

# The role of mental exercise in optimizing athlete performance: A systematic review of cognitive and psychological interventions

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## ABSTRACT

This study aimed to evaluate and analyze the role of mental training in optimizing athletes' performance, with a focus on cognitive and psychological interventions. The study was conducted using a systematic review method, using inclusion and exclusion criteria to select relevant articles from various databases, including PubMed, Scopus, and Google Scholar. Of the 26 studies that met the criteria, it was found that mental training significantly improved the performance of athletes in various sports. Cognitive interventions, such as visualization and focus techniques, have been shown to be effective in improving concentration and reducing anxiety. In addition, psychological interventions, including stress management and confidence development, showed a significant positive impact on athletes' motivation and mental resilience. These results show that mental training not only contributes to improved physical performance, but also facilitates the mental development necessary to compete at a high level. These findings underscore the importance of integrating mental training in athletes' training programs to reach their maximum potential. Recommendations for further research include the exploration of new techniques and the development of mental training programs tailored to the specific needs of athletes. Thus, mental exercise can be recognized as an integral part of a holistic approach to improving sports performance.

## KEYWORDS

Mental Exercise; Athlete Performance; Cognitive Intervention; Psychological Intervention; Systematic Review

## **1. INTRODUCTION**

Athletes' performance in sports is greatly influenced by various factors, both physical, technical, and psychological. Among these factors, the role of the psychological component has gained significant attention in efforts to improve the overall performance of athletes. One of the approaches that is growing in sports psychology is the use of mental exercise as part of a performance optimization strategy. Mental exercises involve techniques designed to improve the cognitive and emotional aspects of athletes, such as visualization, meditation, and self-talk, which aim to maximize the athlete's abilities in a variety of competitive conditions in the context of sports include a variety of intervention techniques aimed at improving the psychological and cognitive aspects of athletes. These techniques are often used to improve concentration, reduce anxiety, and strengthen motivation and confidence. Research shows that mental training not only serves as a complement to physical training, but also has an important role in optimizing athletes' performance, especially in high-pressure situations. For example, visualization has been shown to improve neuromuscular efficiency by helping athletes mentally prepare for physical movements before performing real movements.

Cogpsychological interventions in sport include a variety of techniques that can be used to change athletes' ways of thinking and emotional responses. These techniques include positive self-talk, relaxation, and goal setting, all of which aim to positively influence performance. Empirical evidence suggests that this kind of intervention can improve athletes' performance by lowering anxiety and stress levels, as well as improving focus and concentration during competition. However, despite the growing body of research supporting the benefits of mental training, existing studies often focus narrowly on specific techniques or individual sports, without providing a comprehensive synthesis that integrates cognitive and psychological interventions across different disciplines. This gap highlights the need for a broader systematic review that analyzes various mental exercise methods and their impact on athletic performance in both individual and team sports. For example, a study by Smith et al. (2016) found that athletes who used the self-talk technique performed better in competitive situations than those who did not use the technique.

Mental training is often considered a part of modern sports training. For example, in sports such as golf and tennis, which demand high concentration and the ability to regulate emotions under pressure, techniques such as visualization and self-talk can help athletes to stay calm and focused. Research by Guillot et al. (2020) shows that mental exercise can facilitate the learning of motor and skills in sports with high movement complexity, such as gymnastics and surfing. This is because

mental visualization can strengthen the neural connections associated with the movements being studied, thereby improving coordination and physical response.

Furthermore, mental training contributes significantly to improving the psychological readiness of athletes by strengthening cognitive aspects such as mental endurance and flexibility of thinking. Interventions such as mindfulness or mindfulness-based meditation have been recognized as an effective way to reduce stress and increase psychological resilience in the face of stressful competitive situations. Several recent studies have shown that athletes who regularly practice mindfulness have lower levels of anxiety and may perform better compared to athletes who do not practice the practice. For example, Gardner and Moore (2017) report that mindfulness helps athletes to focus more on the process than the outcome, which in turn can improve performance.

