

## Retraction

# Retracted: Psychological Analysis of Athletes during Basketball Games from the Perspective of Deep Learning

### Mobile Information Systems

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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- [1] Q. Meng, "Psychological Analysis of Athletes during Basketball Games from the Perspective of Deep Learning," *Mobile Information Systems*, vol. 2022, Article ID 4319437, 9 pages, 2022.

## Research Article

# Psychological Analysis of Athletes during Basketball Games from the Perspective of Deep Learning

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Due to the influence of psychological factors during sports, basketball players often change the shooting rhythm in sports, which will reduce the shooting rate and directly affect the training effect. Therefore, we need to analyze the basketball shooting process of some athletes, which is not a complete negation of traditional training methods, but a psychological analysis of some athletes' shooting in the course of competition, so as to complement the feedback and training information after the game. With the great improvement of computer computing power, deep learning natural language processing can help people analyze and solve previously unsolvable problems in production and life. The psychological emotion of adolescence has a great influence on the study and life of middle school students. At present, the unified monitoring and analysis of the daily life of middle school students need not only a lot of manpower, but also slow speed. If the psychological problems are not found in time and feedback is given, it will cause a series of adverse effects on individual athletes. The neural network model based on deep learning can process students' daily mass text information quickly and accurately, and then give comprehensive judgment, which is a good solution. This paper applies the neural network algorithm of the Bi-LSTM model and CNN model to study the text data, and finally has 95.55% and 90.03% accuracy in the psychological analysis experiment, which provides a feasible solution to solve the batch rapid analysis of psychological changes reflected in the daily text of athletes during basketball. Some suggestions are put forward on how to strengthen and improve the psychological quality of college basketball players and their ability to bear pressure and difficulties.

## 1. Introduction

With the development of market economy in modern society and the increasing improvement of material living standards, modern people begin to yearn for a fitness lifestyle, and sports gradually become a fashion [1]. Among many sports, basketball has become the most popular sport in China's sports industry. According to the white paper on China's Basketball Industry 2018, both the number of basketball courts and the number of basketball fans are far ahead of other ball sports, and basketball has become a fashion [2]. As a team project, basketball can improve people's physical quality; especially in the youth group, basketball can help them control their weight, cultivate teamwork ability, optimize their physical quality, correct sports attitude, and spread the competitive sportsmanship of basketball [3].

American expert Gruby believes that "for junior and intermediate players, 80% of the success of modern basketball is due to the biological power, 20% to the soul, and for high-level players, 20% to the biological power and 80% to the soul." Therefore, people began to fully understand the impact of psychology on the shooting rate. With the increasing improvement of basketball technology, psychology has become more critical. Therefore, this chapter gives some opinions on the psychological analysis and methods of basketball players' shooting skills for colleagues to explore.

With the increasing influence of NBA in the world, basketball is attracting more and more people's attention and love [4]. With the rapid development of basketball, basketball tactics have become more complex [5]. In today's information age, basketball is developing toward high-speed, high-skill, high-altitude competition and fierce competition. In order to adapt to the rapidly changing situation in the

arena, the current basketball technology will be rapidly changed to the trend of high-speed evolution. The cross-penetration and interaction of basketball attack and defense and basketball confrontation technology have different psychological effects on athletes. On the basketball court, the game becomes more intense and exciting. Through several years of development and exploration, the current basketball technology has not only been limited to physical quality, but also developed into confrontation in psychology, will, combat skills, and so on. The strong physical quality is the cornerstone, and the advanced fighting technology is the guide. However, the impact of psychological quality on basketball players in basketball matches cannot be underestimated [6]. If the psychology is not perfect, it will be difficult to show your ability in the competition; athletes can often outperform if they are mentally tough. In the world, many countries attach great importance to psychological training of basketball players.

