

# A Bibliometric Review of Sports Competitive State Anxiety

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**Abstract:** Sports anxiety is a kind of psychological problem specific to sports competition, which can lead to the decline of athletic skills and the unsatisfactory performance of athletes to some extent. This paper mainly uses the bibliometric method to make a statistical analysis of the research papers on sports state anxiety in China, and draws a conclusion: no matter what kind of measurement and analysis method is adopted, there are certain limitations, and a single measurement index may not be able to fully reflect the athletes' sports anxiety state. This paper reflects on the existing problems in recent years, and puts forward some ideas for future research.

**Keywords:** CiteSpace; Knowledge Graph; Competitive State Anxiety; Sports Metrology

## 1. Introduction

Sports anxiety and general anxiety are both anxiety symptoms, indicating that individuals feel nervous, worried, or fearful when facing challenges or pressures. There are significant differences in manifestation and causes. The manifestations and scope of influence of these two types of anxiety may also be different. Ordinary anxiety is manifested as physical and mental symptoms such as emotional fluctuations, restlessness, insomnia, and loss of appetite, and usually stems from stress and challenges in daily life, work, and study, which have a negative impact on individuals' lives and work in various aspects, thereby affecting their overall quality of life. Sports anxiety is a psychological problem specific to sports competition. Sports anxiety often manifests as emotions such as tension, worry,

fear, and self doubt. Sports anxiety refers to feeling nervous and anxious before competitions or exams, worrying about whether one's performance meets expectations, afraid of failure or being evaluated by others. It may limit athletes' technical performance and tactical execution, reduce their confidence and motivation, and ultimately affect competition and exam results, leading to a decline in sports skills and unsatisfactory performance. This paper mainly uses the bibliometric method to make a statistical analysis of the research papers on sports state anxiety in China. Through analyzing the measurement methods of sports anxiety in different periods the problems existing in the current research are found, and the basis is provided for future research, so as to improve the accuracy and reliability of sports anxiety measurement and help provide better support and guidance for athletes. Encourage them to give full play to their potential in the game and show excellent competitive results.

## 2. Research Object and Method

### 2.1 Data Sources

CNKI was chosen as the main retrieval platform for journal data. Data was sourced from the search results of the China National Knowledge Infrastructure (CNKI) academic journal full-text database. In order to ensure the accuracy and completeness of the research results, the concepts and types of sports anxiety were sorted out in the pre-experimental stage, and the three secondary concepts of competitive sports competition anxiety, school sports examination anxiety, and mass sports anxiety under the concept of "sports anxiety" were clarified. Therefore, "sports competition anxiety", "competition

anxiety", "competition anxiety", "sports examination anxiety" Keywords such as "mass sports anxiety". The specific points of data sources and the summary of search results (Table 1).

**Table 1. List of Research Data Sources**

Type	Retrieve content
Sources of date	Academic journal of CNKI China (CNKI)
Professional retrieval	SU = ('Sports competition' + 'competition' + 'sports test' + 'competition' + 'mass sports') * 'anxiety'
Age	All years
Subject	Physical
Retrieval time	2023/3/16
Retrieval results	427
valid data	427

**2.2 Study Methods**

**2.2.1 Literature measurement method**

SATI 3.2 was used to organize and analyze the relevant literature on "sports anxiety" in

the CNKI database, and the results were obtained by analyzing the bibliometric knowledge such as Prieters' law, so as to provide a theoretical basis for the research.

