sports science and educational psychology emphasize that the use of mental training supported by physical performance yields more effective outcomes than mental training alone. "Mental training contributes to both the improvement and development of movement, as well as the consolidation of motor actions, through the focused imagery of the movement's trajectory". (Othman, 1987, p. 188).

The learning plateau is a common phenomenon that players go through during developing their skills. When learning and developing complex skills

Like overwhelming beating and blocking the wall, the players pass through periods in which they cannot show any progress despite the perseverance in training

This may be evident in the stability of the percentage of errors or the difficulty of improving the accuracy of the skill, and this limit represents the most severe period of training or the learning process, which is a dangerous period because it causes the player's or the learner's loss of desire, motivation and enthusiasm.

The physiological limit is the highest limit to the player or the learner and he cannot advance in it, then his performance level goes back to a less advanced one. So, he must choose another method or style of training or learning with the necessity of immediate feedback from the coach and deliberate training focusing on the weaknesses specified in the context similar to the match. (Schmidt & Lee, 2019: 4).

This plateau may be in many cases the physiological limit, which is a phenomenon of plateaux that the player or the learner passes in a state of stability in the level, so it stops development or improvement, due to their capabilities and the individual differences among them, for the purpose of

passing this level, we need modern and new methods of exercise (Twana & Araz, 2024: 287–290)

(Hamoodi) emphasizes that accurate visualization of a motor skill generates neuromuscular responses like those produced during actual execution. This visualization process triggers neural signals from the central nervous system to the muscles to perform the desired skill and is closely tied to practice and repetition. Hamoodi,2019,p.2)

(Khayoun) states that Repetition leads to successive constructions, which are inherently linked to motor imagery. Through continued repetition and correction, these constructs become ingrained in the learner’s mind, clarifying each component of the motor task. Consequently, the learner develops successive mental representations of motor skill. (Khayoun, 2002, pp. 130–133).

The researcher believes that consistent training without interruption, along with appropriately structured repetitions within the training program—combined with mental training—contributed to the improvement of skills. As Mahmoud (1994) notes, “Consistency plays a significant role in enabling the athlete to reach a high level of performance in terms of execution, integration, and stabilization of high–performance mechanics” (Mahmoud, 1994, p. 54).

The researcher also observes that the observed difference is attributed to the learners' exposure to live visual models, “which helped solidify correct performance patterns in their minds. This allowed the learners to compare their own execution with the model, leading to performance improvement by eliminating incorrect responses”. This aligns with what was stated by Sayed (2000,p75).

Saadallh (2008) indicates that the development of feeling and perception is closely related to the knowledge of athletic skills since determining the temporal relationship in motor work and the consistency of various movements is one of the complex perceptions and this depends on the careful coordination of muscle contraction, relaxation and awareness of the place, it is the latter occupies great importance in motor work

The sense of vision plays a major role in this field. In every sports activity, there should be development of the athlete's ability of spatial perception; for example, the volleyball player must hit the ball in a specific field, taking into account the height of the network

The ceiling of the hall, the players, and their places of distribution on the field, and by realizing the place, can have many skills and planning duties in the match.

5 – Conclusions and Recommendations:

5 – 1 Conclusions:

1. The sample group demonstrated significant improvement in the post-tests regarding the development of certain sensory-motor perceptual abilities.
2. Participants also showed notable progress in the post-tests for improving the skills of spike hitting and blocking.
3. No statistically significant difference appeared between the pre- and post-test results for the blocking skill, despite observable improvement, this enhancement did not reach the level of statistical significance.
4. The positive effect of the training program, supplemented with mental practice, was evident in overcoming the learning plateau, as reflected by the favorable post-test outcomes.

5 – 2 Recommendations:

1. Emphasis should be placed on the necessity of incorporating mental training and motor imagery into training programs, given their significance in enhancing perceptual, motor, and skill-related abilities.
2. Great importance is placed on mental training programs due to their significant benefits in overcoming learning plateaus and enhancing essential subject – related cognitive abilities .

3. Further studies and research are recommended on other volleyball activities and skills to explore the broader impact of mental training across various performance domains.

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