Basketball is a comprehensive and direct competition, strong objective dependence on the collective project [7]. The process of the game is complex and changeable, and fierce confrontation and the psychological changes of basketball players are also very complex. The outcome is unpredictable and can change quickly. Therefore, basketball players need to have a strong psychological quality to cope with any changes on the court, so that it is not affected [8]. In a large number of practice matches, basketball players not only consume a lot of physical energy, but also consume a lot of psychological ability in their competitive activities [9]. With the increasing improvement of the technical level of modern basketball in China, the overall technical level and comprehensive strength of Chinese basketball players have significantly improved, but the differences between basketball players are gradually decreasing [10]. In this case, the psychology of tennis players is very important. In foreign high-level basketball matches, the main assessment is not only the physical fitness and combat skills of tennis players, but also a psychological competition [11]. At these times, especially at the end of the competition, the decisive role is usually the psychological quality of the players. In the basketball game, it is unpredictable on the court, which makes the psychological activities of basketball players in the process of participation constantly change [12]. Through the research on the game and relevant data, basketball players generally have two mental states: one is conducive to the players' technology display and application in the game, and the other is not conducive to the players' technology application and use in the game [13]. This paper provides a feasible solution to solve the problem of batch rapid analysis of the psychological changes reflected in the psychological daily texts of athletes during basketball. Put forward relevant suggestions on how to strengthen and improve the psychological quality and ability to withstand pressure and difficulties of college basketball players. Therefore, "in order to improve the shooting rate of basketball players to enhance the psychological stability of shooting ability and increase the degree of exciting matches, the study of psychological stability factors affecting the shooting rate is very key."

## 2. State of the Art

### 2.1. Analysis of Psychological Factors Affecting Shooting in Basketball Match

*2.1.1. Lack of Preparation for the Competition and Rush to Participate.* The athletes are not well prepared for the competition and do not analyze the strength of the opponent [14]. Mental preparation does not form accurate consciousness, so attention cannot be focused. Central nervous system disorder is caused by excessive excitement or inhibition, sudden or untimely handling of events, tight muscles, busy movements, and fear of losing.

*2.1.2. Lack of Understanding of the Other Party before the Competition.* Without understanding the other side, you may make unnecessary mistakes in the game [15]. For example, psychological fear that the other party is better than themselves, or contempt for the other party, thinking that the other party is poor and vulnerable, helps to ignite their fighting spirit [16]. Athletes are too eager to win the game, and if there is a score behind, they cannot control their emotions, which needs to be avoided. This has resulted in the distortion of the movement, the previously formed movement habits, the rhythm changes, and out of control.

*2.1.3. Lack of Training and Psychological Pressure.* The training at ordinary times is lax, often unable to reach the normal training quality, and the playing is often interfered by external influences, which is easy to lead to rigidity of action, lack of actual combat awareness, and low shooting hit rate [17].

*2.1.4. Lack of Competition Experience and High Psychological Tension.* Players do not participate in the competition for a long time and have no experience in the competition. Every time after a major competition, their mentality is easy to be too nervous and thus reduce the scoring and shooting rate [18].

*2.1.5. Score Versus Shooting Percentage.* Shooting score is the yardstick for judging the success or failure of a basketball game. Whether a game is won or not mainly depends on the number of shots and the percentage of hits [19]. Performance is the standard to evaluate the technical and tactical ability of team players, and also the comprehensive embodiment of their performance on the court [20]. Therefore, the score also plays a certain role in shooting. When the score is leading, the skills will be more normal, the shooting action will be more simple and easy, and the hit rate will be higher. When the score falls behind, there will be impatience and the shooting action will be more rigid, thus reducing the hit rate. When the score falls behind, some players will lack self-confidence and even abandon themselves, which is not conducive to giving full play to their shooting skills. When the score is nearly uniform, this is the best time to test the psychological quality. People with good physical and

psychological quality generally have a higher shooting rate, while people with good physical but poor psychological quality have a limited shooting rate.

*2.2. The Importance of Mood, Confidence, and Concentration in Shooting.* Emotion, belief, and attention are also closely related. Emotion contributes to confidence and attention. When athletes are excited, they are confident, focused, and confident in shooting. Otherwise, people will be distracted, lack confidence, hesitate, and delay the flight. Therefore, mentality, belief, and attention are interrelated and mutually restricted.

