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A Study of Emotions in Sport Psychology Based on the Mood State Inventory

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Abstract

This paper analyzes the emotional results of sports psychology by conducting an in-depth study and analysis of emotions in the form of a state of mind scale. This study takes the research on the effect of sports on an individual's state of mind as the background, and the different effects of different sports on the state of mind of college students as the entry point. To achieve this, it uses a combination of the literature method, questionnaire survey method, experimental method, and mathematical and statistical methods. A total of 348 students are selected as experimental subjects, respectively, for 10 weeks of physical exercise in different sports, and their state of mind is measured twice before and after the experiment. The difference test is conducted on the measured state of mind data. Through the comparative study of the changes in the state of mind of college students who participate in different sports, this paper is able to analyze the effects of different sports on the state of mind of college students in different directions and to different degrees, which can help college students choose the sports that are suitable for them, provide a practical reference for sports to improve the state of mind of college students and promote their physical and mental health development. The mechanism of this predictive effect is mainly the indirect effect of internal motivation and intention to exercise, i.e., the self-comparison attention of college students cannot directly affect their exercise persistence but can promote their exercise persistence through the indirect path of enhancing their internal motivation and intention to exercise. To ensure the positive effect of the intervention of physical test self-comparison on college students' exercise persistence, it is necessary to focus on the mediating role of exercise internal motivation and exercise intention in their relationship.

Keywords: state of mind scale; sports; psychology; emotion research

Introduction

With the progress of society and the improvement in quality of human life, the pursuit of health is seen as the first fundamental need of individuals for continued survival and development. As a special group of people, college students' behaviour, speech, and psychological quality are of great potential benefit to economy and society (Salim & Wadey, 2018). As a group of high quality and high-level college students represent the future hopes of a country, the need to ensure their physical and mental health is perceived as an investment into the future. Whether college-going students are in good physical and mental shape to face the stressors characteristic of modern life and adapt to the rapidly occurring changes in the natural and social environments has become an issue that requires immediate attention (González-Mesa, Arroyo-González, Ibrahim-Díez, & Cazorla-Granados, 2019). In recent years, health issues particularly faced by college students have been more frequently reported in the media, such as tension, anxiety, depression, irritability, and other psychological states caused by unhappy relationships, lack of employment prospects, academic pressure, and family issues, resulting sometimes in even extreme behaviors such as suicide (Doğan, 2021). Improving the state of mind of college students has become a public health issue that requires the urgent attention of all relevant stakeholders.

State of mind is an expression of emotion, which refers to a certain emotional state that persists in a person for a considerable period, and it is characterized by persistence, stability, faintness, and diffusion. The state of mind has an impact on a person's life, work, study, and physical health (Gennarelli, Brown, & Mulcahey, 2020). Individuals' life activities of both physical and mental nature are influenced by their state of mind. Physical and mental states of individuals are divided into positive states of mind and negative states of mind. A positive state of mind can ease the rhythm of life, relax one's mood, and makes one more comfortable to deal with external life challenges – a positive state of mind is characterised by a lowered sense of feeling pressure from outside. On the other hand, a negative state of mind is characterised by depression, tension, reduced enthusiasm for work, and reduced efficiency in terms of productivity and learning (Samełko, Guszkowska, & Gala-Kwiatkowska, 2018). The state of mind is influenced by multiple factors, such as the degree of smoothness of work, the pace of completing tasks, the evaluation of society, and even the support of one's family background (Shapiro, Brewer, Cornelius, & Van Raalte, 2017). According to the data, the mental health of college students deteriorates because of, among other things, fast-paced life, study pressure, and/or social or peer-related pressure. In some students, this leads to a state of anxiety, tension, anger, fatigue, panic, and other negative emotions which not only affects various aspects of an individual's life (including ability to learn). A number of previous studies demonstrate that a player's individual state of mind can affect his or her performance in terms of athletic ability or sportsmanship.

State of mind is an important indicator reflecting the

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degree of mental health of college students. Investigating the state of mind of college students is conducive to a comprehensive understanding of their mental health, helping them to establish the correct concept of the state of mind and promoting their healthy physical and mental development (Shapiro et al., 2017). Many studies show that sports have a positive impact on the state of mind of college students and contribute to their mental health development, and sports have become an important means to intervene in the mental health of college students (Donachie, Hill, & Madigan, 2019). Through the comparative study of the before and after data changes of the state of mind of college students who participated in different sports, it is possible to analyze the influence of different sports on the state of mind of college students in different directions and to different degrees, which helps college students choose sports that are suitable for them, and provides a practical reference for sports to improve the state of mind of college students and promote the development of their physical and mental health (Rodrigues et al., 2017). The experimental results provide a theoretical basis for the development of diversified public physical education courses in universities aiming to enrich the theoretical results of exercise psychology (Trinh, Brown, & Mulcahey, 2020)

A state of mind is an emotional state which is influenced by numerous factors. A good state of mind can promote the healthy development of college students and have a positive impact on their life and work. The choice of suitable sports can not only affect the physical health of college students but also influence their mental health. The experimental study on the effect of different sports on the state of mind of college students makes it clear that different sports may have different effects on seven individual dimensions of the state of mind: tension, anger, fatigue, depression, energy, panic and self-esteem, and that there are both commonalities and differences among sports. It is important to identify the effects of different sports on a certain state of mind and what sports are suitable for college students in different states of mind so that they can choose those sports that are suitable for them in accordance with their individual needs. This study analyzes the effect of various sports on improving the state of mind of college students through experiments, which can provide experimental bases of sports psychology for college students to improve their state of mind through sports and provide scientific suggestions for college students in terms of sports selection and daily exercise regime. This study also provides a toolkit for college students to overcome their negative emotions, provides a reference for interventions into college students' psychological problems, and promotes the healthy development of their body and mind.

Current status of research

A state of mind is a more persistent and faint emotional state that infects all human emotional experiences with a certain colour and is characterized by non-directional diffusion. This means that a good or bad state of mind will cause a person to form a faint background in the psyche, and when a person is in a certain state of mind, such emotional colors will be added to everything around him/her (Massimino et al., 2019). In his research, Schmitt points out that a positive and good state of mind can improve the efficiency of human activities, while a negative and bad state of mind can reduce the motivation for human action, making individuals lose their motivation and confidence (Schmitt et al., 2019). Boolani in his research posits out that the duration of the state of mind varies from person to person; it may be as short as a few hours, and as long as a few days, weeks, or possibly longer. However regardless of duration, the state of mind is relatively stable within this certain period (Bartlett, Abrams, Byrd, Treankler, & Houston-Norton, 2018; Boolani, O'Connor, Reid, Ma, & Mondal, 2019).

A state of mind is a relatively persistent, weak emotional state that affects a person's entire mental activity, is not a specific reaction to a specific experience, and is diffuse in nature (Selmi, Zouaoui, Azaiez, & Bouassida, 2018) The state of mind has a significant influence on the behavior of a person. Moreover, some mental states and some external factors inherent to the environment of a person can also influence an individual's state of mind (Davis, Appleby, Davis, Wetherell, & Gustafsson, 2018). A lively, cheerful person's negative state of mind will not last long, while an introverted person will hold a grudge for a long time; when an individual is in the mood to achieve success, accomplish goals, etc., the state of mind will be pleasant and excited, when experiencing failure or loss, he or she will be sad and depressed (Rodriguez-Ayllon et al., 2018). Therefore, it can be said that the state of mind is caused and influenced by certain internal and/or external factors (Laborde, Allen, Katschak, Mattonet, & Lachner, 2020). This study defines a state of mind as a diffuse emotional state that exists in oneself by external stimuli, and this state can have certain consequences for one's mental health (Keramidas, Siebenmann, Norrbrand, Gadefors, & Eiken, 2018; Milroy, Hebard, Kroshus, & Wyrick, 2018).

A case study by Lori Schwanhausser with adolescent divers shows that the level of attention, level of experience acceptance, positive thought awareness, and level of athletic performance significantly improves in the subject athletes with the MAC intervention (Stocker, Englert, & Seiler, 2019). Takayama et al. conducts a qualitative study of a women's soccer team with positive meditation training that shows that the subject athletes improve their ability to feel and experience their emotions from a new perspective through positive meditation training (Edwards, Rhodes, & Loprinzi, 2017). Taylor et al. conduct 8 weeks of meditation training with 6 national-level swimmers. Most athletes show an improvement in their attention efficiency and performance, and the meditation training is positively evaluated by the athletes and coaches (Noetel, Ciarrochi, Van Zanden, & Lonsdale, 2019; TAKAYAMA, SAITO, FUJIWARA, & TSUTSUI, 2018). Josefsson et al. shows a

positive effect of a positive thinking intervention on positive thinking, fluency, and pessimism in competitive cyclists (Taylor et al., 2020). They found that MAC interventions is better at reducing emotion dysregulation and increasing psychological flexibility than PST.

There is a strong relationship between an athlete's performance and his or her emotions at the time of competition, and this is important to study because many athletes attribute their performance failures to "being in a negative mood" or "being under the influence of certain emotions" (Josefsson et al., 2017). As a result, researchers are increasingly paying more attention to the relationship between the state of mind and athletic performance. The applied research on the combination of mindfulness and sports psychology is manifested in three main areas: first, the relationship between mindfulness state profiles and athletes' performance; second, the use of mindfulness monitoring to regulate the load of sports training; and third, the effect that sports have on mindfulness.

