

# *Evaluation and Analysis of Psychological Stress in Vocal Performance of Ethnic Singers from the Perspective of Big Data Analysis Psychology*

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**Abstract:** In the contemporary music market, ethnic songs and music have become increasingly popular artistic expressions. In this form of performance, ethnic singers face certain challenges, including musical skills, emotional expression, and stage performance. Ethnic singers are prone to psychological tension during the performance process. Due to the potential for poor performance due to psychological tension, evaluating and quantitatively analyzing the psychological tension of ethnic singers in vocal performances can better understand and address these issues. This study aims to explore the psychological stress assessment analysis of ethnic singers' vocal performance from the perspectives of big data analysis and psychology. By collecting and analyzing physiological data (such as heart rate, breathing, etc.) and subjective feedback (such as anxiety level, stage confidence, etc.) during the vocal performance of ethnic singers, objective quantitative analysis of psychological tension can be obtained. Through experiments, it is known that the accuracy of the automatic analysis system for vocal performance status of ethnic singers can reach 95%. In addition, this article would also explore the impact of individual differences, performance backgrounds, and techniques among ethnic singers on psychological tension, as well as suggestions and guidance for adopting effective strategies to improve their performance and stage performance.

## 1. Introduction

In today's era of rapid technological development, big data analysis is gradually changing way of life and work. Among them, its application in academia and industry has received widespread attention [1]. Especially in the specific field of vocal performance by ethnic singers, the use of psychological perspectives for big data analysis of psychological stress assessment has become particularly important. This not only helps to reveal psychologists' understanding of group potential and promote individual value realization [2], but also fully reflects the charm of folk songs, enriching the cultural research and economic development value of folk songs [3]. Vocal music has a unique artistic form [4]. Occupying an important position in the performance art system [5]. Furthermore, deep learning serves as a powerful technological driving force [6]. It would provide broader possibilities for big data collection and bring countless opportunities for new research fields [7]. Therefore, it is necessary for us to continue to pay attention to the application of big data in psychological research, and continuously optimize the analysis process by exploring new research methods and technologies, further promoting the development of the field of psychological stress assessment and analysis for ethnic singer vocal performance.

The psychological stress assessment analysis of ethnic singers' vocal performance from the perspective of big data analysis psychology has feasibility and important value. Through deep learning methods, models can be trained using a large amount of data, and patterns and patterns can be discovered to better analyze and evaluate the psychological tension of ethnic singers in vocal performance. At the same time, as an important component of the inheritance and development of Chinese culture, the development of ethnic vocal music is also of great significance. Therefore, the psychological stress assessment analysis of ethnic singers' vocal performance from the perspective of big data analysis psychology is very feasible and has important practical significance.

## 2. Composition and Influence of Psychological State

### 2.1. Impact of Psychological State

Stage tension is a difficult problem for students majoring in music performance to overcome [8]. In recent years, with the continuous development of ethnic songs and music culture, more and more ethnic singers have emerged on the music stage. However, at the same time, these ethnic singers also face certain challenges during the performance process, especially psychological tension issues. Psychological stress may have a series of negative effects on the vocal performance of ethnic singers, including voice tremors, difficulty breathing, decreased stage performance, and confusion in thinking. Therefore, in order to improve the performance and stage performance of ethnic singers, it is crucial to evaluate and address psychological tension issues. Many performers experience stage fright in large-scale performance occasions. Although sometimes nervousness can help the performer perform, stage fright is a major taboo in all performances. Stage fright can cause the performer to lose control [9].

The following would provide a detailed introduction to the impact of psychological stress on the vocal performance of ethnic singers. The impact of psychological stress on the vocal performance of ethnic singers mainly includes the following aspects (as shown in Figure 1):

**Voice tremor:** When ethnic singers feel nervous, their bodies become stiff, which may cause their voices to shake or tremble. This situation can affect vocal skills and musical expression.

**Breathing difficulties:** nervousness can also lead to shallow or irregular breathing in ethnic singers, thereby affecting their singing skills. If ethnic singers cannot fully control their breathing, they may scream or flip when singing high notes.

**Reduced stage performance:** When ethnic singers feel nervous, they may feel anxious, afraid, or

uneasy. These emotions may cause them to lose confidence and perform poorly, such as forgetting words, out of tune, or unnatural movements.