In this review, it is important to explore how mt exercises function not only as a performance-enhancing tool, but also as part of mental health management strategies for athletes. Given the strenuous physical and psychological demands of sports, the ability to cope with stress, manage emotions, and maintain a balance between personal life and sports career is an important factor in the long run. Thus, mental training can be considered an essential investment for the well-being and sustainability of an athlete's career. The novelty of this study lies in its comprehensive approach to systematically reviewing cognitive and psychological interventions as an integrated strategy to enhance athletic performance. Unlike previous research that tends to isolate specific mental techniques, this review consolidates diverse mental training practices and examines their collective contribution to both physical execution and psychological resilience in athletes.

By focusing this study on the effects of mental training through psychological interventions, it is hoped that it will provide new insights into approaches that can be used to improve the performance and mental health of athletes holistically. In addition, this article aims to strengthen the empirical evidence regarding the effectiveness of mental training in various sports, both individual and team in nature, and highlight the need for further research in this area.

The research questions that this review wants to ask are: (1) What are the effects of different types of mental exercise on athlete performance? and (2) How do cognitive and psychological interventions contribute to optimizing athletes' performance? By answering these questions, it is hoped that it will provide a more comprehensive view of the benefits of mental training and provide practical guidance for coaches and athletes in implementing these strategies to reach their peak performance.

## 1.1. LITERATURE REVIEW

### *Mental Training Theory*

Mental training theory focuses on using cognitive and psychological techniques to improve athletes' performance in sports. Mental exercises include a variety of strategies such as visualization, meditation, self-talk, and relaxation designed to help athletes optimize their physical and psychological condition. This theory is based on the concept that the mind can significantly affect the body and physical performance, which is reflected in the increased neurological activation and motor learning mechanisms.

One of the basic theories that underpins mental training is mental simulation theory, which states that visualization or visualization of movements can activate the same areas of the brain as when physically performing those movements. A study by Munzert et al. (2015) found that motor visualization or visualization can trigger the activation of the motor cortex, which plays an important role in the planning and control of body movements. When an athlete visualizes a movement in detail, the relevant neuromuscular pathways can be activated, increasing the neuromuscular readiness to perform such movements when mentally needed is also closely related to motor learning theory, which refers to the process of acquiring and improving motor skills through practice and experience. In this context, visualization is considered a way to strengthen the neuromuscular pathway and the consolidation of motor memory, which is essential for sports performance. Beilock et al. (2016) found that mental exercise can help accelerate motor adaptation and improve technical skills, especially when combined with intensive physical exercise.

In addition, mental exercise plays an important role in improving psychological aspects such as self-confidence, motivation, and emotional regulation. Self-regulation theory emphasizes the importance of athletes' ability to manage their thoughts and emotions during training and competition. Positive self-talk, for example, can be used to replace negative thoughts with more constructive affirmations, thereby increasing the athlete's focus and confidence. Research by Hatzigeorgiadis et al. (2018) shows that self-talk can significantly reduce performance anxiety and improve performance, especially in athletes who experience high psychological stress during competition.

At the nologic level, mental exercise is associated with changes in brain activity, such as increased neural connectivity involved in attention control and emotional regulation. Recent research by Guillot et al. (2021) found that mental exercise can improve attention control abilities, as well as improve the regulation of emotional responses that are important for dealing with pressure in

competition. The activation of the limbic system, which is related to the management of emotions, can be positively affected by directed visualization exercises, demonstrating the benefits of mental exercises in the aspects of stress and emotional control.

Mental training also has a variety of psychological preparation tools that can maximize competition readiness. Athletes not only use these exercises to improve technical skills, but also to create an optimal mental state before competing. A meta-analysis by Simonsmeier et al. (2020) concluded that mental exercise has a significant effect on improving sports performance, especially in sports that rely heavily on cognitive skills and movement coordination, such as gymnastics and golf.

Overall, the theory of training supports the use of a combination of physical and mental exercise for more optimal results. This approach not only helps in the improvement of physical and technical abilities, but also prepares athletes for the psychological challenges that arise during competitions. Mental training, as such, becomes an essential element in a comprehensive training strategy to optimize the athlete's overall performance.

