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Effects of Psychological Skills Training on Brain Quotient and Perceived Performance of High School Rapid-Fire Pistol Athletes

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Abstract: The purpose of this study was to investigate the effects of psychological skills training on the brain quotient and perceived performance of high school rapid-fire pistol athletes and to provide basic data to overcome the psychological difficulties experienced in practice and competition situations. Using the non-probability sampling method, four rapid-fire pistol athletes were selected as subjects for the study. To verify the effects of the psychological skills training program (10 weeks), data collected through electroencephalography and a survey were analyzed. First, through psychological skills training, the psychological tension and physical stress of the left brain among the players' brain function index significantly improved. Furthermore, the perceived performance of the study participants improved. Therefore, it was confirmed that through psychological technology training, participants increased their faith and confidence in shooting skills; thus, the level of perceived performance also increased. In addition, if the effectiveness of the psychological skills training conducted in this study is developed with a wider range of sports or athletes, this study will be valuable for athletes who always have to demonstrate outstanding performance.

Keywords: psychological skills training; brain quotient; perceived performance; rapid-fire pistol athletes

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1. Introduction

1.1. Significance of the Study

Shooting is a target-type record game. It is a representative sport with the characteristics of a closed skill. In other words, shooting athletes should be able to maintain a certain posture and perform certain techniques with a fixed target and environment [1]. Athletes' performance in sports is determined by the complex interaction between physical, physiological, kinematic, and psychological factors [2]. As shooting is a mental sport that requires high concentration and mental power, when shooting athletes experience excessive tension or anxiety during the game, their performance can be hindered because it can trigger psychological anxiety factors, such as low self-confidence, helplessness, and loss of control [3]. Previous studies [4,5] have found that psychological management is important for competitive athletes to demonstrate a high level of performance. Therefore, in addition to regular technical training, shooting athletes should endeavor to acquire self-confidence, motivation to achieve goals, emotions, strong mental strength that is not affected during competitions, and psychological skills to have optimal psychological factors to maintain high performance [6].

Therefore, shooting athletes conduct psychological skills training to demonstrate peak performance in competitions with optimal psychological factors. The main interest of sports psychologists has been the development of methods to reinforce psychological factors for athletes to perform at their peak in practice or competition situations. In the

past, various terms, such as mental training, mental practice, and image and mental reenactment, have been used to describe the training to develop psychological factors that influence athletes' performance. Gould [7] and Vealey [8] established psychological skills training, a terminology coined to avoid confusion caused by using various terms to identify the psychological factors of athletes. Furthermore, they attempted to make a clearer approach by dividing psychological skills training into psychological skills and psychological methods and defining them. Psychological skills refer to the ability to control one's psychological state through self-confidence, willpower, concentration, and motivation to achieve the best athletic performance [7,8]. Therefore, psychological skills refer to positive changes, such as positive self-awareness, reduced anxiety, increased confidence, and coping with stress [7,8]. Psychological methods include goal setting, image, attention, concentration, and routines to maintain psychological skills [7,8].

Moreover, people are becoming more interested in new training methods that can change athletes' brain function as part of their psychological skills training. As we are shifting to the fourth industrial revolution, scientific and technical training methods are being introduced in sports. Neurofeedback is emerging as a representative training method in sports science in the 21st century. Many initial studies on neurofeedback training aimed at treating patients, such as the treatment of patients with resistant seizure disorder [9], attention deficit hyperactivity disorder (ADHD), and depressive disorders [10,11]. As its effectiveness began to be verified, various studies began to be conducted in the sports field to solve the psychological problems of athletes and improve their performance.

Despite this situation, even high school shooting athletes, who are the future of South Korea, do not recognize the importance of psychological training and focus solely on technical training, which is a problem. Moreover, most previous studies [12–14] were conducted on adult athletes, such as college and professional athletes. Even when student-athletes were studied, only 10 M air pistol athletes were studied. Therefore, studies on the application of psychological skills training to rapid-fire pistol athletes are rare. Consequently, this study aimed to provide information to emphasize the effects of psychological skills training on rapid-fire pistol athletes and coaches by proving that psychological skills training for high school rapid-fire pistol athletes positively affects brain function index and perceived athletic performance.