The state of mind does not exist spontaneously as people are able to regulate their state of mind. However, the state of mind will be different for each person in different environments, and competitive sports activities are intense and exciting, and the effect on the state of mind will be different. The first relates to the activation dimension of the mind, i.e., the expected increase in activity and excitement before the event, and a significant decrease after the event, which is called the "tension cycle". The second is related to the evaluative dimension of mindfulness, i.e., joy and happiness after victory, anger, and depression after failure, etc.

Analysis of Mood Research in Sport Psychology with the Mood State Inventory

Analysis of the Design of the Mood State Scale

In addition to the commonly used POMS scale, two parallel indicators, namely the Depression Scale and the Depression Self-Rating Inventory, are added to the paper for more effective testing of the state of mind. Since multiple indicators affect the state of mind of college students, the test of the state of mind relies on several international common test standards to provide sufficient data support for our state of mind test. As it is, there is a difference in the state of mind between different levels of functional movement ability (Madrid, Niven, & Vasquez, 2019). Different students have different functional movement ability levels, and if different functional movement ability levels are highly correlated with the state of mind, it can be assumed that as long as functional movement ability levels improve, the state of mind will also improve, regardless of whether it is the result of congenital genetics or acquired exercise, or whether it is a correlation or causation. Theoretically, the higher the level of functional movement ability and the better the motor ability, the better the state of mind will be, and the lower the level of functional movement ability, the lower the state of mind will be. Different motor abilities have different effects on their state of mind, with higher levels of motor ability having lower levels of depression and a better state of mind, and lower levels of motor ability leading to higher levels of depression and a worse state of mind.

The research on the state of mind measurement tools has long been one of the most central issues in state of mind research (Fogaca, 2021). Only by selecting a reasonable measurement tool can we make a reasonable evaluation of the state of mind of the subject and gain an accurate and comprehensive understanding of the state of mind of the subject. To a certain extent, the reasonableness of the selection of the state of mind measurement tools directly affects the accuracy and persuasiveness of the research results. Firstly, the study can provide a new perspective to improve the increasingly negative state of mind of college students. The state of mind has an important influence on the psychology and behavior of individuals, and the cultivation of a good state of mind is the foundation and prerequisite for promoting the development of an individual's mental health. Different types of physical exercise have a positive impact on the state of mind, not only eliminating the negative state of mind, but also facilitating the formation of a positive state of mind; however, it bears to note that the degree of impact is significantly different. Shotokan is a national specialty item, which has its commonalities with other sports while retaining its unique and special characteristics. This study introduces sparring training as an exercise prescription to the intervention of college students' mental state, analyzes its effect on improving college students' mental state and provides a new perspective for the intervention of college students' mental state. It also expands the intervention path, enriches the intervention means and provides a reference basis for college students to choose their suitable sports to develop a good mental state, as shown in Figure 1.

The goal-directed behavior model has led to the development of the theory of planned behavior in three main ways. Maintaining the basic structure of the theory of planned behavior, the goal-directed behavior model focuses on three key areas, namely strategy, motivation, and habit, which have been relatively neglected by the theory of planned behavior (Di Battista et al., 2019). The goal-directed behavior model attempts to expand the understanding of behavioral volition and behavior by linking them directly to the goals they are targeting. The goal-directed behavior model includes the influence of anticipated effective feedback on goal attainment. In short, the model replaces past behavioral theories that emphasize measuring how behavior X made individuals feel by considering that the achievement of goal Z will be exciting and enjoyable for them.

On the other hand, the Model of Goal-directed Behavior (MGB) attempts to assert "desires" as the main determinant of intention by explicitly considering goal-related intentionality as a fundamental component. Expectations are intended to reflect attitudinal motivations

that are not presented in traditional intentions. In this model, "expectations" are measured by focusing on the goal rather than the behavior itself. Besides, "expectancy" is assumed to be an intermediate variable between attitude effects, anticipatory influences, subjective norms, and cognitive-behavioral controls on intentions. Attitudinal effects occur when an individual's expectations of the expected outcome of the behavior are linked to positive or negative outcomes. If an individual believes that the attention to the physical test results will bring benefits to himself, his attitude towards physical activity will develop in a positive direction, and therefore, his intention to exercise will become stronger.

It breaks through the traditional binary division of motivation and views motivation as a continuum from no motivation to external motivation (external regulation, internal regulation, identity regulation, and integration regulation), to internal motivation, with six types of motivation being on a continuum and no absolute division between them. This provides a new perspective for understanding human motivation at a deeper level, as shown in Figure 2.

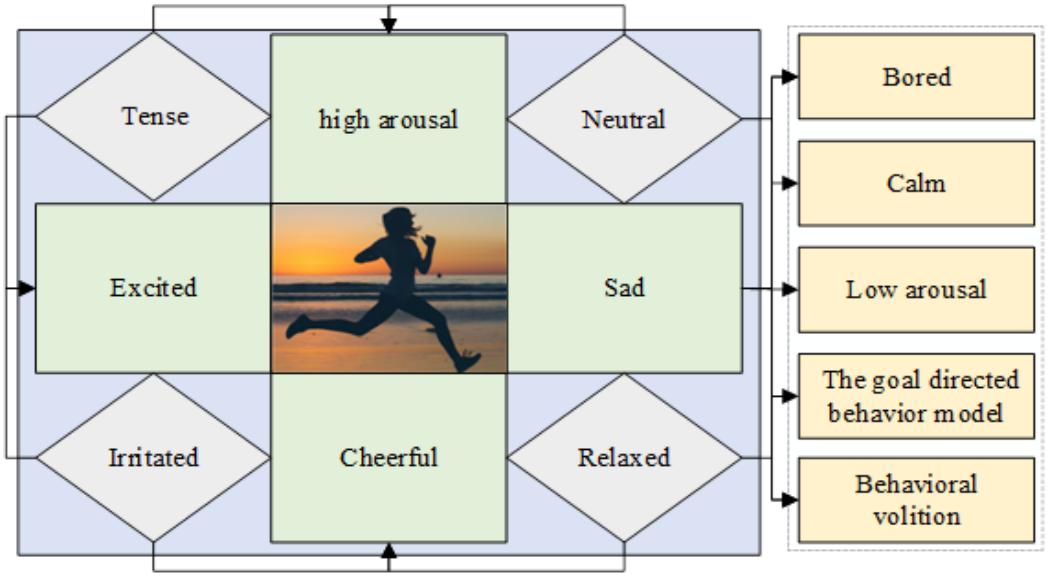

Figure 1. Framework for the design of the Mood State Scale

A linear prediction model of each dimension of physical test results on exercise adherence is constructed by studying the specific content dimensions of college students' physical test results through the interview method. Based on the self-determination theory and the goal-oriented behavior model, this study further proposes a chain mediation model based on four variables: physical test self-comparative concern, exercise internal motivation, exercise intention, and exercise persistence.

The researcher intimates subjects in advance to know the reasonable time when the subjects could participate in the experiment, and then makes reservations for the subjects in different sections after counting the convenient time for the subjects. This is done in order to avoid the objective influence of the concentration of subjects and address the lack of experimental equipment as well as to ensure the smooth conduct of the experiment and the subjects' seriousness in the experiment (Markati, Psychountaki, Kingston, Karteroliotis, & Apostolidis, 2019). At the same time, the subjects are reminded that it is better to provide documents with relevant information on the day of the experiment to reduce the time spent on the statistics of relevant information, and to wear comfortable and suitable clothes for exercise, so that the data of the next day is not affected by excessive drinking or sleeplessness on the day before the experiment, and not to carry out a high-intensity strenuous exercise to prevent unnecessary effects on the experimental data. The experimental environment is adjusted before the test to ensure that the experimental environment met the test standards; the temperature is kept at a suitable state (about 25 degrees Celsius), and the laboratory is odor-free and kept in a clean and tidy condition. If the subject is in poor physical condition (heavy cold, migraine or physiological period of girls, etc.), the experiment is rescheduled for another day, and if the subject has just undergone a high-intensity training exercise, it is recommended to let the subject do the recovery adjustment as soon as possible so as not to affect the stability of the next test data, and to keep the subject in a relatively quiet state.

Emotional Design in Sport Psychology

The main purpose of this thesis is to analyze and organize the information available in academic journals and sports newspapers about positive thinking, mindfulness, and basketball free-throw shooting through academic websites such as Knowing.com, and the university library. This study aims to learn from the previous studies, study specific theoretical and methodological frameworks related to positive thinking training and analyze the feasibility of applying them to college students' sports learning. The structure of the VGGNet network is shown in Figure 3 below. The input image passes through a fixed number of two or three convolutional kernels with a fixed kernel size of 3*3 and a convolutional step size of 1. After the convolutional filtering operation, a maximum pooling

layer with a kernel size of 2*2 is accessed (Giles et al., 2018). VGGNet differs from previous network structures in that it uses smaller, fixed-size convolutional kernels, which effectively reduces network parameters and improves network performance. More nonlinear mapping is also performed to increase the fitting expression of the network.