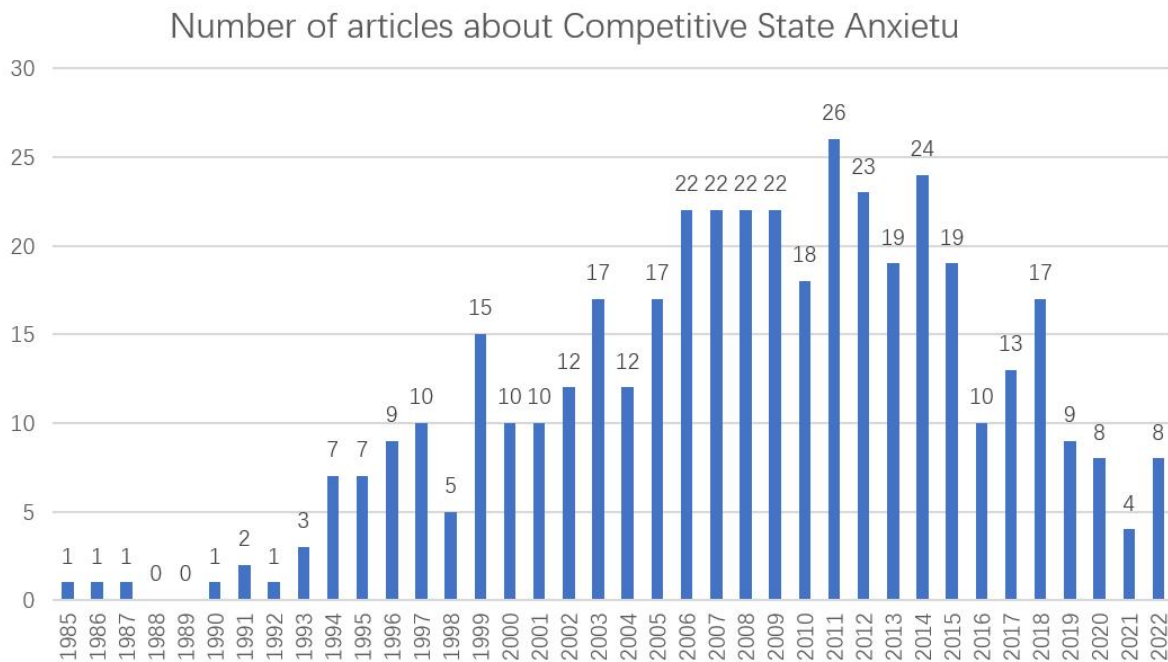
**2.2.2 Visualized analysis**

With the help of professor Chen Chaomei developed CiteSpace 6.1 R1 visual technology, the 427 time span for 1985-2023 literature data into the software, set the "1 year" for the time slice, and select the node form a complete set of threshold, and draw the co-occurrence network, time zone evolution and adjust the visual map, using the knowledge map of the author and keywords, intuitively reflects the development of sports anxiety and research.

**3. Results and Analysis**

**3.1 Literature Distribution of Competitive Anxiety in Sports**

The number of publications on exercise anxiety during the period 1978-2022 can be divided into three phases. (Figure 1)



**Figure 1. Trend Chart of Sports Anxiety Research**

publications from 1978 to 2022

**3.1.1 Bud development period (1985 - 1999)**

This period of sports anxiety related research in less and slow growth, mainly because of sports anxiety as a research field is relatively novel, the researchers on its importance and influence, followed by the lack of resources and research tools in our country, other

disciplines such as the development of mental health and sports psychology is relatively slow, understanding of sports anxiety is relatively low, for the first time from the psychological factors of athletes, from the athletes zhu example, demonstrate the influence of psychological anxiety for athletes performance. Later, scholars began to discuss

and study the formation of anxiety and overcome [1].

### 3.1.2 Period of rapid growth (1999-2018)

The competition pressure in the fields such as sports competition and sports in school is gradually increasing, leading to more research demand and interest. At the same time, the social attention to mental health and sports psychology gradually increased, sports anxiety as one of the important themes caused more attention, the progress of many research tools and methods enable researchers can better explore the influencing factors of sports anxiety and coping strategies, inverted U shape hypothesis, multidimensional anxiety theory, the theory of anxiety on athletes and practice test, the related content of sports anxiety is constantly developing and perfect. From different dimensions of sports competition anxiety, explored the defects of competition anxiety [2]; believes that competition anxiety may not only promote sports performance, but also the direction of competition anxiety may be an important indicator to distinguish the level of athletes [3]. So the intensity direction view will likely have a greater impact on all kinds of competition anxiety research. Later, the holding of the 2008 Beijing Olympic Games boosted the rapid development of athletics, and the development of competitive sports made the training methods and means of athletes 'competitive ability increasingly rich. These methods also gradually penetrated into the intervention of athletes' anxiety, and the intervention means of adolescent anxiety became more scientific and systematic.