1.2. Types of Psychological Skills Training

1.2.1. Goal Setting Training

Locke et al. [15] presented the concept of goal as having two aspects. They defined the first aspect as the desired state to achieve in the future, which was a state that an individual or organization wants to reach at a certain point in the future, and the second aspect was the result of past or present decision making and behavioral interventions, which were various constraints imposed in the present or future.

1.2.2. Routine Training

Weinberg and Gould [16] defined a routine as a specific, unique movement or procedure for athletes to achieve the ideal conditions necessary for ideal athletic performance. Kim [17] defined it as a habitual motion that is consistently performed consciously or unconsciously by the characteristics or behavior of each athlete to perform a specific motion. In other words, a routine can be viewed as various actions that athletes repeatedly perform in practice or competition situations.

1.2.3. Positive Self-Talk Training

Self-talk means people talk out loud or silently to themselves [18]. Vygotsky [19] argued that human language has another function to help organize and plan one's own actions so that one can escape from constraints or subordination from the environment, in addition to other functions such as expressing and conveying thoughts and emotions. When

applied to sports, language can induce specific behaviors required for optimal performance, even if an athlete experiences psychological difficulties in practice and competition situations.

1.2.4. Relaxation Training

Relaxation refers to the process of decreasing physical and/or psychological tension. Physical tension refers to a state in which muscles are contracted more than necessary, and psychological tension refers to a state in which the level of arousal becomes excessively high because self-confidence is lowered owing to anxiety or nervousness caused by emotions [20]. According to the optimal level theory, peak performance is possible only when an optimal level of arousal is maintained because excessively high or low arousal levels adversely affect performance [20].

1.2.5. Image Training

Image training refers to recalling a specific experience or creating a new experience by mobilizing bodily sensations without direct motor performance [21]. Sports psychologists divide image training into internal imagery and external imagery. Internal imagery feels changes in your body, such as muscle activity, through your senses in the aspect of kinematics, whereas external imagery is a visual approach [20].

1.2.6. Attention and Concentration Training

Attention refers to the ability to select an object to pay attention to [22]. Attention continuously accepts and recognizes information from one's own situation [22]. Concentration refers to the ability to maintain the most appropriate attention to information received through attention according to a given situation [22]. Because attention and concentration are organically linked interactively, attention must be premised on concentration. If this attention is applied to the sports field, it can be seen as focusing on and maintaining the most effective among various possible cues (e.g., movement, technique, response, and selection) during motor performance.

1.3. Neurofeedback

Neurofeedback is a technology that has been developed through many studies going back decades, starting with Russian biologist and Nobel Prize winner Ivan P. Pavlov's conditioned reflex and psychologist B.F. Skinner's operant conditioning [23]. It is also called brainwave biofeedback [24]. This means that information associated with functions that humans cannot control by themselves is measured and converted into recognizable information to make the function controllable by their own will [24]. Park [25] defined neurofeedback as a scientific and effective method for self-activating the brain by improving brain plasticity and reorganizing the brain nerve tissue and network through the development of the brain nerve network by self-regulating the brain waves necessary for brain development while directly checking the brain wave information.

1.4. Brain Quotient

Brain quotient analysis was developed by the Korea Institute of Psychiatric Science and is a program that measures and analyzes electroencephalography (EEG) signals in the prefrontal cortex. It comprises a structure performed using a series of measurement and analysis procedures. These indices comprehensively evaluate brain function based on each index through a ratio analysis of the EEG values measured for each frequency band [25]. The brain function index comprises the self-regulation quotient, which evaluates the self-regulation ability of the autonomic nervous system; the basic rhythm quotient, which shows the degree of brain development; the attention quotient, which indicates the degree of brain arousal; the emotional quotient, which determines the level of emotional balance; the stress resistance quotient, which determines the degree of physical and mental stress; and the brain quotient, which comprehensively evaluates the state by integrating the results.

1.5. Perceived Performance

Weinberg and Gould [16] stated that perceived athletic performance is a belief about how successfully an individual can perform desired tasks or actions. Bennett and Pravitz [26] defined perceived athletic performance as the will and confidence to achieve one's goal, even if certain obstacles occur in the performance process while conducting a task given in sports. Vealey [27] defined perceived athletic performance as the belief and conviction an athlete has concerning their ability to succeed in a sport. In summary, perceived athletic performance can be viewed as psychological confidence in an individual's athletic performance. A strong belief in one's ability must precede an excellent performance. Therefore, an increase in perceived athletic performance motivates players to continue pursuing sports and acts as a driving force for their activity [28,29].