**Stable state of mind:** a stable state of mind can make the physiological process and psychological process of shooting consistent, so as to better mobilize the regulatory function of the nerve, so that the muscle can more smoothly and directly carry out the shooting action. The state of mind is stable, and he can control himself under all conditions. Especially under the most difficult conditions, he should be full of confidence, guide himself to fulfill the choices he has made, eliminate any obstacles with strong perseverance, and consciously adjust his best state of mind to maintain stable shooting effects. When the players have strong desire to overwhelm the other side or strong desire to shoot and will to shoot in the game, they will carry a huge psychological burden on their backs, form a bad ideological pressure, cause failure in the game, and even lose confidence in shooting. It can be seen that the balance of mind in the shooting process is very important. A positive and excited attitude will reduce the physical and mental pressure of the players and make it easy to complete high-quality events. A positive, excited, and relaxed attitude often makes the players run actively in the attack and makes full and complete actions when shooting, thus improving the shooting hit rate. Table 1 lists the analysis and investigation of the causes of athletes' psychological and emotional states during ball shooting.

**Enduring faith:** confidence refers to the ability of athletes to prove that they can complete the specified shooting activities during practice and competition. Lack of self-confidence will restrict the player's thinking and make him hesitant, which will affect the next good shot. Even at the beginning of a good shot, he will be unable to hit the ball because of lack of confidence. When players are confident, shooting skills can be used freely and easily. Confidence is important to the level of the players' practice. During the practice, we should learn to use various teaching methods and other languages to exercise the confidence of the players. Only after hard practice and mastering good shooting skills can we have sufficient material foundation for confidence.

**High attention:** attention refers to people's mental movement, pointing and focusing on specific objects. Attention can be attracted under certain conditions and time and focused on a certain focus. The high concentration of attention is the main psychological factor when shooting, which can keep the psychological activities in a positive state. Modern psychologists have confirmed that the range of attention is positively related to the tension of attention. The higher the tension of attention, the smaller the range of

attention. In the whole shooting process, the attention of the players is pointed to according to the situation of different stages. For example, when getting a basket, players will focus on the distance of the shot, whether the position is blocked by the opponent, what kind of shot to use, and so on.

### *2.3. Strengthen Psychological Quality and Improve Shooting Accuracy*

*2.3.1. Pay Attention to the Psychological Preparation before the Game.* The competition practice has also proved that the mentality preparation before the competition is important to the victory of the competition. The mentality of players and their preparations for the game usually depend on the understanding of the coach and players on the significance of the game. Before the competition, the psychological countermeasures shall be put forward according to the abilities of the players of both sides and the mental state of both sides in the preparation activities, and transmitted to the players. Let the players have full confidence in the event, so that no matter what happens before and during the event can be in a good psychological state.

*2.3.2. Strengthen Self-Psychological Adjustment Training.* The situation in the competition is complex and changeable. The failure and achievement in the competition will lead to the change of the players' mentality. Be realistic, people cannot let a successful setback affect their life mentality. Train the players' strong will and keep a clear mind. During the competition, the players realized self-regulation by changing their skills and tactics on the field. They can use self-suggestion, self-imagination, and self-regulation to maintain a good state of mind.

*2.3.3. Cultivate the Quality of Decisive Will.* Train the team members to create positive shots. Of course, comprehensive psychological analysis should be carried out by moving, getting rid of, grabbing the ball, and breaking through. If positive shots are formed, they should be decisive and do not worry. To do this well, the players need to have a bold style and strong attention, and at the same time, they also need to have strong shooting ability and determination.