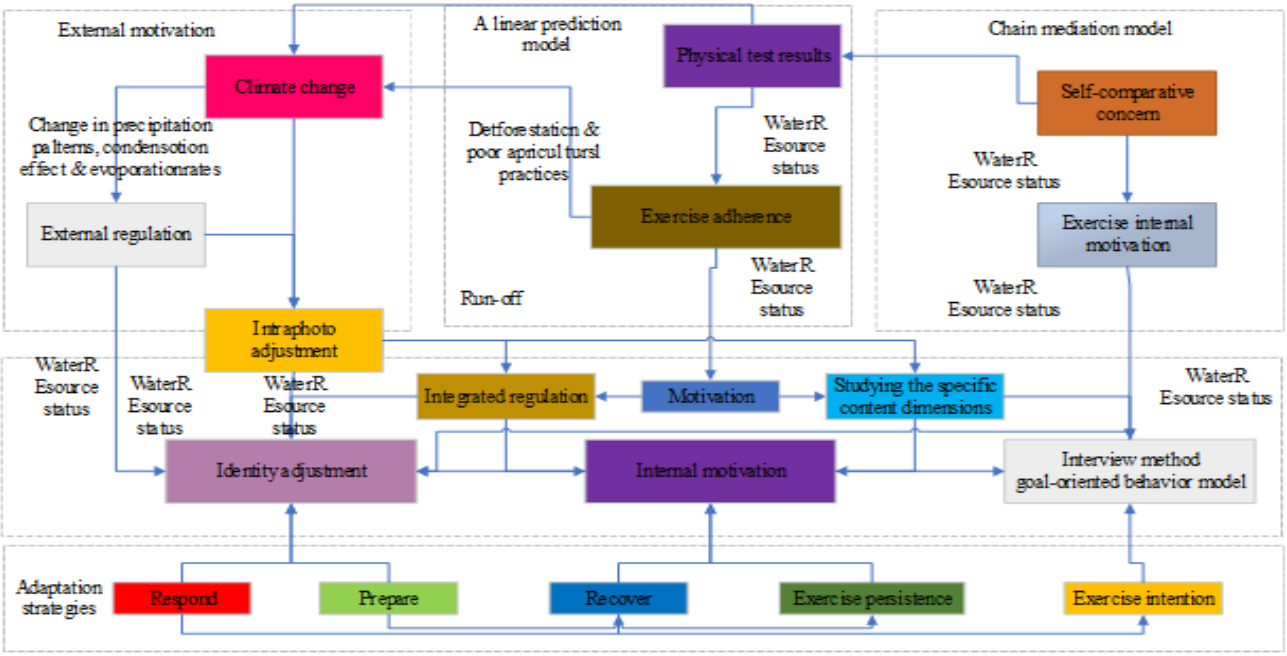

Figure 2. Self-determination theory

After two to four convolutional filtering operations in each module, a maximum pooling layer is accessed at the end of each module to reduce the size of the input image and maintain the translational invariance of the network. Unlike finding a linear hyperplane, the problem brought by the nonlinear model is that the computational effort of solving increases substantially, and there is also some difficulty in solving as it is not always possible to find a nonlinear model that meets the requirements.

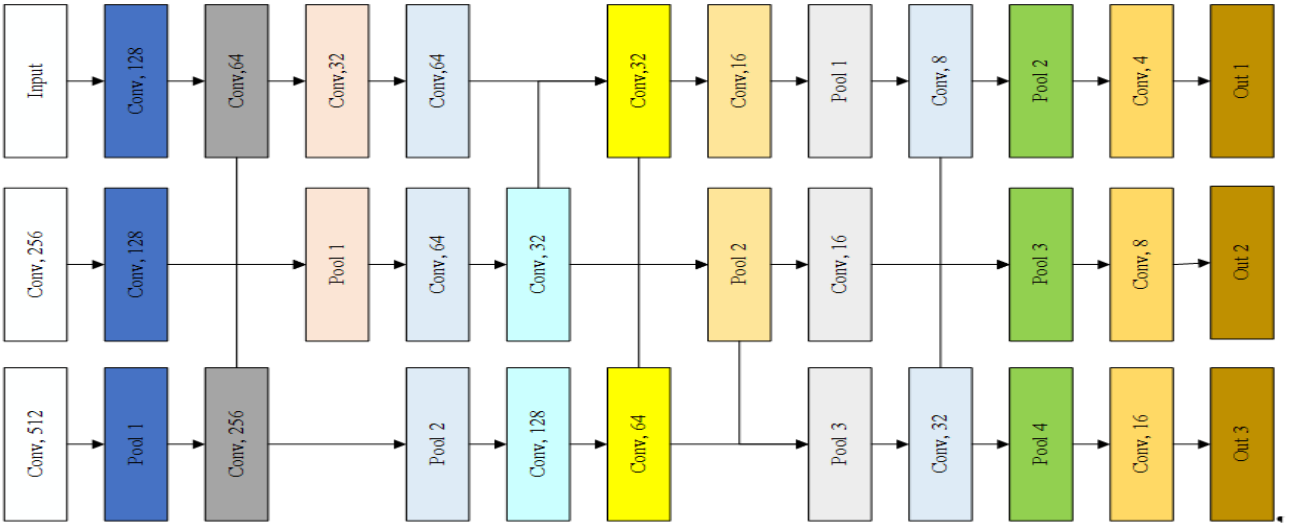

Figure 3. Network structure of VGG

Therefore, we adopt the idea of mapping the nonlinear vectors to a high-dimensional space and perform the solution of the linear hyperplane in the high-dimensional space, transforming the problem of finding a nonlinear model into a problem of finding a linear in the high-dimensional space. The problem of finding a nonlinear model is transformed into a problem of finding a linear solution in a high-dimensional space. If the dimension of the original space is finite, then there must exist a high-dimensional feature space that is sample divisible. Let $\phi(x)$ denote the eigenvector after mapping x. Thus, the model corresponding to the partitioned hyperplane in the eigenspace can be expressed as shown in equation (1) below.

$$f(x) = w_2^T \phi(x) + b \quad (1)$$

Then, there is a minimization function as shown in equation (2) below.

$$\min \arg in \frac{1}{2}\left\| ww_2^T \right\|^2 \quad (2)$$

$$maxarg\, i\, n \sum_{i=1}^{m} \alpha_i + \frac{1}{2}\sum_{i=1}^{m}\sum_{j=1}^{m} \alpha_i \alpha_j x_i x_j \phi(x_i)^T \phi(x_i) \quad (3)$$

To solve Eq. (3) directly, it involves calculating $\phi(x_i)^T \phi(x_i)$, which is the inner product of samples x_i and α_i after mapping to the feature space, and since the dimensionality of the feature space may be high, even infinite, it $\phi(x_i)^T \phi(x_i)$ is usually difficult to calculate directly, so the kernel function is used as shown in Eq. (4) below.

$$k(x_i, x_j) = \phi(x_i)^T \phi(x_i) \quad (4)$$

The inner product of ix and jx in the feature space is equal to the value of their function in the original sample space $k(x_i, x_j)$ calculated by the function, which is solved as shown in equation (5) below.

$$f(x) = \sum_{i=1}^{m}\sum_{j=1}^{m} k(x_i, x_j)\phi(x_i)^T \phi(x_i) + b \quad (5)$$

The function $k(x_i, x_j)$ is the kernel function, in the selection of the kernel function, the practical application usually with the distribution of sample data to choose a different kernel function for calculation, now we use the Gaussian kernel function for calculation, the formula is shown in the following formula (6).

$$k(x_i, x_j) = exp\left(\frac{\|x_i - x_j\|^2}{2a^2}\right) \quad (6)$$

This study uses a one-to-many design idea to design the SVM classifier, i.e., one classifier distinguishes each class from all the remaining classes. And the SVM classifier is combined with the nearest neighbor distance classifier to make the classifier with good classification performance.

Once the subjects arrive at the Center for Physical Fitness Assessment and Health Promotion with voluntary participation and seriousness, the primary testers should respect the subjects' right to know, and explain the test content, methods, time consumption, and possible problems and solutions in the experimental process to the recruiting students. After the recruiters are made clear about the experimental process without objection, they can be guided to fill out the questionnaire (Hagan Jnr & Schack, 2019). After the recruiter is clear about the experimental procedure and registers no objection, the recruiter can be guided to fill out the questionnaire to understand the basic information and data collection and sign the informed consent form. After a brief warm-up, the subject is led to the test area by the principal investigator, who removes the shoes and socks and explains the basic requirements and purpose of the test and uses the FMS test kit to perform the functional motor ability test. Since the functional motor ability test requires the subjects to perform certain exercises, such as spinal stability push-ups and supine leg lifts, the functional motor ability test is placed in the last step to ensure the accuracy of the quiet state of mind index test in order to ensure that the subjects are not affected by the exercise.

Nine teachers of comparable coaching level teach each group separately and carry out teaching activities according to the planned teaching content. Meanwhile, a control experiment is conducted to strictly control the experimental variables and ensure that the experimental subjects are not disturbed. During the experimental period, the experimental subjects do not receive systematic learning and training of any other sports except for the daily school prescribed running exercise to avoid other sports to affect the experimental results, as shown in Figure 4.