1.6. Research Question

This study aimed to develop and apply an appropriate psychological skills training program for high school rapid-fire pistol athletes and to test its effectiveness. The objectives of this study were to determine the importance and necessity of psychological skills training for high school athletes who had a relatively high level of psychological difficulty compared to adult athletes by providing materials to help those who lack psychological skills overcome psychological difficulties experienced in practice and competition situations, reach peak performance, and to introduce a systematic psychological skills training program with this opportunity. The research questions on the effects of psychological skills training on the brain quotient and perceived athletic performance of high school rapid-fire pistol athletes identified in this study are as follows:

RQ1. *How does psychological skills training affect the brain quotient of high school rapid-fire pistol athletes?*

RQ2. *How does psychological skills training influence the perceived athletic performance of high school rapid-fire pistol athletes?*

2. Materials and Methods

2.1. Study Participants

This study investigated the effects of psychological skills training on four high school rapid-fire pistol athletes (see Table 1). This study selected rapid-fire pistol athletes who were affiliated with the shooting team of H high school in Seoul and registered with the Korea Sports Association in 2021 as study subjects using the purposive sampling method (non-probability sampling), which was suitable for this type of study.

Table 1. Composition of study participants.

Subject	Gender	Age (Years)	Height (cm)	Weight (kg)	Experience (Years)
A	Male	17	168 cm	54 kg	1
B	Male	17	172 cm	60 kg	1
C	Male	18	180 cm	80 kg	2
D	Male	18	183 cm	103 kg	2

2.2. Study Design

This study conducted psychological skill state measurements, in-depth interviews, detailed subject-specific lectures, task presentation and examination, discussion, video-watching sessions, and participant observations of individual practice while providing advice. This training was given twice a week at the 10 M range at the International Shooting Range for 40–50 min per session, followed by neurofeedback training for approximately 20 min per individual. This was conducted as an on-site lecture for the entire experimental group. If necessary, the interviews were conducted naturally by observing the conditions

of each individual. If additional training and conversations were needed, real-time, non-face-to-face communication through the Zoom program was conducted. After this study was completed, a post-test was conducted to comprehensively analyze the effects of the psychological skills training program.

2.3. Composition of Psychological Skills Training Program

Through a meeting of an expert group consisting of one professor majoring in coaching psychology, one Ph.D. in sports psychology, one doctoral student in sports psychology who was providing mental coaching, and the manager and coach of the team, it was determined that goal setting, routine, positive magnetization, relaxation, image training, and attention and concentration training were necessary. Therefore, this training program was selected along with the neurofeedback training. The content and supporting literature on psychological skills training used in this study are shown in Table 2.

Table 2. Psychological skills training program for rapid-fire pistol athletes.

Week	Date	Content	Supporting Literature
1 week	3 July 2021	* Orientation * Testing of brain quotient * Distribution of questionnaire (perceived athletic performance) * Interview	Mamassis and Doganis [30] Park [25]
2 week	4–10 July 2021	* Concept and importance of goal setting * Understanding the principles of goal setting * Goal setting and creating a list of goals * Neurofeedback practice	Savoy and Beitel [31] Chung and Kim [20]
3–4 week	11–24 July 2021	* Understanding the concept of routines, behavioral routines, and cognitive routines * Developing a 1-min routine after "LOAD", a minimum 1-min routine after "UN LOAD," a routine before the game, and a routine to overcome mistakes * Application of the developed routine * Routine confirmation through image analysis * Establishing your own routine * Neurofeedback practice	Jang et al. [32] Chung [20] Oh [33]
5 week	25–31 July 2021	* What is positive self-talk? * Understanding confidence development through self-talk * Regulation and control of negative thoughts * Replacing negative self-talk with positive self-talk * Neurofeedback practice	Weinberg and Gould [16] Kim [34] Chung [20]
6–7 week	1–14 August 2021	* Understanding the concept and importance of relaxation * Arousal control and relaxation * Progressive relaxation training * Application of relaxation * Neurofeedback practice	Jacobson [35] Williams and Krane [36] Chung [20]
8 week	15–21 August 2021	* Understanding the concept of image training, extent, and control * Recalling successful performance scenes * Image training practice * Neurofeedback practice	Loehr [37] Weinberg and Gould [16] Chung [38]
9 week	22–28 August 2021	* Understanding the concept of attention and concentration and types of attention * Understanding distractions and exploring and eliminating your own distractions * Attention maintenance practice (1 to 50 game) * Neurofeedback practice	Loehr [37] Williams and Krane [36] Kim [17]
10 week	29 August 2021	* Aggregate six psychological skills training * Testing of brain quotient * Distribution of questionnaire (perceived athletic performance) * Interview	Mamassis and Doganis [30] Park [25]