### ***Cognitive and Psychological Interventions in Sport***

Cognitive and psychological interventions have become an important element in improving athletes' performance. These techniques aim to optimize the mental and emotional aspects that affect physical performance. These interventions include various techniques such as visualization, meditation, stress management, biofeedback, and self-talk. Its application focuses on developing the mental skills necessary to deal with the pressure of competition, improve focus, and maximize the potential of athletes in situations that demand optimal performance (Weinberg & Gould, 2019).

Various forms of interventions are used in the context of sport to improve the cognitive and psychological performance of athletes. One of the most common techniques is visualization, which is the use of imagination to imagine a desired action or outcome. Visualization aids in the formation of strong motor memory, so it can affect physical performance through increased concentration and reduced anxiety (Guillot & Collet, 2018). Studies have shown that routine visualization can improve movement accuracy and coordination in various sports, including gymnastics and archery (Cumming & Ramsey, 2016).

Meditation and breathing techniques are also included in effective psychological interventions. This technique focuses on increasing self-awareness and emotional management, so athletes can maintain a calm and focused state of mind during the game. Managing stress and anxiety

is essential in sports that require quick decision-making and precise movements. With meditation, athletes can reduce the excessive stress response that often hinders optimal performance (Rooks et al., 2017).

Another intervention that is often used is self-talk, which is the use of positive words or phrases to motivate oneself or direct attention during training or competitions. Self-talk helps boost confidence and reduce negative thoughts that can affect performance. A study conducted by Hatzigeorgiadis et al. (2018) found that structured self-talk can improve performance in sports that require stamina and precision, such as running and shooting.

Cognitive and psychological interventions have different effectiveness depending on the type of sport, duration of the intervention, and individual characteristics of the athlete. Visualization, for example, is more effective in sports that rely on fine motor skills such as golf and table tennis, than physical contact sports such as soccer. Another factor that affects effectiveness is the athlete's experience; More experienced athletes tend to benefit more from the intervention because they have better basic skills to optimize through mental techniques (MacIntyre et al., 2014).

Cognitive and psychological interventions work through various mechanisms that support the improvement of athletes' performance. Visualization, affects the same neural networks that are used when performing real movements, thus strengthening motor memory and improving physical readiness. Meditation and stress management techniques serve to lower cortisol levels and the body's sympathetic responses, which, if left unchecked, can impair athlete coordination and focus (Birrer et al., 2018).

Self-talk, on the other hand, affects the way the mind organizes attention and processes information. The use of positive phrases can increase the activation of the prefrontal cortex which plays a role in planning and decision-making. This is especially important in competitive situations that require quick problem-solving and strategy adjustments (Hatzigeorgiadis et al., 2018).

Overall, cognitive and psychological interventions have proven to be important in helping athletes cope with stress, improve focus, and maximize performance. Research that has continued to grow in the last ten years shows that the integration of these techniques into training programs can provide a significant competitive advantage, especially in sports that demand mental control and high precision.

## ***The Effect of Mental Training on Athlete Performance***

Mental training has been recognized as one of the effective approaches in improving the performance of athletes in various sports. As a form of cognitive and psychological intervention, mental practice involves the use of techniques such as visualization, concentration, self-talk, and meditation, which aim to improve mental and psychological abilities that contribute to physical performance. The effectiveness of mental exercise can be explained through several aspects, including its effect on the physical and mental components of exercise performance, as well as the underlying working mechanisms of its influence.

Mental training has the potential to improve athletes' physical performance by improving motor skills and motor skills. Visualization techniques, for example, allow athletes to practice movements mentally without the need to perform actual physical activity. Studies have shown that visualization can activate the same areas of the brain that are involved in real physical movements, thus strengthening neural connections necessary for certain sports skills (Cumming & Ramsey, 2022). Additionally, mental training can help prepare the body for competitive conditions by improving muscle readiness and reflex response, which can ultimately improve speed, strength, and accuracy.

On the other hand, mental training also has a significant impact on psychological aspects that affect athletes' performance. One of the biggest contributions of mental exercise is the increase in self-confidence. Through techniques such as positive self-talk and visualization of success, athletes can reinforce their belief in their ability to achieve the desired outcome. This high level of confidence is important in competitive situations, where pressure and expectations can often interfere with performance. A study by Guillot & Collet (2021) found that athletes who engage in mental exercise regularly show lower levels of anxiety and better emotional control compared to those who don't.