*2.3.4. Strengthen the Difficulty of Simulating Confrontation in Training.* In the ordinary practice, it can be set in different training venues, different technical conditions, tactical conditions, and different confrontation conditions to improve the antagonism of offensive shooting, increase the stability and hit rate of shooting, and also use more practice means such as hypothetical luck and time pressure, such as hypothetical time is the last 3 minutes, 1 minute, 30 seconds, 5 seconds. Carry out special cooperative shooting training under the condition of backwardness or draw at all times, so that the team members will not be nervous and soft at all times and in adversity, and have the courage to fight and dare to stop and win, so as to improve and consolidate the shooting percentage. In the ordinary practice, in addition to

TABLE 1: Questionnaire on the causes of psychological and emotional states of athletes when shooting three-point ball.

name	Delegation	Position	Emotional state	Cause
Xie XX	Northeast Normal University	Point guard	Relax	Have a correct understanding of the game
Zhu XX	Xi'an Jiaotong University	Forward	Absorption	Strong confidence in the match
Yan XX	Tianjin Polytechnic University	Forward	Relax	Treat the game normally
Liu XX	Liaoning University	Forward	Nervous	The score fell behind in the game
Chen XX	Guangdong University of Technology	Forward	Nervous	The score fell behind in the game
Luo XX	Hunan University	Point guard	Decisive	Highly trained and confident
Wang XX	Huazhong University of Science and Technology	Forward	Panic	Inadequate preparation for the game
Ma X	Wuhan University of Technology	Forward	Nervous	Lack of self-confidence

training the players to learn more points and various shooting training methods, the quality of shooting training must also be increased. Especially after the training or a large number of training, the high-quality shooting training cannot be ignored, nor can the players form arbitrary and irresponsible shooting behavior in the ordinary practice, such as the methods in some competitions, such as penalty kicks or fixed-point shooting competitions. All of this requires the training team members to be more careful and serious, and in view of the characteristics of the competition, so as to enhance their confidence in the game and their shooting percentage when their physical quality is significantly reduced.

*2.4. Promote the Basketball Players Smooth Play of the Psychological State of Tactics and Skills.* The psychological conditions that promote the smooth development of basketball players' skills and tactics are divided into the following four aspects:

First is emotional stability. A stable mood is the prerequisite and cornerstone for the normal development of basketball players' skills and tactics. This kind of stable mood is to make the basketball players in the competitive activities, not affected by personal feelings, or sad or happy, to control the results of the game. Whether a player has a stable mood in the competition and normal practice plays an important role in whether a player can play a stable role in the unpredictable competition. Emotional stability is the key reason to maintain good psychological quality. There are many factors that cause emotional changes. Master the various factors that affect the emotional stability of basketball players, and point out the development direction for routine practice.

Second is strong will. It is generally believed that the willpower refers to the basketball player's ability to control his own actions and technical behaviors spontaneously in order to win the final game in competitive activities. Its main feature is the players' positive attitude in the competition. In competitive activities, players must have strong willpower to overcome their own or external obstacles. This will reflect the shaping ability and perseverance during the competition and is not afraid of difficulties. Basketball, as a team activity, also contains a huge antagonistic component, which leads to the variability and complexity of the will of basketball

players. Therefore, this requires the strong will of the team members to overcome many difficulties in the competition.

Third, we should have the ability to adapt to change. Basketball is not only fierce, but also complex and changeable. The game is characterized by uncertainty. There is no way to predict what will happen on the court. It is impossible for the opponent to play according to the skills you have prepared.

### 3. Methodology

*3.1. Feedforward Neural Network.* Neural network is a machine learning algorithm that simulates human brain. It has strong expression ability and good data fitting ability. Neural networks are generally composed of injection layer, hidden layer, and input-output layer. By setting multiple hidden layers, it can automatically learn features from the bottom to the top of the training data. Expression of neural network is

$$y = NN(x). \quad (1)$$

$X$  is the input vector, and  $y$  is the task-dependent output.

The simplest neural network model is feedforward neural network, also known as multilayer forward neural network. As shown in Figure 1, each item has a value even for money, and there are two hidden layers.

The basic working unit of neural network is neuron. The information of the upper level can be summed by weighted matrix to obtain neurons and then activated by activation method. The output is calculated to be consistent with the input value of the next stage, so it has a good fitting function.