2.4. Measurement Tools

2.4.1. Brainwave Meter

This study measured brain quotient by connecting a 2-channel system portable EEG meter (NeuroHarmony, Braintech Corp., Daegu, Republic of Korea), developed by the Korea Institute of Psychiatric Science, to a computer. This EEG meter can simultaneously evaluate brain function and provide neurofeedback training. The reliability of this NeuroHarmony S EEG meter used in this study was proven by comparing its performance with the Grass Nuerodata Amplifier System, which is most commonly used for medical purposes in the United States owing to its proven reliability and validity: the correlation coefficient of left and right α waves, β waves, and θ waves was 0.916 ($p < 0.001$) [39]. Detailed factors of brain quotient are shown in Table 3.

Table 3. Brain quotient and sub-factors.

Brain Quotient	Sub-Factors	Meaning
Attention Quotient (ATQ)	Attention ratio between left and right	Θ wave/SMR ratio
	Left and right tension	Physical tension and instability
	Left and right distraction	Mental anxiety, tension, and distraction
Anti-stress Quotient (ASQ)	Left and right physical stress	Tension, anxiety, and excitement states of the human body
	Left and right mental stress	Mental tension and anxiety states

2.4.2. Perceived Performance Test Questionnaire

The perceived athletic performance test questionnaire used in this study was a translation [40] of the test developed by Mamassis and Doganis [30]. It has eight one-dimensional items: 1. Physical feeling. 2. Quality of skills. 3. Timing and rhythm. 4. Concentration. 5. Amount of effort. 6. Mental attitude and thinking. 7. Level of confidence. 8. Comparison of expected and actual athletic performance in matches with opponents [41]. The exploratory factor analysis of this one-dimensional questionnaire did not find two or more factors, and Cronbach's alpha coefficient calculated to verify the reliability of each item was 0.857, which proved its validity and reliability [42]. Each item was evaluated on a 5-point Likert scale (1: strongly disagree, 2: disagree, 3: neither agree nor disagree, 4: agree, 5: strongly agree).

3. Results

A paired *t*-test was conducted to analyze differences in brain quotient, competitive anxiety, and perceived athletic performance before and after the application of the psychological skills training program. It was found that the tension of the left brain decreased significantly from 16.75 (±6.61) (before) to 13.33 (±4.98) (after) ($p = 0.031$), and physical stress of the left brain significantly decreased from 16.75 (±6.61) (before) to 13.33 (4.98) (after) ($p = 0.031$). However, no significant differences were found in other variables. In addition, perceived athletic performance significantly increased from 23.25 (±1.708) (before) to 28.25 (±1.500) (after) ($p = 0.012$). The detailed results of *t*-tests are shown in Tables 4 and 5.

Table 4. Results of paired *t*-test for brain quotient factors before and after psychological skills training.

				(*n* = 4)
Variables	**Before *M* (*SD*)**	**After *M* (*SD*)**	***t***	***p***
Tension: Left	16.75 (6.61)	13.33 (4.98)	3.838	0.031
Tension: Right	13.11 (7.02)	12.16 (3.08)	0.381	0.729
Distraction: Left	1.13 (0.36)	0.94 (0.52)	0.927	0.422
Distraction: Right	1.22 (0.65)	0.90 (0.48)	2.791	0.068
Attention quotient: Left	48.08 (10.94)	46.40 (15.60)	0.422	0.702
Attention quotient: Right	55.71 (10.55)	48.95 (6.62)	1.374	0.263
Physical stress: Left	16.75 (6.61)	13.33 (4.98)	3.838	0.031
Physical stress: Right	13.11 (7.02)	12.16 (3.08)	0.381	0.729
Mental stress: Left	1.13 (0.36)	0.94 (0.52)	0.927	0.422
Mental stress: Right	1.22 (0.65)	0.90 (0.48)	2.791	0.068
Anti-stress: Left	71.71 (8.99)	75.00 (7.74)	−2.747	0.071
Anti-stress: Right	76.80 (9.71)	76.71 (4.67)	0.024	0.982

Table 5. Results of paired *t*-test on perceived athletic performance before and after psychological skills training.