Mental confusion: nervousness may also cause confusion in the thinking of ethnic singers, making it difficult to correctly remember the lyrics and melody of the song, affecting its performance.

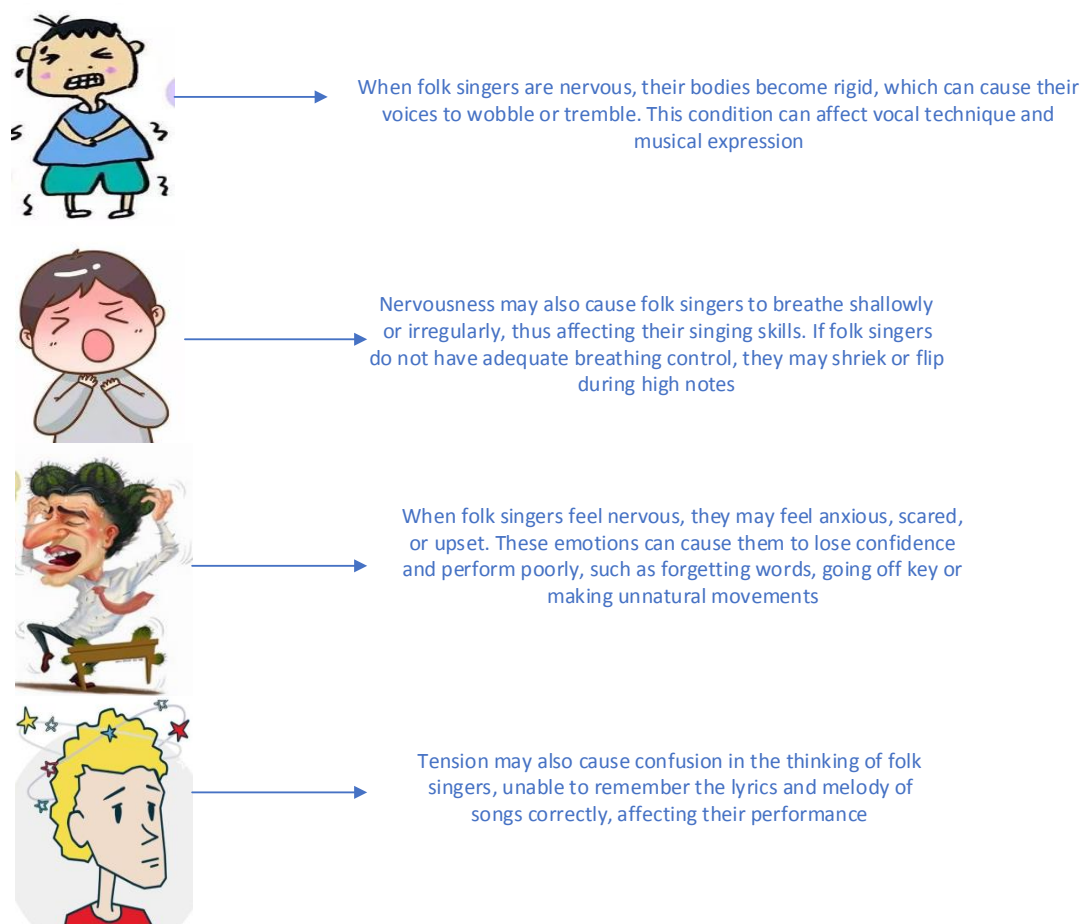


Figure 1. The impact of psychological tension on performance

In short, psychological tension is a common problem among ethnic singers in vocal performance, which can have a negative impact on their performance skills, emotional expression, and stage performance. Therefore, evaluating and addressing psychological tension issues is crucial for improving the performance and stage performance of ethnic singers.