Among  $\theta$ ,  $I$  represents the weight of  $X_i$  input, and the machine can learn independently.  $F$  is the activation parameter. The machine can realize nonlinear fitting of data, but usually uses other activation parameters such as sigmoid, tanh, and ReLU. The mathematical expression of the multilayer feedforward neural network of a group of hidden layers  $n$  is

$$\begin{aligned}
 NN(x) &= y, \\
 h' &= x, \\
 h^i &= g^i(h^{i-1}W^i + b^i), \\
 y &= h^{n-1}W^n.
 \end{aligned} \quad (2)$$

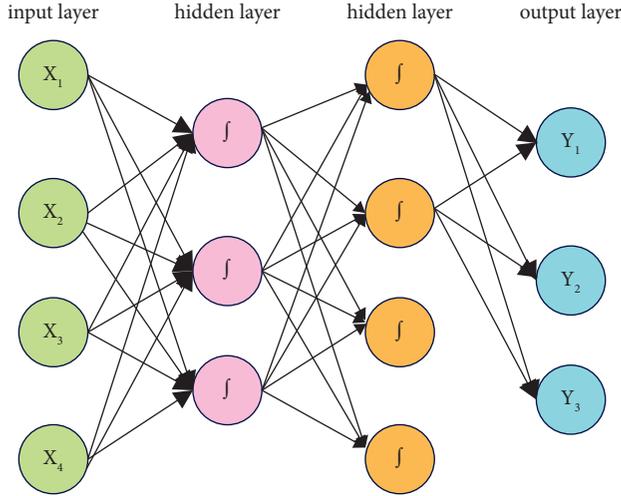


FIGURE 1: Feedforward neural network.

**3.2. CNN Model.** Convolutional neural network (CNN) model is a neural network model for obtaining local information. CNN initially used image recognition technology. Most pictures on social networks have simple language structure and compact structure, and can also be described using embedded word vector technology. Through the application of CNN model, it also achieved good results in text analysis. The CNN model first arranges the embedded vectors of words from the text and then performs the following three processes after input:

*Step 1. Convolution layer:* Each neuron was treated as a filter. The filter type is  $f * F$ . It scans the  $k * x$  matrix of a sentence filled with  $s$  steps, where  $k$  is the width of the sentence and  $X$  is the word embedding vector of a word. In the inner product of a scan matrix, the obtained (rounded down) matrix is finally generated. Convolution algorithm is a step-by-step feature extraction method. Designing multiple filters can extract high-level features.

*Step 2. Pool layer:* The pool is carried out in the process of continuous convolution. By obtaining relevant data in the text, and by using cell average technology in the models of Max and LSTM, the parameters of the data source are reduced to reduce the amount of overfitting and improve the feature extraction technology.

*Step 3. Full connectivity layer:* The calculation result of convolution layer is ReLU activation function or nonlinear mapping. Finally, the softmax function is used to calculate the tag probability of more types of emotion. ReLU function is

$$f(x) = \begin{cases} x & (x > 0), \\ \lambda x & (x \leq 0), \end{cases} \quad (3)$$

where  $\lambda$  is a variable that can be learned through the back propagation algorithm.

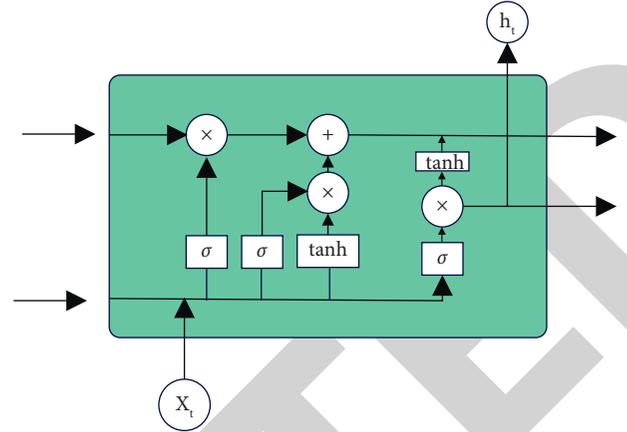


FIGURE 2: A cell in the LSTM model.