				(*n* = 4)
Variable	**Before *M* (*SD*)**	**After *M* (*SD*)**	***t***	***p***
Perceived athletic performance	23.25 (1.708)	28.25 (1.500)	5.477	0.012

4. Discussion

This study examined the effects of psychological skills training on the brain quotient and perceived athletic performance of high school rapid-fire pistol athletes. This study trained a single group of four players for 10 weeks. The psychological skills training program consisted of goal setting, positive self-talk, routine, relaxation, image, and attention and concentration training through expert meetings based on previous studies and various data. Neurofeedback training was also conducted using NeuroHarmony S during each session. This study used the BQ test and a perceived athletic performance test questionnaire to verify the program's effectiveness.

The difference in the brain quotient of high school rapid-fire pistol athletes before and after the psychological skills training program is that the tension and physical stress of the left brain, which are sub-factors of the attention quotient, significantly decreased. The results are consistent with those of Rhee [43], who revealed that when neurofeedback training was applied to high school students, the tension of the left brain, a sub-factor of the attention quotient, was significantly different. Therefore, the neurofeedback training conducted in this study stabilized athletes' physical tension, anxiety, and mental stiffness. Moreover, the study participants learned how to overcome physical and psychological tension after psychological skills training and were significantly more confident in their shooting skills and performance. The results of this study are partially consistent with those of previous studies [43,44], which reported that neurofeedback training greatly reduced trait and state anxiety in adolescents and increased self-efficacy. Therefore, it is believed that changes in brain quotient through psychological skills training could decrease negative psychological factors, such as athletes' tension and anxiety, and increase perceived athletic performance.

Notably, changes in the quotient of the left brain are more prominent than changes in the quotient of the right brain. Alpha waves, reflecting emotional stability, were more predominantly activated in the left brain during rest before training; similarly, even during concentration training, the sensorimotor rhythm (SMR) wave, which is a state of readiness for arousal and a standby state of the motor system, highly related to attention and concentration, was activated more predominantly in the left brain. Therefore, the results of

this study are similar to those of Shim [45], who found that neurofeedback training was related more to the function of the left brain than the right brain. Petruzzello et al. [46] reported that an archery athlete group that received biofeedback to the left brain improved their athletic performance, whereas an archery athlete group that received biofeedback to the right brain greatly decreased their athletic performance. It can be inferred from the results of previous studies that EEG activity of the left brain is related to the performance of athletes who require a high level of concentration, such as archery and shooting athletes. Therefore, it is believed that the results concerning the participants of this study can also affect athletic performance.

This study found no significant difference in attention quotient and anti-stress quotient, unlike previous studies [43,47–49], which showed that neurofeedback training significantly increased the attention quotient and anti-stress quotient of adolescents. This could be because the frequency of training was not higher in this study than in previous studies, as neurofeedback training was conducted as a part of psychological skills training. Nevertheless, it is noteworthy that positive changes were observed in most quotients. However, only the attention quotient yielded a negative result. It was judged that the high theta waves of high school athletes, the subjects of this study, affected it, which is consistent with the results of Byun [48], who found that a high school group did not show an upward trend as seen in elementary and middle school groups. Although distraction, a sub-factor of the attention quotient, did not show a significant difference, it decreased when comparing the mean values before and after the program. It can be inferred that neurofeedback training can help reduce athletes' mental anxiety, tension, and distraction. Although the anti-stress quotient did not change significantly, it increased when the mean values before and after the program were compared. Moreover, although mental stress did not show a significant difference, it decreased when the mean values before and after the program were compared. It can be inferred that neurofeedback training may increase resistance to stress by reducing mental and physical tension and anxiety in athletes.

Finally, the perceived athletic performance of high school rapid-fire pistol athletes before and after the psychological skills training program significantly differed. This result is consistent with the results of previous studies [50–52] that reported that psychological skills training had a positive impact on perceived athletic performance. Therefore, the psychological skills training program conducted in this study contributed to the increase in the perceived athletic performance of high school rapid-fire pistol athletes.