## 2.2. Nervous Psychology of Ethnic Singers during Vocal Performance

When a national singer stands on stage and faces the gaze of the audience and judges, the generation of tension and other emotions may lead to corresponding changes in the singer's heart rate, blood pressure, and other aspects (data is shown in Table 1)

Table 1. Body part data under normal and tense states

	Ordinary	Nervous
Heart rate	60~75frequency(m in)	80~100frequency(mi n)
Blood pressure (during diastole)	60-89mmHg	>140mmHg

Respiratory rate	12~20frequency(m in)	>24frequency(min)
Temperature	37°C~37.3°C	>37.5°C

Overall, this tension is not necessarily a bad thing for the performance of ethnic singers. Moderate tension can stimulate better performance and make singers more engaged and confident. With reasonable control, ethnic singers can turn tension into motivation and showcase their unique artistic charm.

### 3. Big Data Analysis Psychology

#### 3.1. Method Analysis

With the rapid development of deep learning and artificial intelligence, emotion analysis, as a branch field, is receiving more and more attention [10]. Big data analysis psychology is a disciplinary field that combines psychology and data analysis. It utilizes large-scale data collection, storage, and computational analysis methods to deeply explore the patterns and characteristics of human psychological activities, thereby achieving the interpretation and exploration of psychological phenomena. The basic method of big data analysis psychology is to use modern information technology to collect and process data, and use relevant analytical tools to reveal the relationships and patterns between large-scale psychological data, in order to reveal potential psychological structures and processes. In practice, big data psychology mainly involves two parts: data collection and data processing.

#### 3.2. Big Data Psychology Design

With the continuous development of the social economy, various industries are constantly seeking change, which puts forward higher requirements for data management and analysis technology [11]. Big data analytic psychology is a combination of big data analysis technology and psychology to extract psychology related information and knowledge from massive data to help people better understand and apply the knowledge of psychology. This technology can be applied in many different scenarios. The psychological stress assessment and analysis process of ethnic singers' vocal performance from the perspective of big data analysis psychology can include six steps: designing a questionnaire, collecting data, cleaning data, statistical analysis, model building, and result analysis, as shown in Figure 2. Collecting data would enable managers to better observe and make decisions [12].



Figure 2. *Psychological Stress Assessment and Analysis Process of Ethnic Singers' Vocal Performance from the Perspective of Big Data Analysis Psychology*

### 3.3. Data Collection

Data exploration technology can search for potentially valuable information from a large amount of data, and its steps mainly include data preparation and data mining, as well as the expression and analysis of results [13]. This article analyzes and organizes data, and collects data to enable the system to obtain data from different sources [14]. Data collection is a very important step in the process of evaluating and analyzing the psychological tension of ethnic singers' vocal performance from the perspective of big data analysis psychology summarized in the previous text. It involves collecting data on the psychological tension of ethnic singers in vocal performance, helping to understand their performance and emotions during the performance process. The purpose of data collection is to collect sufficient data samples and related variables, control and analyze them, and draw meaningful conclusions to help deepen the understanding of the tension of ethnic singers and vocal performers. Experiments are an important way of scientific exploration, and the ability to design experiments is a necessary key skill in experimental exploration [15].

**Experimental subjects:** This article recruited 1000 vocal performers from ethnic groups and divided them into two groups. Group A consisted of 500 senior performers. B is a group of 500 performers with relatively weak stage experience, covering different ages, genders, educational levels, music preferences, and other aspects among the 1000 performers.

**Data collection method:** This article divides volunteers into two performances, the first with no audience and no venue restrictions for judges. For the second time, 10 judges and 200 spectators were arranged on a professional stage to conduct psychological state tests during the two

performances. The experimental data is shown in Figure 3.