### 3.1.3 Relative stability period (2019-2022)

At this stage, the annual volume of sports anxiety research was maintained in the medium and high range, and the annual volume was 5-15, but compared with the second period, the heat of the research decreased slightly. After more than 20 years of rapid development in the research on sports competitive anxiety, the popularity of the research began to decline in 2019. This downward trend has a lot to do with the researchers' transfer of hot issues to mass sports and school sports. In addition, at the end of 2019, sudden public health events and other factors around the world also had a great impact on the holding of sports competitions. In the past years, most of the gathering public

sports activities have been cancelled, which may have a certain negative impact on the academic research of the urgent state of sports competition.

## 3.2 Research Institutions and Partnerships

By running the CiteSpace v software, after the primary and secondary units to obtain the institutional data are merged, the authors (Author) and institutions (institution) in the network node (Node Type) are selected to analyze the co-occurrence map results of the research institution, and intuitively see the distribution of the main forces and influence involved in this field (Figure 2).

Considering the results in Figure 2 and Table 1 below, the most important position of sports anxiety in the overall ability and influence of sports associations and other normal and comprehensive colleges, which have a high number of articles, Wenzhou University, Beijing Normal University and Hebei Normal University have formed stable research network centers with their universities as the core, and showed certain interdisciplinary characteristics. It is noteworthy that the aggregate network density value (density) shown in Figure 2 is only 0.0017, and the wiring results in Figure 2 are also very scattered. The index of aggregated network density value measures the correlation between the nodes in the co-occurrence map from the distribution characteristics, and the close degree of cooperation between different institutions is shown by the thickness of the connection. The results of the above two indicators show the overall degree of cooperation and low degree of centralization among various institutions, that is, the distribution characteristics of research institutions are relatively extensive and the connections are relatively dispersed.

## 3.3 Important Researchers and Collaborative Analysis

With the help of CiteSpace tool, the network nodes were set to the author for visual analysis, and the author overview of sports anxiety research was obtained (Figure 2), After sorting out the author's number of papers (Table 2). According to the law, "N=0.749 max (Vmax is the number of the highest anxiety authors max=14), N 3, Said

that more than three published papers in this field are productive authors, By the statistics, 11 authors (52), The top author in the number of posts is Zhang Liwei of Beijing Sport University (14 articles), Followed by \* Zhang Zhongqiu (6) and Fu Mingqiu (5), In the partnership, With tension as, Tian Maijiu, Zhang Guoxiao, Dou Yanli, Tian Ling, Yang Guangyan and other authors as the core, Formed a certain cooperative relationship, Yu

Jing, Zhang Bin, Zeng Zhongwen and other authors are mainly independent research, It also shows a high influence in the co-occurrence network. However, overall, the density (Density) is 0.0027, and the few connections between nodes indicate that the broader cooperation between cooperation networks among important researchers is also more independent and dispersed.