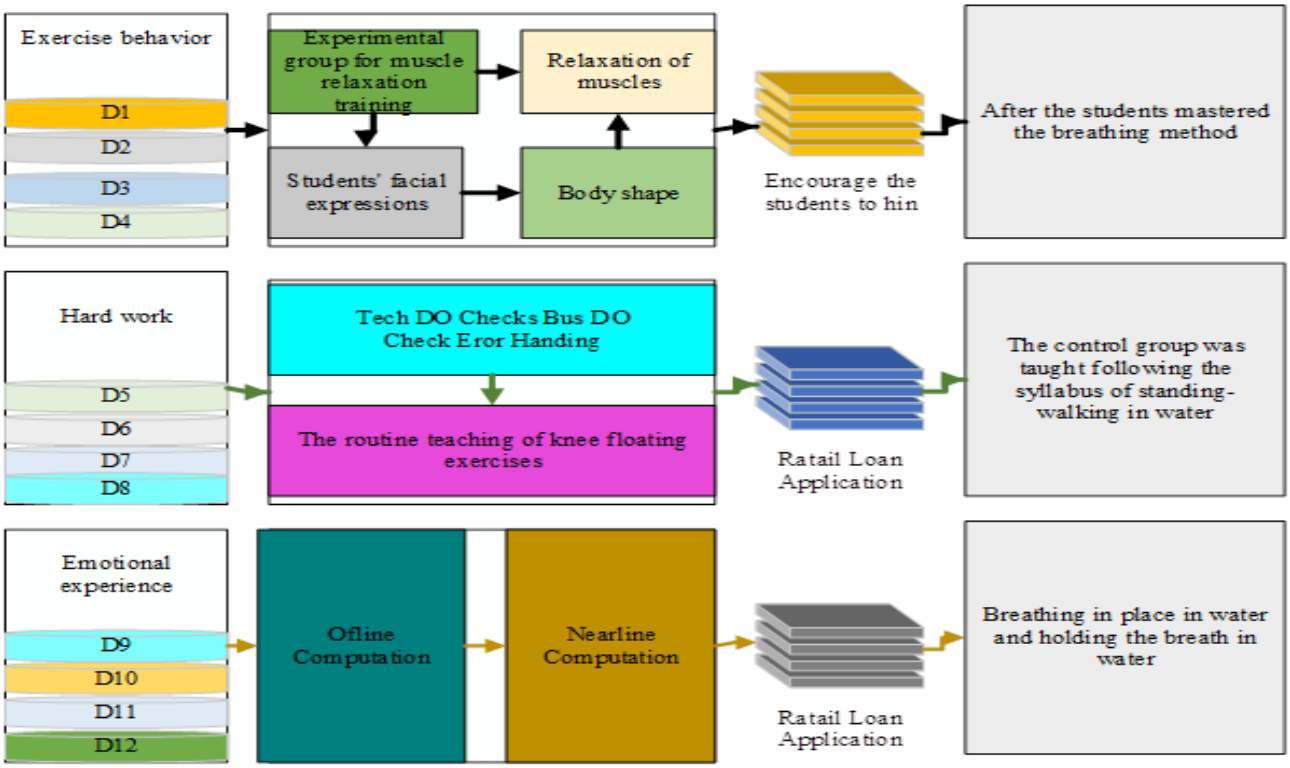

Figure 4. Emotional Analysis Design

For the experimental group for muscle relaxation training, before the class, the teacher through the shore of the water, let students into the relaxation of muscles, and gradually encourages them to adapt to the feeling of water splashing on the body, followed by breathing relaxation so that students can stand in the water - walking, in situ water breathing change of breath training, and holding knees, and floating body exercises. In this process, teachers should observe the students and whether their facial expressions and body shape reflect a state of tension and anxiety. Students who have not been able to complete the in-situ breathing do not rush to use language to encourage the students to hint and use patience to eliminate the fear of breathing when students breathe to avoid giving up learning. After the students master the breathing method, there is the sinking knee float practice, requiring students to bend down and sink into the water knee float, and to hold when they cannot stand up, so that students adapt to the pressure brought by sinking in the water to the body and mind (v et al 2018). The control group is taught to follow the syllabus of standing-walking in water, breathing in place in water and holding the breath in water, and the routine teaching of knee floating exercises.

In the experimental group, after the muscle relaxation training, deep breathing relaxation training is added to the regular teaching content to increase students' sensation when breathing in the water, followed by land breaststroke leg technique practice. In the process of breathing in place in the water, teachers should teach students to relax more with words, so that students can actively overcome the fear when holding their breath, and then carry out floating exercises on the floating board in the water. Students who do not have a good balance in the water should be encouraged to relax their muscles to control their bodies. The control group should still carry out the teaching contents of land imitation exercises, in-situ breathing exercises, and floating exercises of the floating board in the water for the regular breaststroke leg technique.

Experimental Design

In this study, the state of mind scale (POMS) is used to measure the state of mind of the subjects twice, with the first state of mind measure taken at the beginning of the experiment in the first session i.e., from September 9, 2020 - September 13, 2020, and the second state of mind measure is taken a week after the end of the experiment, from December 2, 2020 - December 6, 2020, with an interval of 11 weeks. Both states of mind measurements are taken 15 minutes before the students' classes, with clear requirements and on-site measurements to ensure the authenticity of the state of mind measurement data. The experimental procedure is shown in Figure 5.

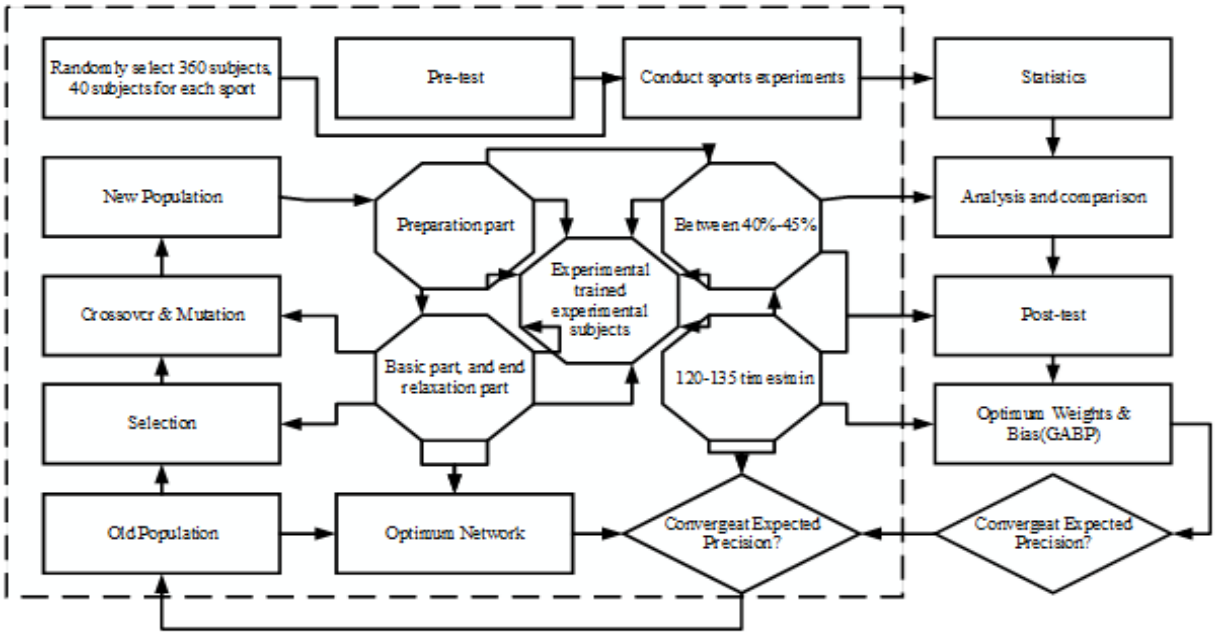

Figure 5. Experimental flow chart

The experiment has been divided into 9 groups, and each group of college students have learnt and trained in one sport i.e., basketball, soccer, volleyball, table tennis, taekwondo, karate, aerobics, taijiquan, and darts, excluding students who could not participate in the whole process. The final number of experimental groups is shown in Table 1 below.

The POMS test is administered to college students before the experiment for two main purposes: firstly, to compare the state of mind among the groups based on the measurement results, and secondly, to facilitate comparison with the later measurements for comparing changes in the TMD scores of college students after ten weeks of sports. The TMD scores of the nine groups of college students are tested by SPSS 22.0, and there is no significant difference found in TMD between the nine groups of college students before the experiment (P>0.05). Each experimental group is divided into three parts for each session: preparation part, basic part, and end relaxation part. The time and content of the preparation

part and end relaxation part are the same. Each experimental group trains the experimental subjects according to the experimental program, and the exercise density of each experimental group was controlled to be between 40%-45%. The heart rate of the basic part is controlled at an average of 120-135 times/min, the exercise intensity is medium, and supervision is strengthened in the learning and teaching process to ensure safety and avoid student injuries.

The functional movement ability level test is conducted using the FMS test kit, which consists of 3 graduated test bars, 1 graduated test board, and a leather strap (McLeod, Bay, Lam, & Valier, 2019). The test consists of 7 movements (deep squat, hurdle step, linear lunge squat, shoulder flexibility, supine leg raises, spinal stability push-up, and rotational stability). Each movement is measured separately and has a maximum of three chances, when a full score is completed at one time, the movement can be skipped and continued down to complete the next movement. The score of each movement is 0, 1, 2, 3, and the total score of the test is a maximum of 21 points. After unified training, the main testers are able to explain and give feedback to the subjects on the completion of the test and the main information during the test, and they are able to score the test according to the completion of the test and fill in the test form accurately.

Before the test, the tester introduces the requirements and purpose of the test and gives the subject sufficient stretching time, so that the subject maintains a relatively stable state and then leads the subject to the test area, where the subject needs to take off shoes and socks, and stand on the test mat, waiting for the introduction of the action of the main tester. The tester gives a specific explanation and demonstration of the test action so the subject can intuitively understand the composition of the action. After starting the test, each action test is completed. After the test, the subject is given some feedback on the completion of the movement, so the subject could feel and adjust the movement, and the completion of the test is recorded, where-after the subject is asked to put on their shoes and socks once the test is complete.