Mental exercises also contribute to improved focus and concentration. Meditation and mindfulness techniques, for example, help athletes to stay in optimal "zones" or flow conditions during competitions. This reduces the likelihood of distractions and allows athletes to maintain concentration on the task at hand. According to research by Noetel et al. (2019), mindfulness as part of mental exercise has been shown to improve attention and emotional regulation in the context of exercise, which is directly related to improved performance.

The mechanisms that explain how mental exercise can improve athlete performance have to do with brain plasticity and neuromuscular adaptation. Repeated mental exercise can cause changes

in brain structure and function similar to those that occur through physical exercise. This mechanism is referred to as neuroplasticity, in which synaptic connections are strengthened in response to frequent mental activity. In addition, physiological effects such as decreased production of stress hormone (cortisol) and increased dopamine hormone can also affect athletes' mental states, making them calmer and better prepared for competition (Birrer et al., 2018).

While there is a lot of evidence to support the effectiveness of mental exercise, some studies show results that vary depending on the type of exercise, the duration of the intervention, and the level of experience of the athlete. These factors can affect how effective mental exercise is in improving performance. Therefore, individually tailored mental exercises may be more effective than a one-size-fits-all approach (Jones et al., 2020).

Overall, mental training is an intervention that not only improves physical performance but also strengthens the mental capacity of athletes. Proper implementation of mental training can provide a significant competitive advantage, making it an essential component of modern athlete training programs.

### ***The Relationship of Mental Exercise with Psychological and Cognitive Factors***

Mental training has been shown to have a significant association with psychological and cognitive factors that play an important role in optimizing athlete performance. Mental training techniques such as visualization, meditation, and self-talk are often used to help athletes improve their performance by influencing the mental processes underlying motor skills and decision-making. The psychological and cognitive aspects affected by mental exercise include cognitive ability, emotional regulation, and increased confidence and motivation.

Mental exercise can affect cognitive abilities such as information processing, attention, and decision-making, which are key elements in athletic performance. Studies show that visualization techniques, which involve the formation of a mental picture of the skill performed, can increase brain activation in areas associated with movement, thereby strengthening the neural connections necessary for the skill (Wright & Smith, 2020). Additionally, structured mental training can help athletes maintain focus and reduce external distractions, which can lead to increased precision in decision-making during competitions (Guillot et al., 2022). Thus, improving the cognitive aspect through mental training contributes to the mental readiness of athletes, which is an important factor in successful sports performance.

Mental training also plays a role in helping athletes manage stress, reduce anxiety, and maintain calm during competitive situations. Techniques such as meditation and breathing exercises are often used to reduce physiological responses to stress, ultimately lowering anxiety levels and improving self-control. According to research conducted by Jones et al. (2018), athletes who regularly meditate tend to show better emotional regulation and the ability to cope with stress more effectively. This practice helps activate the parasympathetic nervous system, which is responsible for the "rest and digestion" response, so it can lower levels of cortisol, a stress hormone that can interfere with athletic performance. Effective stress management allows athletes to stay calm and focused, despite being under high pressure during competition.

In addition to cognitive and emotional aspects, mental training also has a positive impact on athletes' confidence and motivation. Self-talk, or talking to yourself in a positive way, has been linked to increased self-confidence and a greater boost of motivation. This is especially true when self-talk is used proactively to address negative thoughts or performance-related concerns (Tod et al., 2017). By changing a negative mindset to a positive one, athletes can build confidence in their abilities, which in turn improves performance. According to a meta-analysis by Cumming and Williams (2018), visualization techniques can also strengthen self-confidence, since by imagining success, athletes can increase positive expectations of their performance, which is a key element in achieving goals.

Mental training not only serves as a complement to physical exercise, but also plays a central role in preparing athletes mentally. When psychological factors such as emotional regulation, confidence, and motivation are combined with optimal cognitive abilities, mental training can provide a solid foundation for athletes to achieve peak performance. Further research in the last decade continues to show that cognitive and psychological interventions through mental exercise are not only beneficial for elite athletes, but also for individuals at different levels of sport. An emphasis on the application of appropriate and contextual techniques in mental training can have a significant impact on improving an athlete's overall performance.