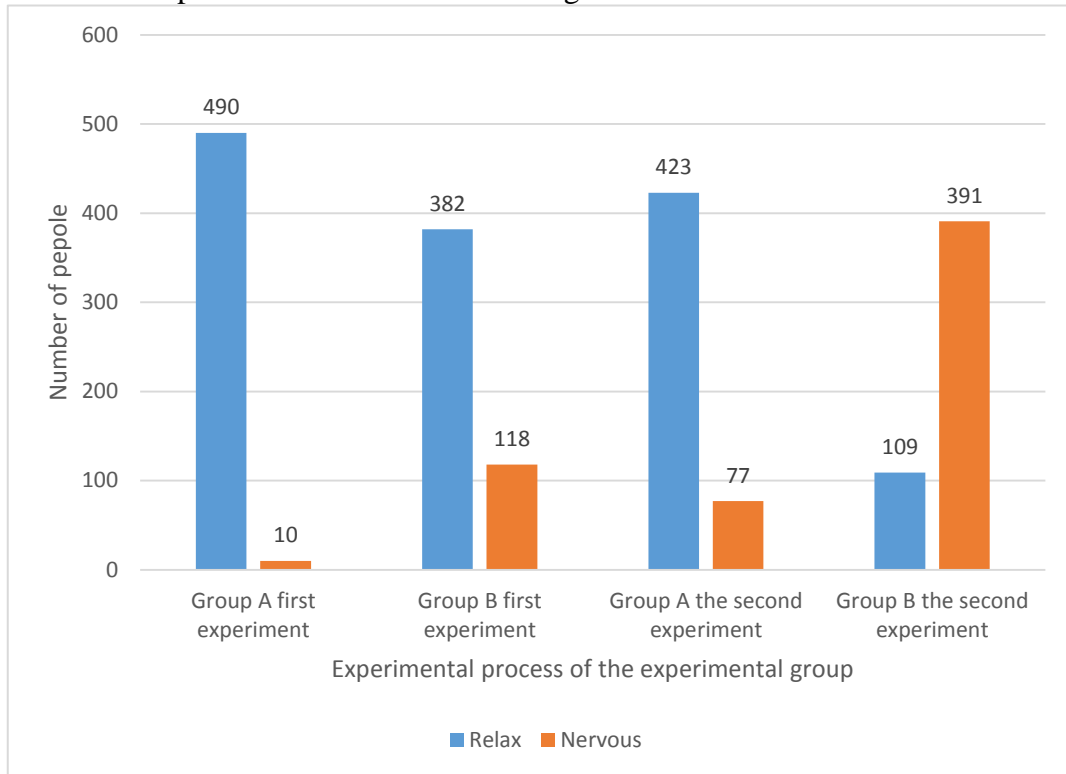


Figure 3. Experimental Data on Vocal Performance of Ethnic Singers

Figure 3 shows that in the experiment, the majority of people in Group A and Group B relaxed during the first experiment, and the number of people in both groups who were stressed during the second experiment significantly increased. However, the majority of people in Group A relaxed during the second experiment, while the majority of people in Group B were stressed during the second experiment.

### 3.4. Deep Learning of Vocal Performance Status of Ethnic Singers

Deep learning method is a machine learning technique that can recognize highly complex patterns in large datasets [16], and deep learning has strong self-learning ability [17]. Deep learning technology can predict the emotional state of ethnic singers during their performances by analyzing their vocal performance data and emotional state data. The vocal performance data of ethnic singers includes audio, video, and other related information. Emotional state data can be obtained through questionnaires, facial expression recognition, and other methods.

The role of deep learning in today's society cannot be ignored [18], and deep learning methods have become a powerful driving force for technological progress [19]. Through deep learning technology, a model can be constructed to extract features from the above data and predict emotional states. To train this model, people need to prepare a large amount of annotated data and perform some preprocessing and cleaning on the data to ensure the accuracy of the model.

Deep learning technology can effectively increase detection accuracy to a certain extent [20]. Learn and analyze the singing status of ethnic singers through 1000 videos of vocal performance status collected in the previous experiment. Deep learning technology analyzes whether the singer is nervous through their external state. The analysis process is shown in Figure 4. The system analyzes whether ethnic singers are nervous from three levels: facial expression, body language, and

physiological response. If nervous, corresponding steps are taken, and then the system once again determines whether ethnic singers are nervous.