Table 1

Grouping table of experimental subjects

Group	1	2	3	4	5	6	7
Preparation	Routine warm-up activity free-throw practice	Practice teacher tour guide	Self-imitation practice group	16	Demonstration of technical movements	8	Routine warm-up activity free-throw practice
Basic	Demonstration of technical movements	Self-imitation practice group	Demonstration of technical movements	Practice teacher tour guide	4	17	Demonstration of technical movements
	Self-imitation practice group	Demonstration of technical movements	17	55	Practice teacher tour guide	Self-imitation practice group	Self-imitation practice group
	Practice teacher tour guide	57	Self-imitation practice group	17	58	42	Practice teacher tour guide
End	Relaxation exercises	41	97	Self-imitation practice group	57	Practice teacher tour guide	Relaxation exercises
	Class summary	16	85	147	47	Demonstration of technical movements	Class summary

The Brief Mood Scale and the Mood State Test are used with two test indicators added for additional clarification: the Depression Inventory and the Depression Self-Rating Scale. The questionnaires include information about daily work and study, life status, and getting along with others. The questionnaire is designed as a multiple-choice test in which the participant reviews his or her feelings over the past 7 days and then choses the most relevant option according to the actual situation. The process of filling out the questionnaire ensures that it is most relevant to reality. In the process, if the subject has difficulty in understanding the subject's questions or has doubts, he/she should be explained in time, and a summary check should be made after the completion of the questionnaire.

Analysis of Results

Comparison of the Results of The State of Mind Measurements in the Experimental and Control Groups in the Pre-Experimental Period

According to the training program designed in this study, the experimental group and the control group are given 12 weeks of sparring training and regular physical education respectively. The results of the pre-experimental, experimental, and post-experimental state of mind scales are used to understand the changes in the state of mind of

college students in the two groups during the experiment. The pre-experimental test had two main purposes: first, to assist the experimental grouping based on the measurement results of the Brief Mood State Scale to ensure a reasonable grouping, and second, to facilitate comparison with the measurement results in the middle and later stages of the experiment to understand changes in the mood states of the university bodies in the experimental and control groups during the experiment. The results of POMS measurements are counted and independent samples t-test are conducted for the two groups in the pre-experimental period.

The scores of each subscale have been calculated, following which the total TMD scores are calculated after accumulation. As shown in Figure 6, from the measurement results of the state of mind of college students in the two groups before the experiment, the total TMD scores of college students in the experimental group and the control group are 113.35±16.88 and 111.40±20.42 respectively, and the experimental group is slightly higher than the control group. In terms of the scores of negative state of mind and positive state of mind, the average scores of negative state of mind of college students in the two groups before the experiment are 41.05±13.89 and 39.30±16.75, which is slightly higher in the experimental group than in the control group, while the average scores of a positive state of mind are 27.70±3.34 and 27.90±4.10, which is slightly lower in the experimental group than in the control group. The difference between the negative state of mind (mainly including five emotions of tension, panic, anger, fatigue, and depression) and the positive state of mind (mainly including two emotions related to self and energy) is not found to be significant (p>0.05).

This shows that the two groups of college students are at the same level of mindfulness before the experiment began, and the differences in both negative and positive mindfulness are not significant, indicating that the groupings are reasonable and comparable.

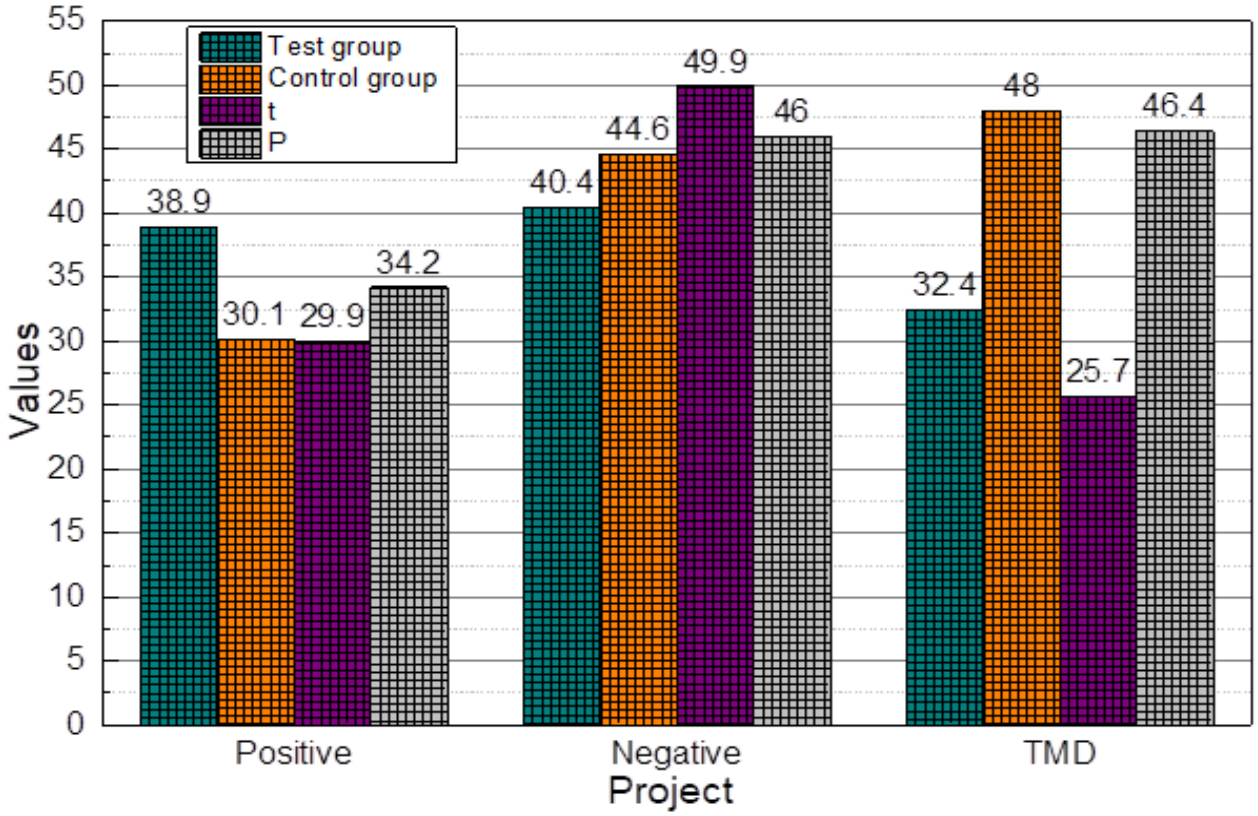

Figure 6. Comparison of the results of the state of mind measurements in the experimental and control groups in the pre-experimental period

As shown in Figure 7, it is possible to see that the scores of 7 dimensions of the state of mind of college students in the experimental and control groups in the pre-experimental period, in which the mean scores of 6 dimensions of tension, panic, anger, fatigue, depression, and energy of college students in the experimental group are slightly higher than those of college students in the control group, but this difference is not significant (P>0.05); the scores of self-related emotions of college students in the experimental group are slightly lower than those of the control group, and the difference is not significant (P>0.05). The mean scores of self-related emotions in the experimental group are slightly lower than those in the control group, but the difference is not significant (P>0.05). It means that before the experiment, all dimensions of the state of mind of college students in the experimental and control groups are at the same level.

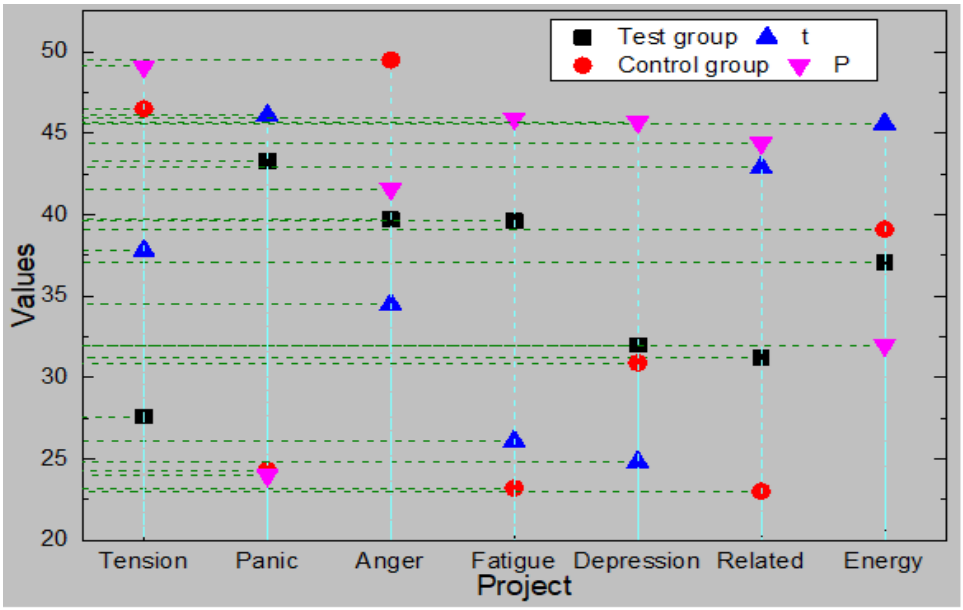

Figure 7. Comparison of the scores of each dimension of the state of mind in the experimental and control groups in the pre-experimental period