**3.3. LSTM Model.** LSTM was first proposed by Hochreiter et al. to deal with the phenomenon of ladder disappearance and ladder destruction caused by the short memory time of recurrent neural network (RNN). It is also an RNN. LSTM can fit the sequence signal well. LSTM is mainly composed of neurons, which is equivalent to the neural cells of memory. On the basis of the entrance and exit of RNN mode, a special forgetting gate is also added, which has the ability of long-term memory. The entry gate, output gate, and forgetting gate are adjusted by sigmoid trigger parameters. Because the sigmoid function can take the value from zero to one, it can limit the opening rate of the forgetting gate at the current node. Both the input gate value and the cell state can be converted by the tanh trigger function. Figure 2 shows a cell in the LSTM mode.

Forgotten door expression is

$$f_t = \text{sigmoid}(W_f x_t + U_f h_{t-1} + b_f). \quad (4)$$

Enter the door expression as

$$i_t = \text{sigmoid}(W_i x_t + U_i h_{t-1} + b_i), \quad (5)$$

$$\bar{C}_t = s \tanh(W_C x_t + U_C h_{t-1} + b_C).$$

## 4. Result Analysis and Discussion

**4.1. Experimental Data and Environment.** The model in this paper will be trained by the flowchart above to obtain the final neural network parameters suitable for the needs of this paper. (1) Use Python's Jieba library to convert the text into one-hot code and then transfer it to the input layer; (2) the word vector of one-hot code pretrained by word2vec is transformed into the word embedding vector as the input of neural network in the embedding layer; (3) various outputs are obtained after the model is trained by Bi-LSTM network or CNN model; (4) after full connection layer multiplication, the affective tendency results are obtained by softmax function multi-classification. Based on this process, this paper will compare and summarize Bi-LSTM and CNN models.

TABLE 2: Bi-LSTM parameters.

Parameters	Value
Batch size	64
Unit-num	32
Bi-LSTM layer	32
Epoch	6
Activate function	LeakyReLU
Learning rate	0.001
Loss function	Cross-entropy
Optimization function	Random gradient descent
Word vector dimension	256

The main data collection of this paper is from the public data set of IMDB, with a total of 50000 data sets, and the ratio of positive and negative samples is 1:1. After pre-treatment, it can be divided into 20000 training sets, 5000 development sets, and 25000 test sets. The training set is used to train the neural network modeling, and then the data of the development set are used to select the debugging parameters of the model. Finally, the generalization ability of the model is evaluated by the test set. The test parameters directly affect the test results of the model. After the pretest, we compared the hidden layer function, optimization parameters, CNN loss function, and filter of different Bi-LSTM, and obtained the best initial parameters of the two modes. Table 2 shows the parameters of all Bi-LSTM, and Table 3 shows all parameters of CNN.

**4.2. Experimental Results and Analysis.** This chapter not only compares the accuracy of Bi-LSTM and CNN mode, but also practices the classical RNN mode and LSTM mode to help analyze the advantages, disadvantages, and effects of this mode. The experimental results are shown in Table 4. It can be seen that Bi-LSTM has achieved quite good results compared with LSTM in context analysis, and its accuracy is 5.52% higher than that of CNN model. The prediction should be because the different sentence lengths of the data sets in this paper lead to CNN's lack of high accuracy in analyzing long paragraphs. However, the accuracy of RNN is significantly lower than that of the other three due to gradient disappearance and gradient explosion. Although LSTM is superior to RNN, it is still impossible to make accurate estimation because the following contents cannot be merged. The conclusion of this paper also indirectly shows that the emotional expression of middle school students for daily texts is scattered in language segments. If the analysis is performed manually, an error may occur. The accuracy range of Bi-LSTM is 95.55%, so it can effectively realize large-scale text processing.

As can be seen from Figure 3, the solid line represents the measured sample data, and the dotted line represents the predicted data of the network. In most cases, it can be said that the trend of the two curves is basically the same, but it does not rule out that there is a large difference between the actual measured data and the predicted data at individual prediction points. Compare the prediction results of the network with the data obtained from the actual

TABLE 3: CNN parameters.