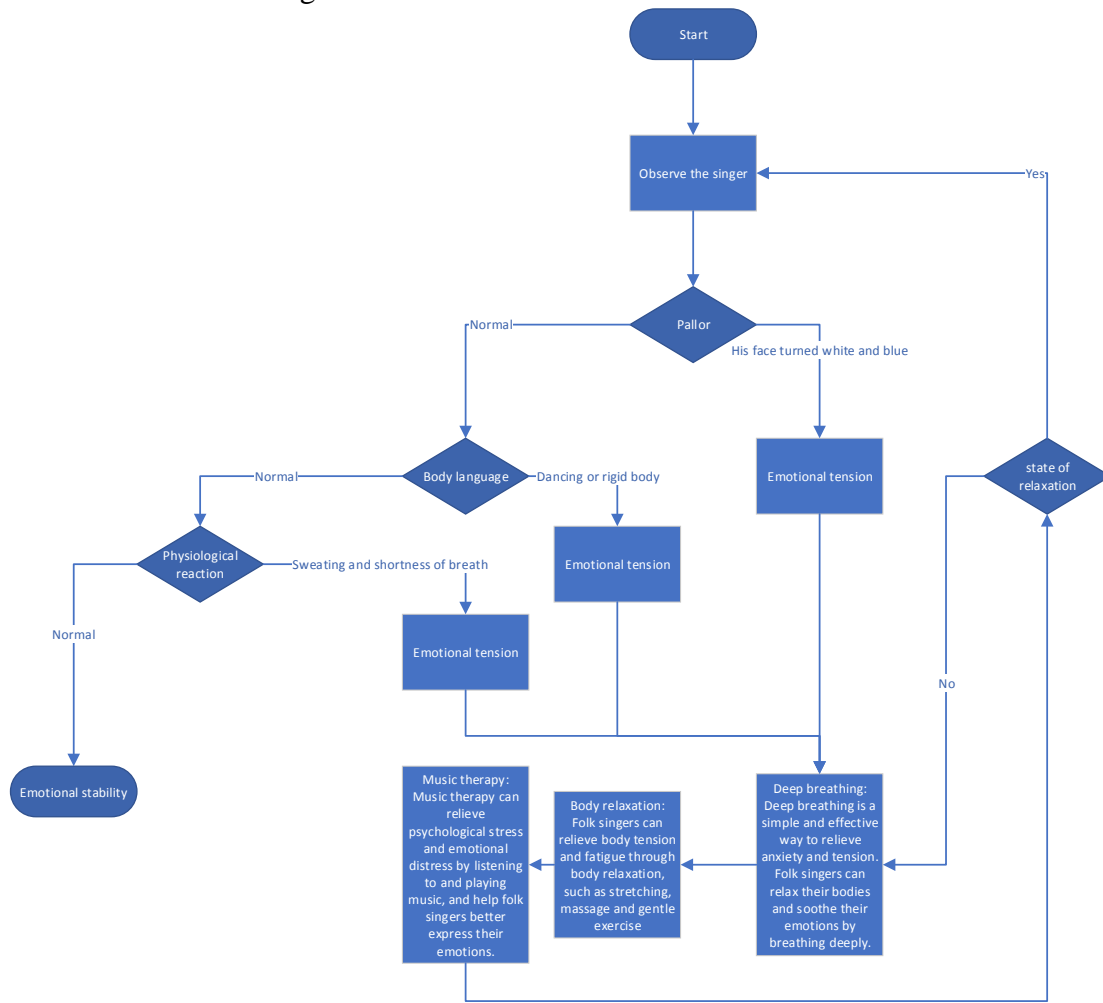


Figure 4. Automatic analysis process for vocal performance status of ethnic singers

## 4. Deep Learning Experiment on the Vocal Performance Status of Ethnic Singers

### 4.1. Formula

In the psychological tension formula (1), A represents the vocal performance status of ethnic singers, X represents the psychological endurance of ethnic singers, f represents a function, and E represents the environment, including the size of the performance venue and the number of spectators.

$$A = f(X \times E) \quad (1)$$

Equation (2) represents the accuracy (Z) of the automatic analysis system for the vocal performance status of ethnic singers, Y represents the total number of errors in the automatic analysis process of vocal performance status of ethnic singers, and B represents the total number of actual people.

$$Z = 1 - \left( \frac{Y}{B} \times 100\% \right) \quad (2)$$

The accuracy of the automatic analysis system for the vocal performance status of ethnic singers can be calculated through equation (2).

## 4.2. Deep Learning System Testing Experiment

The experimental parameters use the same experimental subjects and processes as in the previous section, and the performer's performance status is determined through the deep learning ethnic singer vocal performance automatic analysis system. The data is shown in Figure 5.