Due to multiple factors including, high pressure of life, uncertain employment prospect, poor academic ability leading to unsatisfactory performance, adolescent view of love, family background, and other aspects, which lead to the potentially negative changes in college students' psychological profile, the mental health of college students is becoming an increasingly key public health concern, calling for immediate attention. A state of mind is a certain emotional state that persists in a person for a considerable period. Different states of mind can insinuate different activities, and a positive state of mind can make life hopeful and enjoyable. Contrarily, a negative state of mind can make life dim and depressing. The state of mind is influenced by many aspects, such as family, career, study, and employment, etc. Today's college students are easily particularly vulnerable to a poor state of mind due to life stressors, confused employment prospect, graduation anxiety, and emotional frustration, etc. If the development is not adjusted in time, the consequences will be unimaginable. Previous research finds that exercise is good medicine and can effectively change a player's state of mind. More recent research focuses on the relationship between sports ability and state of mind found that different sports, sports participation, years of sports, the basic composition of the body, and the level of sports ability have different effects on the state of mind, sports can effectively produce significant improvement on negative emotions. Foreign studies also confirm that exercise has a good promotion effect on the improvement of mood, but the population of subjects rarely focuses on the college students' group. Most have focused on older adults, children, adolescents, and military or competitive athletes. Data collected during this study is collated and analyzed for further data analysis. The results of one of the t-tests regarding the five-dimensional positive thinking scale are shown in Figure 8.

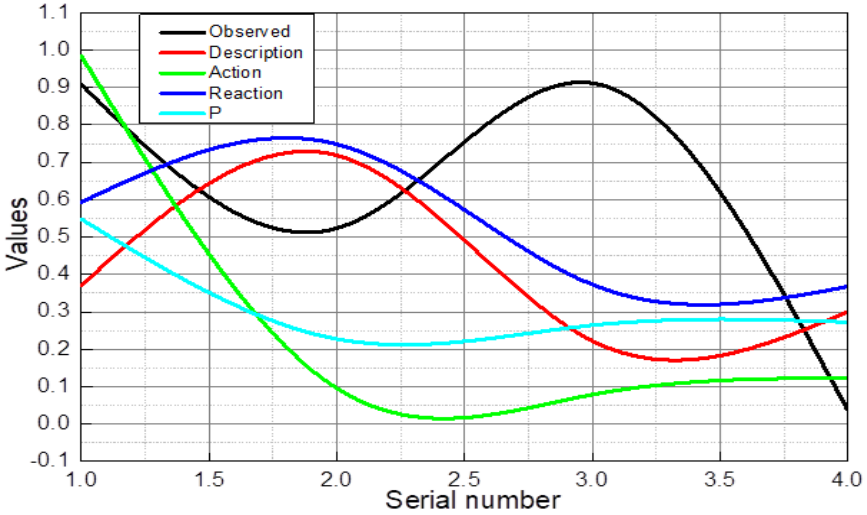

Figure 8. Comparison of the five-dimensional positive thinking levels of students in the two classes before the experiment

After the muscle relaxation training in the experimental group, deep breathing training and language encouragement are added to the regular teaching content. When imitating breaststroke leg movement practice on land and stirrup with breathing practice on land, more language encouragement was used to eliminate the students' non-standard movements; when stirrup with breathing practice in water, students are found to be more prone to muscle tension and rhythm disorder, teachers should encourage and advise to regulate students. The teacher should seek to regulate the students' condition, and if necessary, can stand in the water for muscle relaxation training, so that students can actively eliminate the fear and continue to complete the subsequent skills learning. In the control group, the students continue to perform the land imitation exercises of breaststroke leg technique, the land imitation exercises of stirrup and breathing, and the exercises of the stirrup and breathing with the board in water according to the syllabus. In the experimental group, after the muscle relaxation training before the class, deep breathing relaxation training is added based on the regular teaching content. After that, the study conducts imitation exercises of "rowing" on land, standing rower exercises in water, complete simulation exercises of legs, arms, and breathing onshore, and complete exercises of legs, arms, and breathing in water without a floating board. In the control group, participants perform the exercises of supporting board stirrups and breathing in water, the simulation exercises of complete coordination of legs, arms, and breathing on the shore, and the exercises of complete coordination of legs, arms, and breathing without supporting board in water, as shown in Figure 9.

The results of the comparison of physical basic information in Figure 9 show that there is no significant difference between the experimental group and the control group in terms of height, weight, and BMI, i.e. (P>0.05), and both groups of participants are in good physical condition, which shows that there is no difference between the experimental group and the control group of participants in the in-depth basic information questionnaire, and the sample background is consistent.

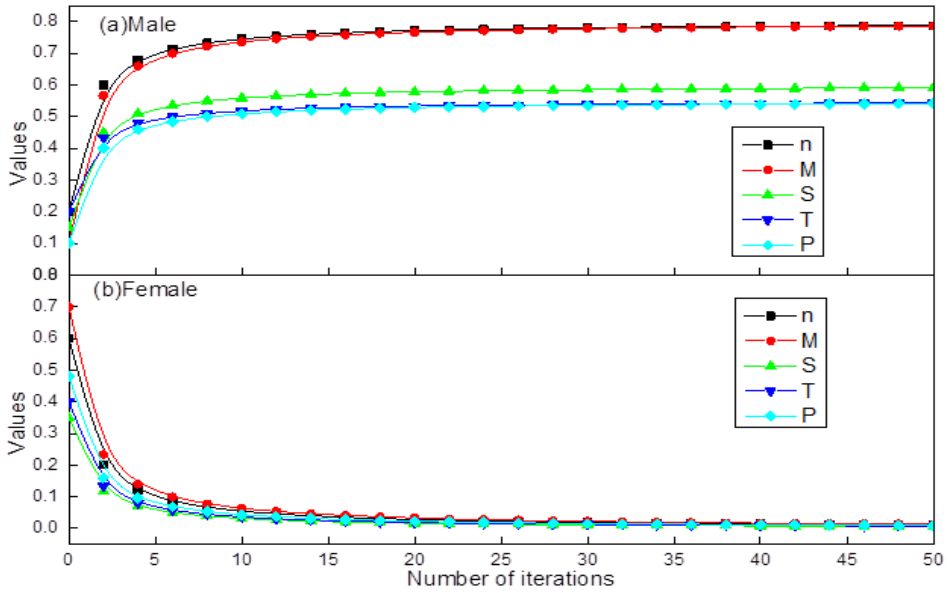

Figure 9. Table of physical basic information of experimental group and control group

Analysis of Psycho-Emotional Outcomes in Sports

According to the statistical results, after ten weeks of sports, the panic mood and level of self-esteem improve. The average score of panic emotion in this group before the experiment is 4.75±3.264, and the average score of panic emotion after the experiment is 3.25±2.426; according to the statistical test, there was a significant difference (p<0.05) between the before and after data of panic emotion in this group; the scores of self-esteems in this group before and after the experiment were 7.80±3.139 and 9.55±2.501, respectively. The difference test shows that there is a significant difference (P < 0.01) between the before and after comparisons. In terms of other factors affecting the state of mind, the mean of the data after the experiment increases compared to them before, but there was no significant difference (P > 0.05). The results of the data show that table tennis can promote the development of college students' self-esteem in a positive direction, and can significantly reduce college students' panic, which has a positive impact on the state of mind, as shown in Figure 10.

The table tennis group requires college students to participate in the whole process from learning to practice to simple competition, and the learning process of the table tennis group is a two-person practice, which will make each person participate in the whole process, and the winning mentality will run through it. As it is, the main contents of table tennis group practice are serving, attacking, and pushing, and the speed of table tennis is fast,

therefore, repetitive practice makes college students' fatigue rise, and the rise of "fatigue" inhibits the central nervous system and reduces the generation of panic, thus reducing college students' panic. The increase of "fatigue" will suppress the central nervous system and reduce the generation of panic, thus reducing the panic of college students. After ten weeks of training, the students in this group are able to master the basic skills of table tennis, including serving, pushing, and blocking, and are able to receive balls from their peers, and their physical dexterity and reaction speed improve compared to before. At the same time, the participants are able to apply their learned skills to the exercises, and gain a sense of self-affirmation, and their physical and psychological self-esteem are increasingly satisfied, which leads to an overall significant increase in the participants' level of self-esteem.