Parameters	Value
Filter size	3*3
Filter quantity	100
Activate function	ReLU
Pooling method	Max
Dropout rate	0.5
Epoch	6
L2	3
Word vector dimension	256

TABLE 4: Comparison of experimental results.

Model	Acc
Bi-LSTM	95.55
CNN	90.03
LSTM	85.07
RNN	81.33

measurement, and the relative error between the prediction results and the actual measurement results is within the acceptable range, as shown in Figure 4. Therefore, the prediction results can meet the requirements of measurement, but it also shows that the prediction model can be further improved to improve the accuracy and accuracy of network prediction results.

As can be seen from Table 5, the null hypothesis is rejected. Therefore, the performance of each algorithm is different. Based on the above analysis results, it can be determined that the proposed method performs better than K-means, k-meanspo, k-meansfa, and fuzzy  $k$ -means algorithms in statistics.

In order to further verify the performance of the SECNN model, different amounts of training data were selected to conduct a comparative experiment on the topic recognition task. The number of training data selected under each topic increased from 1000 to 10000, and 1000 pieces of data were added each time. Ten comparisons were made. And the representative  $f$ -value is used as the main judgment index. The test results are shown in Figure 5. It can be seen from the experimental results that the improved neural network model has shown its advantages when the amount of data is

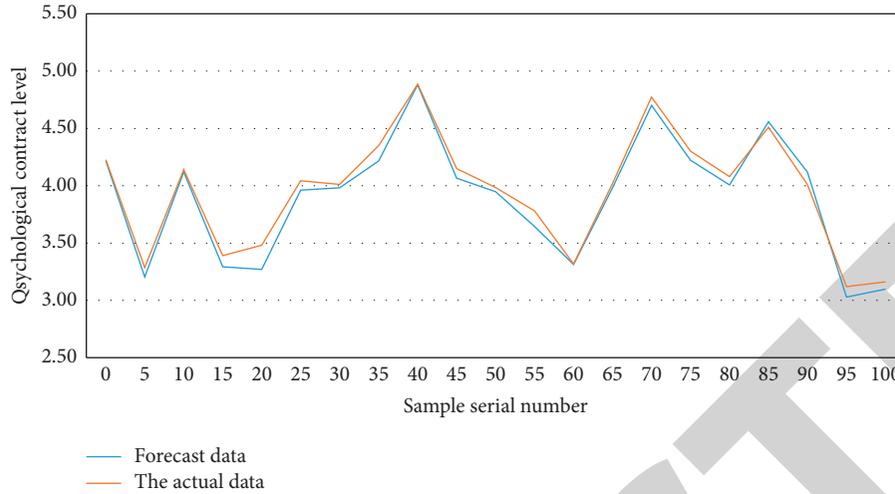


FIGURE 3: Neural network prediction results.

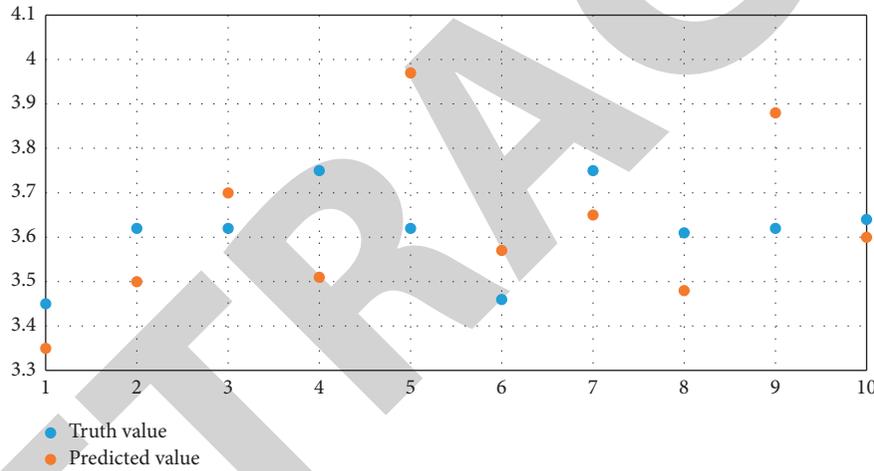


FIGURE 4: Corresponding error diagram between predicted data and actual data.