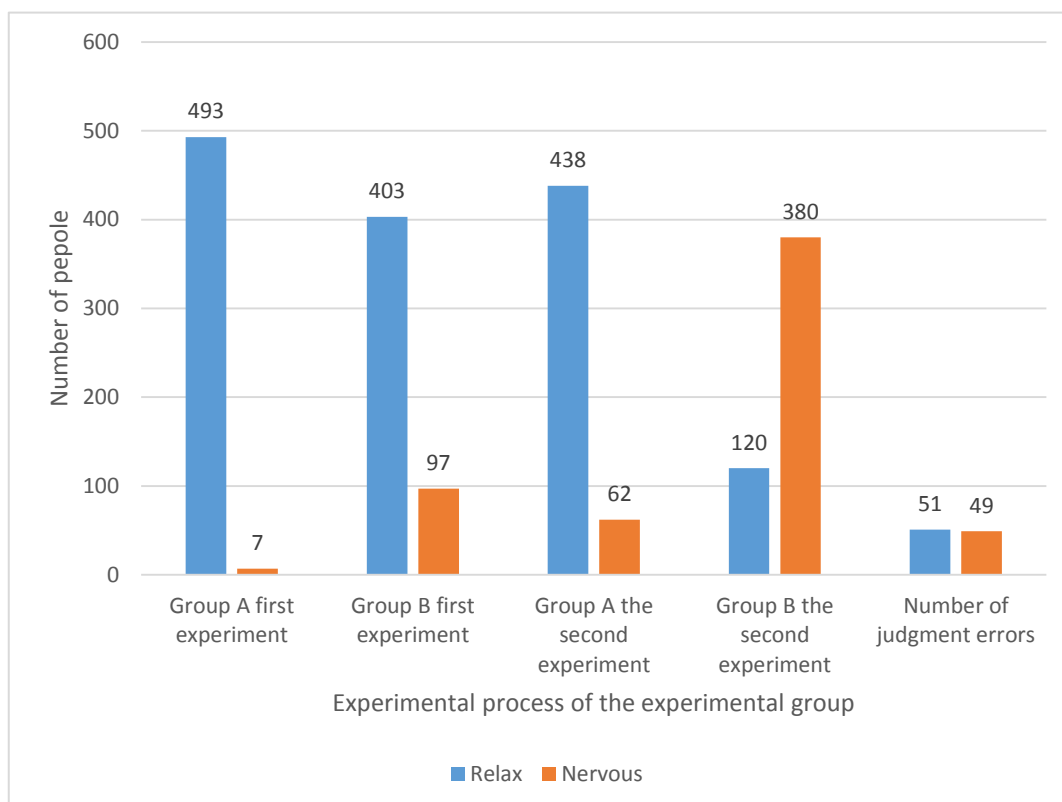


Figure 5. Experimental data of deep learning analysis system testing

From the data in Figure 5, it can be seen that the experimental data of the deep learning analysis system test shows that most of the experimental data of the automatic analysis system for the vocal performance status of ethnic singers are generally consistent with the actual situation, but there is an error of 51 relaxation times and 49 tension times. According to equation (2), it can be calculated that the accuracy of the automatic analysis system for the vocal performance status of ethnic singers can reach 95%.

In summary, the automatic analysis system for vocal performance status of ethnic singers can accurately analyze the singer's status in most cases, with a accuracy rate of 95%. Although there is some error in the analysis of the number of relaxed and tense individuals, overall it still has practical feasibility for application.

## 5. Conclusions

From the perspective of big data analysis and psychology, this study evaluated and analyzed the automatic analysis system for vocal performance status of ethnic singers. Through statistical analysis of experimental data, it was found that the accuracy rate was as high as 95%. However,



research has found that there are certain errors in the analysis of the number of relaxed and tense individuals, and further improvement is needed. In addition, during the vocal performance of ethnic singers, psychological tension can have a significant impact on their performance, so it is necessary to take corresponding adjustment measures to alleviate the tension. Overall, this study has significant implications in the current social context. By utilizing big data analysis techniques and psychological knowledge, ethnic singers can better identify their performance status, thereby improving their performance level and self-regulation ability. In the future, more psychological theories and practices can be combined to make greater contributions to the performance career of ethnic singers.

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### Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

### Conflict of Interest

The author states that this article has no conflict of interest.

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