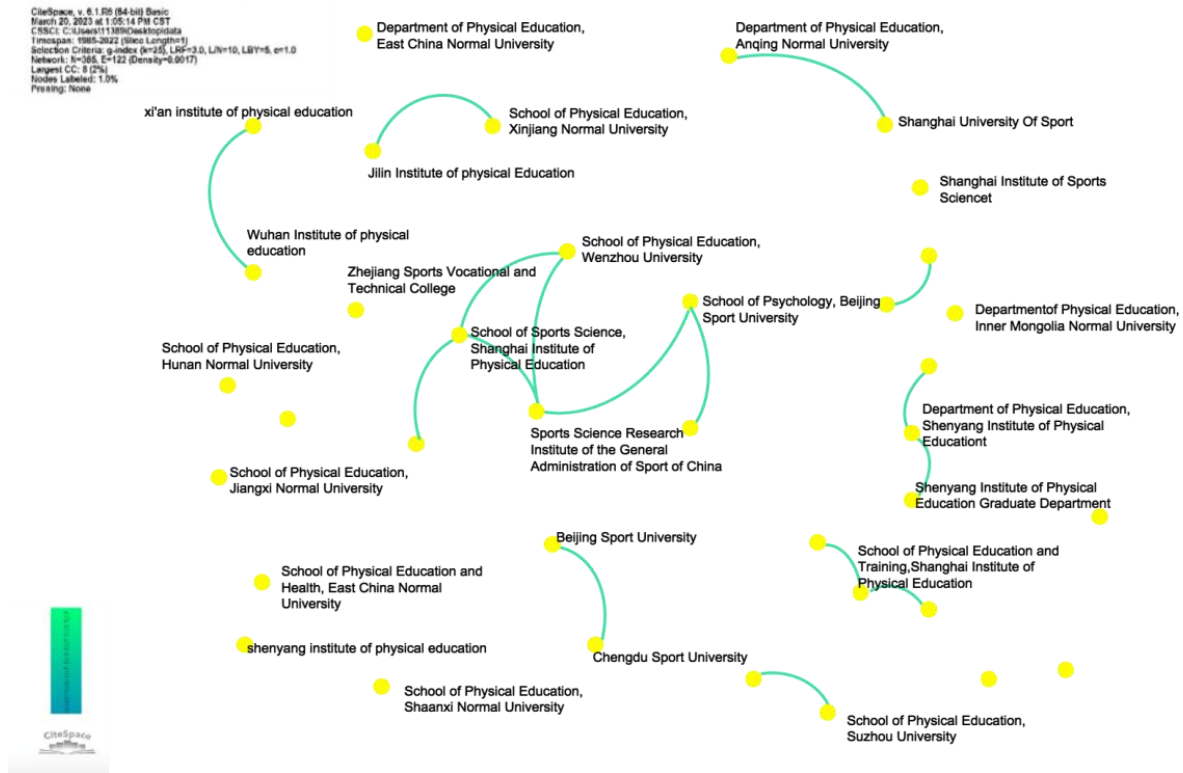


Figure 2. Co-occurrence Map of Sports Anxiety Research Institutions from 1978 to 2022

Table 2. Sports Anxiety Study from 1978 to 2022

order number	Post volume	Author	author's unit
1	14	Zhang liwei	Beijing Sport University
2	6	Zhang Zhongqiu	Research Institute of Sports Science, General Administration of Sport of China
3	5	Fu Ming autumn	Southwestern Normal University
4	4	Zhu Bei li	East China Normal University
5	4	Dou Yanli	Xinjiang Normal University
6	4	Zhu Jianmin	East China Normal University

7	3	Guo-sheng zhu	Suzhou University
8	3	Sun Guoxiao	Beijing Sport University
9	3	Ji Liu	East China Normal University
10	3	Sun poly	Suzhou University
11	3	Cao qinghua	Physical Education College of Xinjiang Normal University

### 3.4 Analysis of the Frontier Hotspot of Sports Competition Anxiety in China

In academic papers, subject words and keywords are often the summary and concise of the topic of the article. Statistical subject words and keywords can distinguish the research and development trend in the academic field. Keywords and mutations refer to important visual results, and draw the

analysis conclusion of the research frontier and hot spots in this field based with the literature [4]. The co-word nodes and emerging keywords with higher frequency and centrality represent the frontier research content and research hotspots in the field of sports anxiety. Combined with the centrality of keyword nodes and the emergence of emerging keywords, the study of sports anxiety can be roughly divided into six research subject groups. Each country in the node network in the visual community graph represents a different node. The size of the circle determines the frequency of the node, the greater the area of the circle; the

connection between the two nodes once appeared in the same article, and the thickness of the connection indicates the close correlation between the two nodes. As can be seen from Table 3, the most frequent keyword in this field was anxiety (69 times), followed by competition anxiety (64 times), followed by athletes (46 times). Anxiety is the realistic reaction of people's subjective initiative. Athletes' expectation for competition and performance makes athletes have certain sports anxiety. At the same time, the psychological ability, psychological training and influencing factors are also the main research issues in this field.