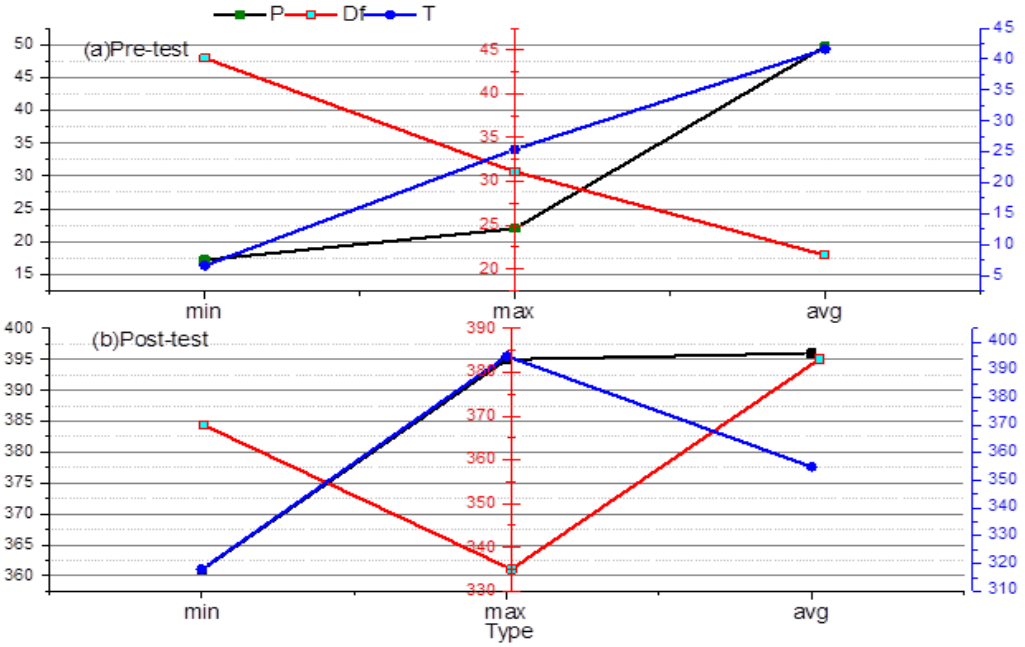

Figure 10. Pre- and post-scores for each factor of state of mind

The main reason darts, taijiquan, and soccer can reduce the tension of the participants more than other sports is the environment. The environment of darts and taijiquan is relatively relaxed, which mainly requires the students to be "calm" and not too impatient during the exercise, while the space of soccer is larger, so the students will not have a sense of space when exercising. The main reason for the increase of tension in table tennis, basketball, and aerobics is that these three sports require students to have fast reaction speed and relatively fast rhythm, while table tennis and basketball have direct ball confrontation, and aerobics needs to follow the music beat to complete the exercises. According to the data in Figure 11, basketball, table tennis, and aerobics make college students' tension rise by 7.81%, 15.63%, and 7.14%, respectively, while soccer, volleyball, taekwondo, karate, tai chi, and darts make college students' tension fall by 28.91%, 19.86%, 8.94%, 0.68%, 22.79%, and 37.97%, respectively. The data shows that darts, soccer, and tai chi are more beneficial to the reduction of college students' tension.

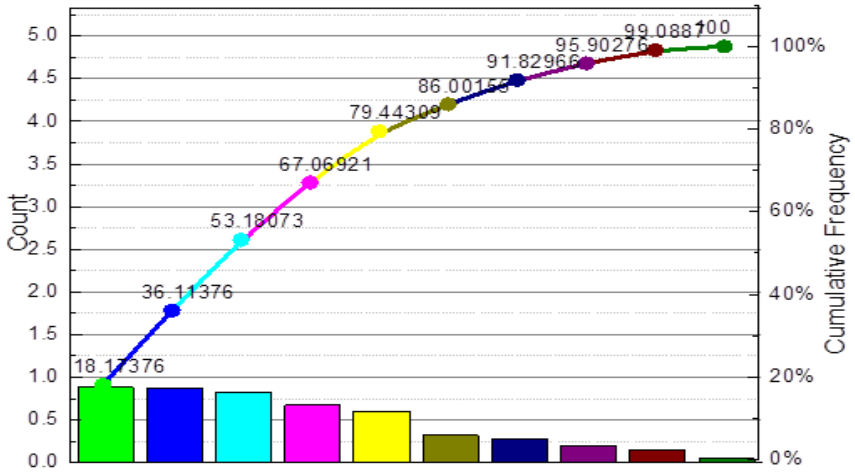

Figure 11. Pre- and post-experimental differences of tension factors for different items

The main reason is that these three sports do not produce higher tension for college students, and the ten weeks of sports can reduce the tension value of college students, thus not acting as a contributing factor towards higher psychological fatigue for the participants; aerobics, darts, and table tennis make college students' fatigue rise compared to the pre-experimental period, aerobics and table tennis needs to follow the faster rhythm of movement during the exercise, while these two sports are more susceptible to external control, such as aerobics, which needs to follow the music until the end of the music, and table tennis, which needs to follow the rhythm of the opponent all the time, and the body is easily fatigued; darts has less space for movement, so it is not easy to release oneself, and a certain amount of psychological fatigue is produced.

Using the total score of the state of mind index TMD of the subject before the experiment as a covariate, the between-subjects group differences in the total score of the state of mind TMD during and after the experiment are seen to be statistically significant ($p<0.05$). According to the data in Figure 12, group $P<0.001$ proves the significant validity of the experiment.

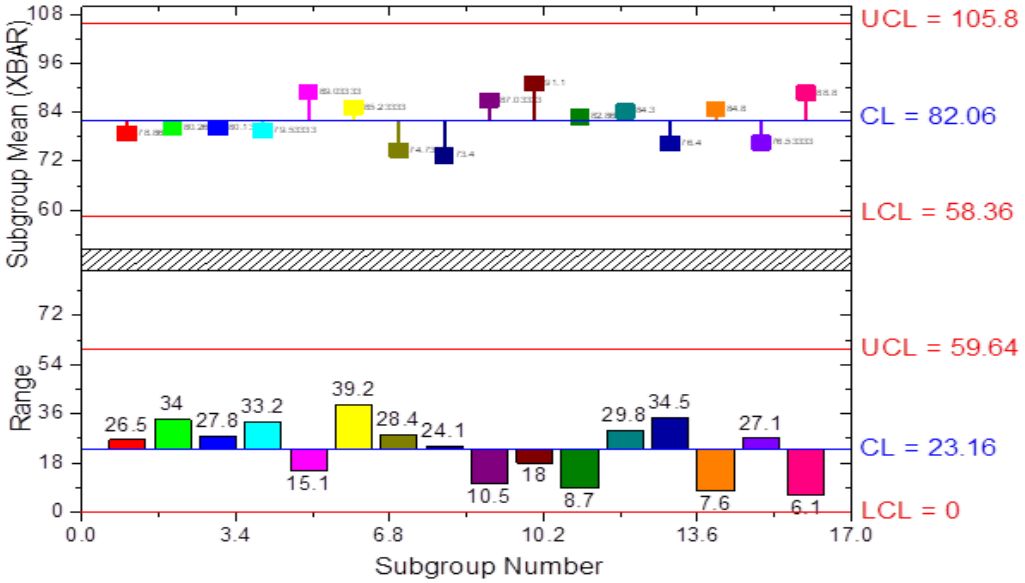

Figure 12. Inter-subject comparative analysis of the scores of each dimension of state of mind

Using the pre-experimental state of mind indicators of the experimental subjects as covariates, the inter-subject group differences in the scores of each dimension of state of mind (tension, panic, anger, fatigue, depression, self-related emotions, energy) during and after the experiment are seen to be statistically significant ($p < 0.05$). On the negative state of mind, there is no significant difference between the experimental group and the control group before the experiment and there is no significant difference between the two groups in the middle of the experiment until the later part of the experiment; whereas it could be found that there is a significant difference between the two groups and that the experimental group has a lower negative state of mind than the control group. There is a significant reduction in panic in the experimental group, while there was no significant improvement in the control group. Moreover, there is a significant increase reported in positive mood in the experimental group compared to the control group, from 12.95±1.73 for the ego-related mood to 16.95±2.63 at the end of the experiment, and an increase of 5 points in energy in the experimental group compared to ego-related mood. It bears to note that there is no significant difference between the control group before, during, and after the experiment for self-related emotions, and a small increase after the experiment. The control group shows varying degrees of improvement in energy before, during, and after the experiment. Overall, there is a non-significant difference between the experimental group and the control group, but the decrease in negative mood and the increase in a positive mood at the end of the experiment are both more significant in the experimental group compared to the control group.

Conclusion

Sports help college students improve their sense of self-esteem and boost their energy level, leading to an overall improved and positive emotional profile. Self-esteem is the most important expression of college students' desire to gain recognition, and sports in any form can greatly improve an individual students' self-esteem level. Schools can organize more extra-curricular sports for college students every week after physical education classes and encourage students to actively participate in different sports organized by various organizations outside the campus, this will lead to an overall improvement in their state of mind. In this study, we investigate the effect of the

intervention of positive thinking training on students' basketball free-throw performance. Whether or not the experimental subjects are engaged in the practice under the positive thinking training intervention has a great impact on the effectiveness of the practice. Some subjects are more engaged and focused during the positive thinking training, and concentrate well on the task, and can therefore have a better rest experience, while some subjects are easily distracted, could not concentrate well or for a long time, and appear to be constantly scattered, and therefore, they do benefit from the same rest experience. Moreover, it is pertinent to note that several factors affect the experimental results and determining the impact of these is key to strengthen the control of experimental variables in future experiments. As it is, simple tests are unable to provide good control of the overall experimental results, and they should be carried out with enhanced quality and quantity in future research studies.