TABLE 5: Statistical results of Friedman test.

Algorithm	$z$ value	$p$ value	$\alpha/(k-1)$	Result
$K$ -means	-2.8571	0.00219	0.02	Refuse
$K$ -means PSO	-2	0.02275	0.025	Refuse
$K$ -means FA	-2	0.02275	0.0333	Refuse
Fuzzy $K$ -means	-2.8571	0.02219	0.05	Refuse
Method in the text	-3.1428	0.00084	0.10	Refuse

relatively small; especially with the increase of the amount of data, this advantage gradually increases. This is because there are many learning parameters in the neural network model, which requires a large number of data to achieve better learning results. However, the learning ability of the traditional machine learning model does not increase with the increase of the data scale. The  $F1$  value of the three models only reaches about 86.7%, which is also a deficiency of the

traditional machine learning model. In addition, compared with CNN model, the  $F1$  value of SECNN model reaches about 94.9% when 7000 pieces of data are available, while the  $F1$  value of CNN model is about 95.0% when 11000 pieces of data are available, which indicates that SECNN requires less training data when there is only a difference of about 0.1%  $F1$  value, proving that SECNN model has stronger feature extraction ability and learning ability.

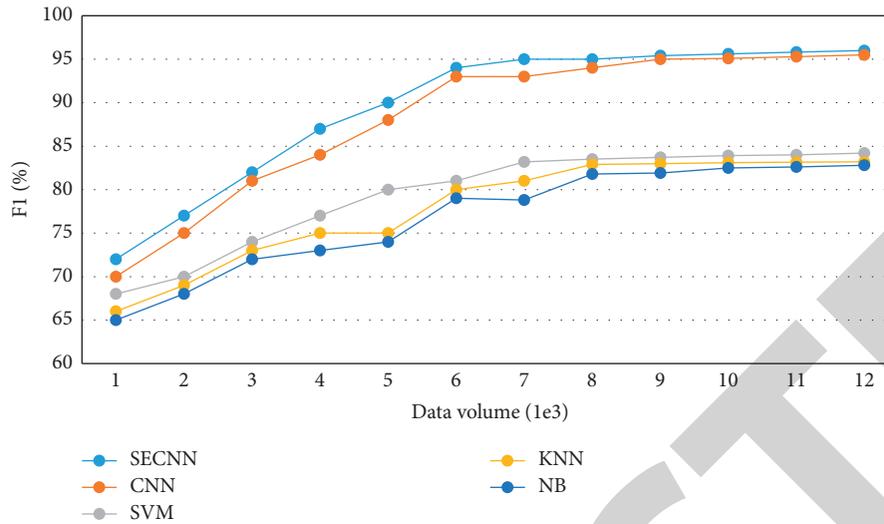


FIGURE 5: Performance comparison of different data sizes.

## 5. Conclusion

Since the birth of basketball, the theoretical research on basketball psychological training has gradually deepened. In today's international basketball arena, the psychological adjustment and psychological training of the players have become the main part of the whole training process and play a vital role in the athletes' competition. In the paper, the batch analysis and the solving methods of athletes' psychological problems are compared and analyzed, and some conjectures are made in view of the different properties of Bi-LSTM model, CNN model, and traditional neural network model. Experimental results show that the  $F1$  value of SECNN model reaches about 94.9% when it has 7000 data, while the  $F1$  value of CNN model is about 95.0% when the data volume is 11000, indicating that SECNN requires smaller training data when it differs only by about 0.1%  $F1$  value, which proves that SECNN model has stronger ability to extract features and learning ability. This paper puts forward a feasible scheme for batch analysis of athletes' psychological text.

## Data Availability

The labeled data set used to support the findings of this study is available from the corresponding author upon request.

## Conflicts of Interest

The author declares that there are no conflicts of interest.

## Acknowledgments

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