**Table 3. Keywords and Centrality of Sports Anxiety Studies from 1978 to 2022**

order number	keyword	frequency	Neutral	order number	keyword	frequency	Neutral
1	anxious	69	0.44	11	influencing factor	11	0.08
2	Competition anxiety	64	0.53	12	athleticism	11	0.05
3	Athlete	46	0.29	13	academician	10	0.03
4	Mental training	22	0.13	14	intensity	9	0.00
5	A trait	19	0.06	15	anxiety level	9	0.08
6	A state	18	0.08	16	psychology	9	0.04
7	Race	16	0.05	17	desired value	8	0.01
8	Anxiety before the game	13	0.06	18	characteristics of mentality	7	0.01
9	Psychology	12	0.08	19	mental power mental power	7	0.03
10	Psychologic factor	12	0.07	20	contest	7	0.02

### 3.5 Dynamic Evolution of Sports Anxiety Training Research in China

The cluster analysis function of Citespace divides the keywords with similar characteristics into the same group, which can understand the development course of a subject field, the main research directions in each period and the latest research hotspots. In the cluster analysis of the keywords included in the literature. There were 10 cluster keywords studied, which could be divided into 10 research directions (Table 4). The cluster analysis module value is  $Q=0.663$ , and the average shear value is  $S=0.8924 > 0.7$ . In the cluster analysis, the shear value is between 0-1, representing the size of the cluster homogeneity. It is generally believed that the shear value greater than 0.5 is a reasonable cluster, and the shear value greater

than or equal to 0.7 means that the cluster is highly reasonable and convincing.

After the reintegration and analysis of the above ten clusters, it can be clearly understood that sports anxiety in China is mainly in three directions: 1. Competitive anxiety, (cluster # 0 (anxiety) and cluster # 1 (competition anxiety)). Both clusters involve anxiety in sports competition, focusing on the stress and anxiety that athletes face during the competition. 2. Psychological factors and interventions: including cluster # 2 (influencing factors), cluster # 3 (psychological ability), cluster # 4 (state anxiety) and cluster # 7 (psychological training). These clusters focus on psychological factors and interventions for physical anxiety. Cluster # 2 discusses the various factors leading to physical anxiety,

Cluster # 3 focuses on the psychological ability and performance of individuals, cluster # 4 discusses the state anxiety of individuals, and cluster # 7 studies the intervention effect of psychological training on physical anxiety.3. Individual mentality and experience: including cluster # 5 (confidence), cluster # 6 (attention) and cluster # 8 (pleasure). These clusters focus on the relationship between individual mindset and experience during physical activity and anxiety.

**Table 4. Cluster Table of Physical Anxiety Studies from 1978 to 2022**

Cluster number	Mean years of publication in the literature	Cluster size	profile tolerance
#0 anxious	2006	63	0.828
#1 Competition anxiety	2002	53	0.871
#2 influencing factor	2007	44	0.909
#3 mental power	2005	41	0.897
#4 A state	1999	35	0.892
#5 self-confidence	2005	31	0.874
#6 attention	2008	29	0.879
#7 mental training	2006	27	0.928
#8 Pleasure	2000	24	0.974
#9 Anxiety before the game	2008	22	0.91

#### 4. Discussion

##### 4.1 The Causes and Regulation of Competitive State Anxiety

The control of anxiety is based on the basic theory of anxiety, so different theories have different relationships in the generation process of anxiety and the relationship between anxiety and action operation. These differences lead to the generation of different control principles and means in real countries. In psychology, according to the inner nature, society and learning can be roughly divided into three schools.1. The anxiety theory of the psychoanalytic school, the representative of Freud, regards anxiety as the key factor of