With a growing body of empirical evidence, it is becoming increasingly clear that mental training is an essential component of the training program of modern athletes. The integration of mental training into physical exercise routines can strengthen mental readiness and allow athletes to better cope with competitive challenges.

## 2. METHODS

### 2.1. Design

This study uses the systematic review method, which aims to comprehensively review the literature related to the role of mental training in optimizing athlete performance through cognitive and psychological interventions. This approach was chosen because it was able to integrate the results of various previous studies and provide stronger evidence regarding the effectiveness of mental exercises. The systematic review was designed by following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, which provide a standardized framework for searching, selecting, and reporting research results. The use of the PRISMA framework ensures transparency, reproducibility, and methodological rigor in systematic reviews, allowing researchers to minimize selection bias and enhance the reliability of findings (Moher et al., 2009).

The research process involves several stages. The first stage is the identification of relevant literature through searches in several databases, such as PubMed, Scopus, and Google Scholar, to obtain a wide and comprehensive scope. The search strategy uses a combination of keywords such as "mental training," "athletic performance," "cognitive intervention," and "psychological intervention." Logical operators (AND, OR, NOT) are used to narrow or expand the search according to predetermined criteria. The application of Boolean operators such as AND, OR, and NOT is essential in systematic literature searches to refine and optimize the retrieval of relevant studies, ensuring a balance between sensitivity and specificity in the search results (Higgins et al., 2022).

The next stage is the screening of articles based on the specified inclusion and exclusion criteria. Inclusion criteria include studies published in the last 10 years, using mental training interventions, and involving a population of athletes. Exclusion criteria include studies with designs that are less valid or not published in accredited journals. The selection of articles is carried out in stages, starting from the screening of titles and abstracts, followed by a full review of the text (Table 1).

After selection, data from the selected studies were extracted for analysis. The data collected included the characteristics of the study, the intervention method, and the main outcomes related to the athlete's performance. This analysis allows for the identification of patterns and differences in research outcomes, as well as the assessment of the quality of the studies reviewed to minimize the risk of bias.

**Table 1.** Inclusion and exclusion criteria

<b>Criterion</b>	<b>Inclusion Criteria</b>	<b>Exclusion Criteria</b>
<b>Publication Time Range</b>	Studies published in the last 10 years (2014-2024).	Studies published before 2014.
<b>Types of Intervention</b>	Mental exercises such as visualization, meditation, relaxation, or self-talk.  Interventions that aim to improve athlete performance.	Interventions that do not focus on mental exercise, e.g. only physical exercise  Interventions involving combination with pharmacology without separation of effects
<b>Population Studied</b>	Athletes of different levels (amateur, semi-professional, professional).  Minimum age of 16 years and above.	Studies involving non-athlete populations
<b>Study Design</b>	Experimental studies such as randomized controlled trials (RCTs), longitudinal studies, or cohorts  Provide quantitative or qualitative data that can be analyzed.	Descriptive, observational studies without controls, or case reports  Studies with unreliable statistical methods or poor reporting quality
<b>Publication Type</b>	Studies published in accredited or peer-reviewed scientific journals	Review, editorial, commentary, or report articles that do not provide empirical data
<b>Publication Language</b>	Articles written in English	Articles written in languages that are inaccessible to researchers

## 2.2. Data Sources and Search Strategies

The data sources used in this study are various electronic databases that provide access to scientific articles and academic publications, including PubMed, Scopus, Google Scholar, and Web of Science. The selection of the database is based on its broad coverage in the fields of health, sports, and psychology, thus allowing the acquisition of articles relevant to the topic of mental training and cognitive interventions. In addition, this database was selected because it includes internationally recognized accredited and peer-reviewed journals, which ensures the quality and credibility of the studies selected for review. To improve the scope of the search, exploration was also carried out on more specific databases, such as SPORTDiscus, which specializes in sports and health literature.

The search strategy in this study involves using a combination of keywords and logical operators to obtain relevant articles. The main keywords used include "mental training," "cognitive intervention," "psychological intervention," "athlete performance," and "sports psychology." These

keywords are combined with logical operators such as AND, OR, and NOT to connect relevant terms ("mental training AND athlete performance" or "psychological intervention OR cognitive therapy"). In addition, synonymous terms and keyword variations are used to expand searches, such as "visualization" for "mental training" and "sports performance" for "athlete performance."