References

Bartlett, M. L., Abrams, M., Byrd, M., Treankler, A. S., & Houston-Norton, R. (2018). Advancing the assessment of anger in sports: Gender differences and STAXI-2 normative data for college athletes. *Journal of clinical sport psychology, 12*(2), 114-128. doi:https://doi.org/10.1123/jcsp.2016-0026

Boolani, A., O'Connor, P. J., Reid, J., Ma, S., & Mondal, S. (2019). Predictors of feelings of energy differ from predictors of fatigue. *Fatigue: Biomedicine, Health & Behavior, 7*(1), 12-28. doi:https://doi.org/10.1080/21641846.2018.1558733

Davis, L., Appleby, R., Davis, P., Wetherell, M., & Gustafsson, H. (2018). The role of coach-athlete relationship quality in team sport athletes' psychophysiological exhaustion: implications for physical and cognitive performance. *Journal of sports sciences, 36*(17), 1985-1992. doi:https://doi.org/10.1080/02640414.2018.1429176

Di Battista, R., Robazza, C., Ruiz, M. C., Bertollo, M., Vitali, F., & Bortoli, L. (2019). Student intention to engage in leisure-time physical activity: The interplay of task-involving climate, competence need satisfaction and psychobiosocial states in physical education. *European Physical Education Review, 25*(3), 761-777. doi:https://doi.org/10.1177%2F1356336X18770665

Doğan, U. (2021). Evaluating the Profile of Psychological Strategies: An Applied Profile for Assessing the Perceived Effectiveness of Athletes' Psychological Strategies in Sport. *Case Studies in Sport and Exercise Psychology, 5*(1), 30-41. doi:https://doi.org/10.1123/cssep.2020-0023

Donachie, T. C., Hill, A. P., & Madigan, D. J. (2019). Perfectionism and precompetition emotions in youth footballers: A three-wave longitudinal test of the mediating role of perfectionistic cognitions. *Journal of Sport and Exercise Psychology, 41*(5), 309-319. doi:https://doi.org/10.1123/jsep.2018-0317

Edwards, M. K., Rhodes, R. E., & Loprinzi, P. D. (2017). A randomized control intervention investigating the effects of acute exercise on emotional regulation. *American journal of health behavior, 41*(5), 534-543. doi:https://doi.org/10.5993/AJHB.41.5.2

Fogaca, J. L. (2021). Combining mental health and performance interventions: Coping and social support for student-athletes. *Journal of Applied Sport Psychology, 33*(1), 4-19. doi:https://doi.org/10.1080/10413200.2019.1648326

Gennarelli, S. M., Brown, S. M., & Mulcahey, M. K. (2020). Psychosocial interventions help facilitate recovery following musculoskeletal sports injuries: a systematic review. *The Physician and Sportsmedicine, 48*(4), 370-377. doi:https://doi.org/10.1080/00913847.2020.1744486

Giles, G. E., Cantelon, J. A., Eddy, M. D., Brunyé, T. T., Urry, H. L., Taylor, H. A., . . . Kanarek, R. B. (2018). Cognitive reappraisal reduces perceived exertion during endurance exercise. *Motivation and Emotion, 42*(4), 482-496. doi:https://doi.org/10.1007/s00421-011-1827-1

González-Mesa, E. S., Arroyo-González, M. L., Ibrahim-Díez, N., & Cazorla-Granados, O. (2019). Mood state at the beginning of the pregnancy and its influence on obstetric and perinatal outcomes. *Journal of Psychosomatic Obstetrics & Gynecology, 40*(2), 106-113. doi:https://doi.org/10.1080/0167482X.2018.1427726

Hagan Jnr, J. E., & Schack, T. (2019). Integrating pre-game rituals and pre-performance routines in a culture-specific context: Implications for sport psychology consultancy. *International Journal of Sport and Exercise Psychology, 17*(1), 18-31. doi:https://doi.org/10.1080/1612197X.2017.1292301

Josefsson, T., Ivarsson, A., Lindwall, M., Gustafsson, H., Stenling, A., Böröy, J., . . . Falkevik, E. (2017). Mindfulness mechanisms in sports: mediating effects of rumination and emotion regulation on sport-specific coping. *Mindfulness, 8*(5), 1354-1363. doi:https://doi.org/10.1007/s12671-017-0711-4

Keramidas, M. E., Siebenmann, C., Norrbrand, L., Gadefors, M., & Eiken, O. (2018). A brief pre-exercise nap may alleviate physical performance impairments induced by short-term sustained operations with partial sleep deprivation–A field-based study. *Chronobiology international, 35*(10), 1464-1470. doi:https://doi.org/10.1080/07420528.2018.1490316

Laborde, S., Allen, M. S., Katschak, K., Mattonet, K., & Lachner, N. (2020). Trait personality in sport and exercise psychology: A mapping review and research agenda. *International Journal of Sport and Exercise Psychology, 18*(6), 701-716. doi:https://doi.org/10.1080/1612197X.2019.1570536

Madrid, H. P., Niven, K., & Vasquez, C. A. (2019). Leader interpersonal emotion regulation and innovation in teams. *Journal of Occupational and Organizational Psychology, 92*(4), 787-805. doi:https://doi.org/10.1111/joop.12292

Markati, A., Psychountaki, M., Kingston, K., Karteroliotis, K., & Apostolidis, N. (2019). Psychological and situational determinants of burnout in adolescent athletes. *International Journal of Sport and Exercise Psychology, 17*(5), 521-536. doi:https://doi.org/10.1080/1612197X.2017.1421680

Massimino, S., Rinella, S., Buscemi, A., Similia, E., Perciavalle, V., Perciavalle, V., . . . Coco, M. (2019). Digit ratio, personality and emotions in skydivers. *Biomedical reports, 10*(1), 39-46. doi:https://doi.org/10.3892/br.2018.1174

McLeod, T. V., Bay, R. C., Lam, K. C., & Valier, A. R. S. (2019). The association between length of recovery following sport-related concussion and generic and specific health-related quality of life in adolescent athletes: a prospective, longitudinal study. *The Journal of head trauma rehabilitation, 34*(1), E1-E9. doi:10.1097/HTR.0000000000000394

Milroy, J. J., Hebard, S., Kroshus, E., & Wyrick, D. L. (2018). Sport-related concussion reporting and coach-athlete attachment among collegiate student-athletes. *Journal of clinical sport psychology, 12*(2), 268-281. doi:https://doi.org/10.1123/jcsp.2017-0029

Noetel, M., Ciarrochi, J., Van Zanden, B., & Lonsdale, C. (2019). Mindfulness and acceptance approaches to sporting performance enhancement: A systematic review. *International Review of Sport and Exercise Psychology, 12*(1), 139-175. doi:https://doi.org/10.1080/1750984X.2017.1387803

Rodrigues, D. F., Silva, A., Rosa, J. P. P., Ruiz, F. S., Veríssimo, A. W., Winckler, C., . . . de Mello, M. T. (2017). Profiles of mood states, depression, sleep quality, sleepiness, and anxiety of the Paralympic athletics team: A longitudinal study. *Apunts. Medicina de l'Esport, 52*(195), 93-101. doi:https://doi.org/10.1016/j.apunts.2016.11.002

Rodriguez-Ayllon, M., Cadenas-Sanchez, C., Esteban-Cornejo, I., Migueles, J. H., Mora-Gonzalez, J., Henriksson, P., . . . Estévez-López, F. (2018). Physical fitness and psychological health in overweight/obese children: A cross-sectional study from the ActiveBrains project. *Journal of science and medicine in sport, 21*(2), 179-184. doi:https://doi.org/10.1016/j.jsams.2017.09.019

Salim, J., & Wadey, R. (2018). Can emotional disclosure promote sport injury-related growth? *Journal of Applied Sport Psychology, 30*(4), 367-387. doi:https://doi.org/10.1080/10413200.2017.1417338

Samełko, A., Guszkowska, M., & Gala-Kwiatkowska, A. (2018). Affective states influence sport performance in swimming. *Polish Journal of Sport and Tourism, 25*(4), 21-26.

Schmitt, A., Martin, J. A., Rojas, S., Vafa, R., Scheef, L., Strüder, H. K., & Boecker, H. (2019). Effects of low-and high-intensity exercise on emotional face processing: an fMRI face-matching study. *Social cognitive and affective neuroscience, 14*(6), 657-665. doi:https://doi.org/10.1093/scan/nsz042

Selmi, O., Zouaoui, M., Azaiez, F., & Bouassida, A. (2018). High intensity interval training negatively affects mood state in professional athletes. *Science & Sports, 33*(4), e151-e157. doi:https://doi.org/10.1016/j.scispo.2018.01.008

Shapiro, J. L., Brewer, B. W., Cornelius, A. E., & Van Raalte, J. L. (2017). Patterns of emotional response to ACL reconstruction surgery. *Journal of clinical sport psychology, 11*(3), 169-180. doi:https://doi.org/10.1123/jcsp.2016-0033

Stocker, E., Englert, C., & Seiler, R. (2019). Self-control strength and mindfulness in physical exercise performance: does a short mindfulness induction compensate for the detrimental ego depletion effect? *Journal of Applied Sport Psychology, 31*(3), 324-339. doi:https://doi.org/10.1080/10413200.2018.1471754

TAKAYAMA, N., SAITO, K., FUJIWARA, A., & TSUTSUI, S. (2018). Influence of five-day suburban forest stay on stress coping, resilience, and mood states. *Journal of Environmental Information Science, 2017*(2), 49-57. doi:https://doi.org/10.11492/ceispapersen.2017.2_49

Taylor, A. M., Thompson, S. V., Edwards, C. G., Musaad, S. M., Khan, N. A., & Holscher, H. D. (2020). Associations among diet, the gastrointestinal microbiota, and negative emotional states in adults. *Nutritional neuroscience, 23*(12), 983-992. doi:https://doi.org/10.1080/1028415X.2019.1582578

Trinh, L. N., Brown, S. M., & Mulcahey, M. K. (2020). The influence of psychological factors on the incidence and severity of sports-related concussions: a systematic review. *The American journal of sports medicine, 48*(6), 1516-1525. doi:https://doi.org/10.1177%2F0363546519882626