neurosis. Anxiety is a release of instinctive impulse, but he ignores the negative effects of anxiety and the need to deal with it in some cases. Later, we put forward the theory of anxiety signal, which emphasizes the interaction between physical response and emotion, cognition and behavior, and reveals the mechanism of individual perception, interpretation and management of anxiety, which is of great significance for clinical treatment and psychological intervention. The anxiety theory of humanistic psychology holds that anxiety is caused by the important choices, self-realization and growth of individuals facing in life. People may feel anxious when they feel unable to master or control their lives. The theory emphasizes the human desire for freedom and choice, and the emphasis on individual experience. It believes that anxiety stems from the insecurity and uncertainty of the gap between the potential needs and values within the individual and the external reality. For example, ok 169 young athletes as the survey object, which proved that youth sports anxiety, competition pressure, life pressure, injury pressure are closely related to learning pressure, teachers and students pressure, environmental pressure, interpersonal relationship and other seven aspects, reducing the pressure of the seven are conducive to the reduction of sports anxiety [5]. 3. The anxiety theory of the social learning school is that individuals may feel anxious when they face challenging situations. This anxiety can in turn affect their thinking, emotions, and behavior. Therefore, individuals need to find appropriate ways to handle anxiety in order to mitigate its effects. Albert Bandura Self-efficacy theory, the systematic desensitization of Joseph Wolpe, Richard Lazarus "Coping patterns" theory These psychologists' theories and studies support the anxiety theory of the social learning school, Think that individuals can learn and imitate the behavior of others, And by methods such as systematic exposure and gradual relaxation, To control and alleviate your own anxiety, For example, Based on the multidimensional anxiety theory and the view that eye movement plays a functional role in representation construction. ", Select the high-level divers as the subjects, Using the experimental approach, Explore that by controlling their eye-movement behavior, To

obtain different motion representation effects, Thus reducing the feasibility of competition state anxiety caused by match errors [6]. However, none of these three factional anxiety theories regards sports anxiety as the interaction of human's internal emotions, nerves and external environment. The current mainstream sports anxiety theory is still bilberg's state-trait anxiety theory, which is a psychological theory of human emotional change. The theory divides individual emotions into two categories: state and trait anxiety. State anxiety is a transient mood that is often associated with a specific event or situation. For example, by studying the personality characteristics, anxiety and mood of 342 college athletes, finds that the athletes with stable personality characteristics have a significantly lower intensity of competition anxiety than the unstable ones, while the overall mental health level is obviously better and they show stronger competition self-confidence [7]. Although most sports psychologists attach importance to the development of methods for regulating sports anxiety, proposing "mental training" such as "relaxation training" "self- suggestion", "biofeedback", etc. In addition, there are some cognition- based behavioral therapy relaxation techniques and drug therapy and many other methods used to regulate the anxiety level of athletes, in the actual operating environment, there are still certain limitations, but in a word, a clear understanding of the causes of anxiety, understanding its impact context is the first step in the management and regulation of anxiety.

#### **4.2 Factors of Competitive State Anxiety**

In most sports groups, sports anxiety is regarded as a negative word, believing that anxiety can only reduce sports performance, and the accompanying anxiety will cause many negative performances in athletes, which can be roughly divided into four categories. One is the internal emotions, such as tension, fear, anxiety, irritability, etc.; the second is physiological aspects, such as increased heart rate, blood pressure, skin resistance reduction and a series of endocrine activity changes; the third is psychological process and thinking, such as inattention, memory loss, thinking process divergent thinking; the fourth is in sports technology

and tactics, such as technical disorder or error, movement stiffness, coordination decline, the competition appeared "Choking" phenomenon (refers to the phenomenon of normal skill performance in the tense moment) [8]. The above four aspects are interrelated and differ in intensity and frequency [9]. However, in modern psychology, anxiety affects the level of movement operation has promoting and hindering two, one of the most famous is the inverted U type hypothesis, the hypothesis is that anxiety and sports performance show inverted U type, too high or too low anxiety level will affect the performance of performance, after the disaster model, the theory suggests that the level of cognitive anxiety determines the physiological arousal level increase or decline when the impact of operating performance, specifically, when the cognitive anxiety level is low, Moderate physiological arousal can help athletes maintain focus, improve response speed, and motor skill performance. In this case, anxiety helps to improve the athletes' competitive state and performance. However, when cognitive anxiety levels are too high, excessive physiological arousal may cause problems with distraction, poor decision-making, and difficulties in technical implementation, which has an obstructive impact on athletic performance. That is, motor operation performance affects by the combination of cognitive anxiety and physiological arousal level [10]. Moreover, the effects of anxiety are modulated by individual differences and task characteristics. Different individuals differ in responding to and adapting to anxiety, and some may be more vulnerable to interference with anxiety, while others are able to translate anxiety into positive motivation. Furthermore, task complexity, stress level, and individual experience and skill levels can also have modulatory effects on the effects of anxiety.