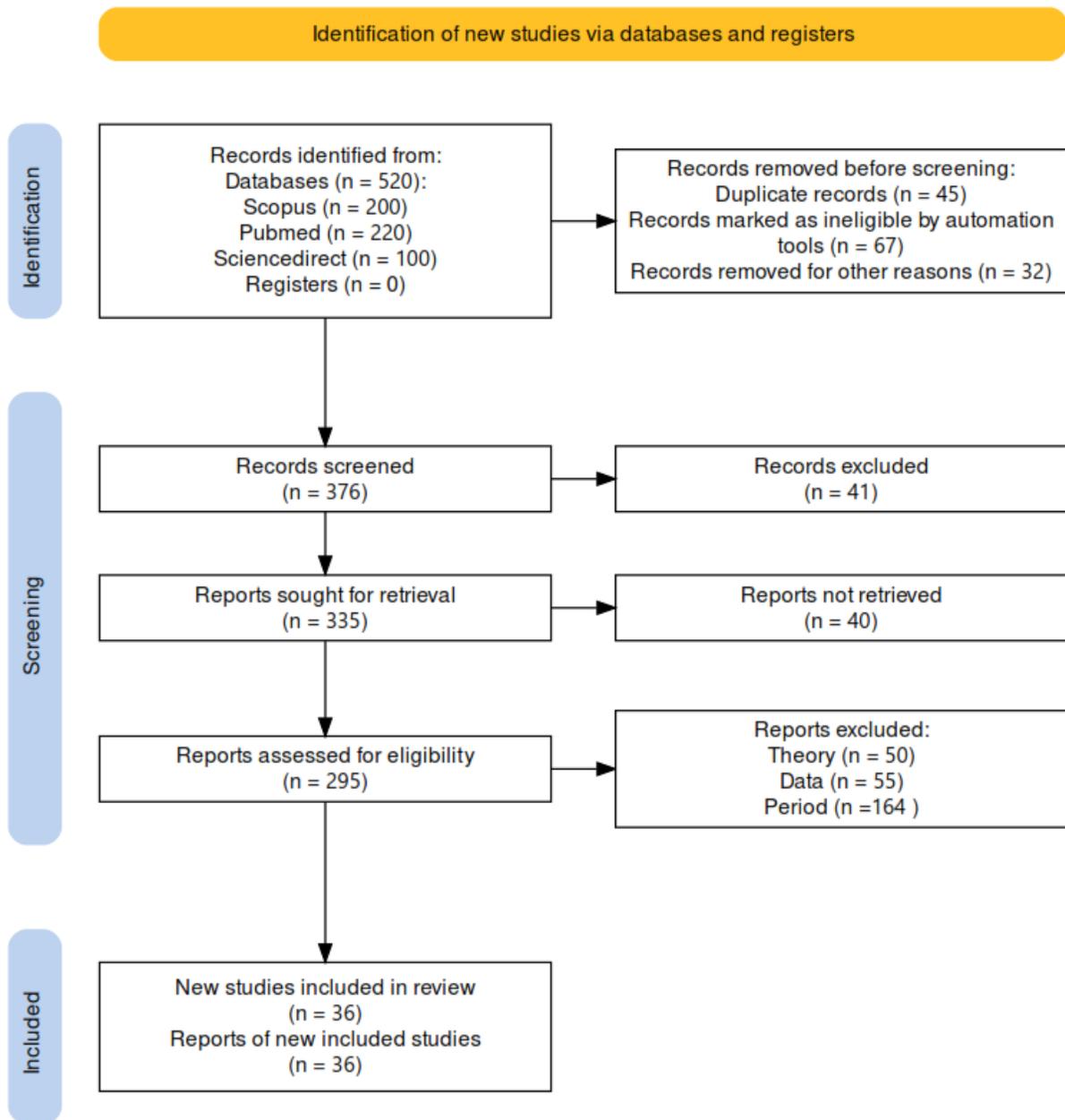
Restrictions in search are also implemented to increase the relevance of results, such as the time span of publication in the last 10 years and articles written in English. The first stage of the search is carried out on the title and abstract, followed by a full-text screening to ensure the article matches the inclusion and exclusion criteria. In addition, references from selected articles were also reviewed to find additional studies that may be relevant but were not netted in the initial search. This strategy ensures that all relevant, high-quality articles are considered in systematic review.