5. Conclusions

The results of this study indicate that 10 weeks of psychological skills training increased the belief and confidence in shooting skills and performance of high school rapid-fire pistol athletes by decreasing their brain quotients related to tension and anxiety and teaching them how to overcome psychological difficulties. However, given that the athletes who participated in this study had only one–two years of experience in shooting, questions may be raised as to whether these results were due to psychological skills training or natural shooting training. Park [53] applied psychological skills training to adolescent billiard players with approximately two years of experience and revealed that the treatment group had increased arousal control, anxiety control, attention and concentration, and confidence compared to the control group. Moreover, Kang [54] applied psychological skills training to middle school shooting athletes with about a year of experience and reported that the treatment group showed better improvement in sports psychological skills, such as goal setting, imagery, and anxiety control, than the control group. These results suggest that the effects of psychological skills training can be sufficiently manifested even in players with little experience. Consequently, it is believed that the results of this study are the effects of psychological skills training and not the naturally improved performance through training high school players in rapid pistol shooting with little experience.

Athletes also indicated that routine training and relaxation training in the psychological skills training program were the most effective in overcoming tension and anxiety and

in increasing self-confidence. The results are consistent with previous studies [33,40,55] that revealed that routine training and relaxation training were very helpful in overcoming the psychological difficulties experienced in competition situations. It was found that the subjects in this study preferred routine and relaxation training because they paid attention to and focused mainly on training that could be applied in competitions. The subjects were interested in routine training while creating their own routines, discovering the routines they were already unconsciously executing, and applying them in the game through the process of supplementing and modifying them. It was confirmed that athletes who tended to experience a lot of tension benefited greatly from the relaxation training by continuously practicing it on the shooting line. The training was suitable for the athletes because they frequently applied the psychological skills acquired through the routine and relaxation training conducted in the psychological skills training program to the game.

Lastly, Huh and Park [56] argued that it was difficult for most athletes to access psychological skills training due to various problems, such as time and cost, unless sports psychological support was provided by the public. The in-depth interviews of this study also confirmed that all subjects had no knowledge or experience of psychological skills training. Although various previous studies have proven the importance and effectiveness of psychological skills training through the development and application of scientific and systematic training programs, it has not yet been operated smoothly in the field. Moreover, psychological skills training can be efficiently employed only when it is based on extensive knowledge and experience, and athletes also value the counselor's expertise and field experience [57]. However, there is a serious lack of coaches with expertise and experience. We hope that the training of elite players corresponding to the trend of the times will be achieved by preparing plans and countermeasures to solve the tasks required for applying psychological skills training in future studies.

6. Limitations

This study confirmed the effects of a 10-week psychological skills training program on the brain quotient and perceived athletic performance of high school rapid-fire pistol athletes. The results also indicate that a psychological skills training program suitable for games such as the rapid-fire pistol should be developed more scientifically and systematically and distributed smoothly. Therefore, it is necessary to recognize the importance of psychological skills and seek ways to provide systematic education and training for student athletes, who are the future of elite sports. Based on the results of this study, the following suggestions are made for follow-up studies that should pursue a more efficient and desirable direction.

The results of this study, derived from only four high school rapid-fire pistol athletes, have a research limitation of generalization. Since this study has revealed practical limitations in conducting large sample sizes with the psychological skills training program, future studies should recruit larger research sample sizes. Alternatively, more in-depth analysis should be made possible through qualitative research methods or comparative studies of various groups. Through these research efforts, more effective psychological skills training programs could be implemented for rapid-fire pistol athletes.

Second, this study conducted a psychological skills training program consisting of goal setting, positive self-talk, routine, relaxation, image, and attention and concentration training for 10 weeks. Because it provided many psychological techniques in a relatively short period, the individual physical capacity of the subjects was not considered, which could be a problem. Therefore, future studies are required to analyze the effects when one or two psychological skills training programs are prepared in depth and applied according to the individual characteristics of the subjects.

Third, this study did not reveal the effect of psychological skills training on athletic performance, which could be a limitation. Although it was confirmed that the athletic performance of the subjects, except for B, increased after the psychological skills training, the results were obtained approximately 60 days after treatment because the competition

scheduled immediately after the end of this study was postponed due to the coronavirus pandemic. It is difficult to conclude that the increase in performance was directly due to psychological skills training. Therefore, follow-up studies should analyze more detailed performance changes and the psychological status of rapid-fire pistol athletes through periodic monitoring at the same time as conducting the psychological skills training program.

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