#### **4.3 Common Evaluation Methods of Competitive State Anxiety and**

Athletes in the game of the level of sports anxiety become affect the performance, affect the original sports level play important factors, early measurement of athletes competition anxiety using the state-trait anxiety scale (SCAT), Martens proposed, can predict competition trait anxiety and athletes

competition anxiety condition of SCAT and CSAI-2 two competition anxiety scale, Chinese scholars and tension for the study have joined the social evaluation of this factor, the development of localization, To improve the cultural adaptability of the scale. Luo Xuelian developed the anxiety prediction scale and validated it in some judo athletes and gymnasts, proving that state anxiety can be predicted and closely related to psychological characteristics such as personality and trait anxiety [11]. This scale as a measuring tool to diagnose the symptoms of athletes, but this does not mean that these scales consider the individual symptom tendency, more not his measured results to represent the athletes in physical, psychological, behavior, especially in the subject often according to social expectations and not according to the actual situation, the reliability of the scale is more lack. In addition, some scholars have studied the changes in athletes' anxiety state in terms of physiological and biochemical aspects. and others conducted a dynamic tracking study of electroencephalography (EEG) and brain image (EEQG), and found that the anxiety of athletes at different levels had different EEG characteristics [12]. Research shows that sports competition anxiety and cyclists heart rate variability, heart rate variability can be used to evaluate the overall anxiety level yan-mei wang through 12 male adolescent cyclists for October tracking survey, found that sports competition anxiety and cyclists heart rate variability has significant correlation, HRV can be used to evaluate the overall anxiety level, so as to timely understand the psychological condition of athletes [13]. By studying shooting athletes found that urine adrenaline and dopamine levels and is proportional to the degree of anxiety, combined with the competition anxiety scale score, can be used to judge athletes before anxiety, the physical anxiety and biochemical reaction found in the body exercise anxiety (especially anxiety before the game), the adrenal medulla and hypothalamus-pituitary-adrenal cortical system excitability increases, which cause a series of systemic changes, lead to increased catecholamine concentration. However, the duration and intensity of the dynamic movement are the main factors that change

the catecholamine concentration, among which the dynamic intensity of the exercise plays a more critical role [14]. However, some studies have also found no association between human anxiety and catecholamine secretion. For example, found in 40 athletes before and after the competition that there was no significant difference between blood testosterone, cortisol, noradrenaline and exercise anxiety in the normal and abnormal performance group [15].

It is worth noting that there are some limitations regardless of the measurement analysis method used. Different methods may yield different results, such as heart rate and EMG represent general levels of activation or arousal, but there is no significant association between them. Moreover, it is difficult to determine the nature of emotion by relying on physiological responses alone, because the elevated heart rate may be caused by other emotions, such as anger or happy emotions. The nature of emotional evaluation also requires a clear understanding of the athletes' cognitive responses, and it is influenced by social expectations and the surrounding environment, thus reducing the accuracy of the evaluation. In addition, some behavioral characteristics may mask real emotions, such as seemingly relaxed but inner tension or poor sleep without abnormal anxiety. There is still no conclusion on which substance or behavioral performance is better used as a characteristic indicator of anxiety, however, different measures and analyses continue to consider the effects of athlete cognitive responses and social environment. Future studies will focus on how to select appropriate indicators to assess anxiety levels and explore ways to regulate catecholamines to regulate physical anxiety to improve exercise performance.

## 5. Conclusion

Each evaluation method has its own limitations. A single measure may not fully reflect the sports anxiety status of athletes, while the evaluation measures may also be influenced by individual cognitive responses, social expectations, and the surrounding environment. Therefore, combining the results of multiple evaluation methods and tools, and combining the individual differences and background information of athletes, can more



accurately assess and understand sports anxiety. Future studies could further explore and validate new evaluation methods to improve the measurement accuracy and reliability of physical anxiety. At the same time, the relationship between sports anxiety and other factors (such as personality characteristics, psychological factors, environmental factors, etc.) should also be deeply studied, so as to understand and deal with athletes' sports anxiety more comprehensively. These efforts will help to provide better support and guidance for the athletes, prompting them to reach their full potential in the competition and show excellent competitive results.

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