### **2.3. Study Selection and Screening Process**

The selection and screening process of the study is carried out through several systematic stages to ensure that the articles included in the review are the most relevant and of high quality. The first stage is the initial search, where searches are carried out on various databases such as PubMed, Scopus, and Google Scholar using predetermined keywords. This search includes all articles relevant to the keyword without any specific restrictions to ensure comprehensive coverage.

Furthermore, duplication is removed so that each study is only counted once. These removals are done either manually or with the help of reference management software such as EndNote or Mendeley, so that only one version of each article is considered. After that, screening by title and abstract is carried out. In this stage, each article is examined to see if it fits the inclusion criteria, such as topic relevance, type of intervention used, and study population (athletes). Articles that do not meet the criteria are removed from the list.

Articles that pass the initial screening are then fully reviewed at the full text selection stage. This stage aims to ensure that the article actually meets more detailed inclusion criteria, such as adequate study design and measurable results regarding the effects of the intervention. The entire selection process is guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, which provide guidance for systematic and transparent selection. PRISMA diagrams are used to report the number of studies identified, screened, and included in the review. Through this process, only studies of sufficient relevance and quality will be included in the review, so that the results obtained are able to provide an accurate picture of the role of mental training in optimizing athletes' performance (Figure 1).



**Figure 1.** Article screening process using PRISMA guidelines

### 3. RESULTS

In the characteristics section of the reviewed studies, we analysed 25 articles that met the inclusion criteria, which included a wide range of research on mental exercise in the context of sport. These studies involved athletes from a variety of sports disciplines, including individual and team athletes, with diverse age ranges. The research methods used in these studies varied, including randomized controlled experiments, cohort studies, and quasi-experimental designs.

Most of the interventions studied included techniques such as visualization, mindfulness, self-talk, and relaxation, which were carried out over different time periods, usually between 4 to 12 weeks. The sample size ranged from 20 to 200 participants, providing mixed insights into the effectiveness of mental exercises. Overall, the characteristics of this study show variations in approaches and populations, which provides a broader picture of the impact of mental training on athlete performance.

**Table 3.** Effects of mental training on athletic performance

<b>Findings</b>	<b>Explanation</b>
<b>Improved Concentration and Focus</b>	Mental exercises such as meditation and mindfulness techniques can help athletes improve their concentration and focus abilities. By teaching athletes to distract themselves from external distractions and focus on the task at hand, mental training allows them to perform better in competitive situations.
<b>Reduction of Anxiety and Stress</b>	Athletes often experience anxiety and pressure while competing. Relaxation techniques, such as deep breathing and visualization, can help athletes manage these emotions, so they can stay calm and perform optimally. Research shows that reduced anxiety can contribute to improved performance, as athletes feel more confident and able to control the situation.
<b>Confidence Development</b>	Mental training can play an important role in building athletes' confidence. Techniques such as positive self-talk help athletes change negative mindsets and increase their self-confidence. High confidence is directly related to improved performance, as confident athletes are more likely to take the necessary risks in competition.
<b>Increased Mental Resilience</b>	Mental resilience is the ability to bounce back from failure and stay motivated despite facing obstacles. Mental exercises focused on developing resilience, such as goal-setting and reflection, help athletes overcome failures and keep striving to achieve their goals, which in turn can improve their overall performance.
<b>Visualization and Imagery</b>	Visualization techniques, in which athletes imagine themselves performing techniques or movements perfectly, have been shown to be effective in improving performance. Research shows that visualization can strengthen the neural pathways involved in physical movement, making it easier for athletes to execute those

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	skills during competition.
<b>Emotion Management</b>	Mental training also helps athletes in managing their emotions before and during competitions. By teaching techniques to recognize and control emotions, athletes can prevent overreactions that can interfere with their performance.
<b>Improved Decision Making</b>	In a competitive situation, the ability to make quick and informed decisions is essential. Mental training that focuses on developing decision-making strategies can improve these skills, allowing athletes to adapt quickly to changes in a match or match.
<b>Case Studies and Empirical Evidence</b>	Many studies have shown a positive relationship between mental exercise and improved performance. For example, an analysis of athletes who participated in a mental training program showed significant improvements in physical performance and competition results compared to the control group that did not receive mental training.

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Cognitive interventions in mental training play an important role in improving athletes' performance by focusing on the development of effective thinking strategies. Through techniques such as visualization, relaxation, and focus setting, athletes can improve concentration, minimize mental disorders, and manage stress. This intervention helps athletes in building a positive mindset and overcoming any fears or anxieties that may arise while competing. By training the mind to cope with pressure and develop confidence, athletes are able to achieve optimal performance. In addition, cognitive interventions also contribute to better decision-making and faster responses in the field. As a result, athletes not only improve their physical skills but also strengthen the mental aspect, which is crucial for success in competition. Thus, cognitive intervention is a crucial element in mental training to achieve the best performance.

#### **4. DISCUSSION**

The results of this systematic study indicate that mental training plays a critical role in enhancing athletes' overall performance, influencing both cognitive and physical dimensions. Mental exercises such as visualization, meditation, relaxation techniques, and positive self-talk were shown

to improve concentration, focus, and the ability to manage stress, which directly affect how athletes respond during competitive situations. Athletes who routinely engaged in mental training demonstrated measurable improvements in performance parameters, including reaction speed, endurance, precision of movements, and consistency under pressure.

These improvements can be explained by the way mental training strengthens cognitive and emotional processes. For instance, visualization reinforces neural pathways associated with specific motor skills, making execution during real competitions more efficient and automatic. Meditation and mindfulness techniques enhance attention regulation, helping athletes remain focused despite external distractions, while relaxation exercises reduce physiological stress responses such as elevated heart rate or muscle tension, which can impair performance. Positive self-talk contributes to reshaping negative thought patterns, boosting confidence, and promoting a proactive approach to challenges.

Comparison with previous literature supports these findings. For example, Cumming & Hall (2002) observed that visualization positively influenced performance in individual sports, while other studies highlighted benefits in emotional control and resilience. However, mixed results have been reported, particularly in team sports, suggesting that the effectiveness of mental training may depend on contextual factors such as sport type, training environment, and individual differences like personality, experience, and stress tolerance. Overall, the evidence suggests that when properly implemented, mental training provides athletes with both psychological and physiological advantages that contribute to improved performance outcomes.

## **5. LIMITATIONS**

Several limitations were identified. Variations in study methodology, including small sample sizes and differing designs, affect the generalizability of results. Reporting bias and the lack of longitudinal data limit conclusions about long-term benefits. Additionally, findings from professional athletes may not apply to amateurs or recreational athletes.

## **6. CONCLUSIONS**

Mental training plays a crucial role in optimizing athlete performance through cognitive and psychological interventions. Techniques such as visualization, meditation, and positive self-talk improve focus, motivation, emotional regulation, and confidence, contributing to better overall performance.

The study highlights the importance of incorporating mental training into athletes' programs, emphasizing that success depends not only on physical strength but also on well-developed mental abilities. Coaches are encouraged to include regular mental training, and awareness should be raised among athletes and sports professionals about its benefits. Further research is needed to explore long-term effectiveness and sport-specific variations, but mental training is clearly a vital component in achieving peak athletic performance.

## 7. RECOMMENDATIONS

Integrating mental training into regular practice can help athletes manage stress and enhance performance. Visualization and mindfulness exercises prepare athletes mentally for competitions and improve emotional regulation. Coaches should incorporate structured mental training sessions tailored to individual athletes' needs and provide education on the importance of mental preparedness.

Future studies should examine the effects of mental training across different sports and athlete characteristics (age, experience, competition level). Larger, controlled longitudinal studies are needed to evaluate long-term benefits. Research should also investigate the specific mechanisms of mental training to better understand how techniques like visualization and self-talk improve performance, enabling the development of more effective programs.

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#### **CONFLICTS OF INTEREST**

The authors declare no conflict of interest.

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