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Music Mental Health Perception Characteristics and Vocal Music Teaching Strategies under the Background of Multimedia Network

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Keywords: Multimedia Network; Artificial Intelligence; Musical Mental Health Perception Characteristics; Vocal Teaching

Abstract: With the continuous deepening of educational reform, the role of multimedia network in teaching has been gradually paid attention to. As far as vocal music teaching is concerned, the use of multimedia networks can effectively enhance the level of students' positive emotional input, students' vocal music learning efficiency and optimize teachers' teaching strategies. However, there are still some problems in the traditional vocal music teaching, such as the lack of correct singing concepts, the lack of students' subjective initiative, and the lack of the use of advanced technology, which is not conducive to the improvement of the quality of vocal music teaching and the effective play of the characteristics of music psychological health perception. Therefore, this paper used Artificial Intelligence (AI) and multimedia network to study vocal music teaching strategies and music psychological health perception characteristics. The research showed that compared with the traditional vocal music teaching method, the combination of multimedia network and AI based vocal music teaching network platform for teaching activities can improve the students' active emotional input level in vocal music learning by 9.37%; it can improve students' vocal learning efficiency by 2.06%; 71.25% of patients with cardiovascular disease believed that music was helpful to promote mental health. The vocal music teaching method combining multimedia network and AI can help improve the quality of vocal music teaching, and music has obvious psychological health perception characteristics.

1. Introduction

The continuous renewal of education concept has gradually made the vocal music education method of improving students' comprehensive quality recognized by people. With the development of information technology, AI and multimedia network have been gradually applied in vocal music teaching, which is of great significance for improving the quality of vocal music teaching. Therefore, in view of the lack of advanced technology and students' subjective initiative in traditional vocal music teaching, this paper uses AI and multimedia networks to conduct research on vocal music teaching strategies, hoping to provide valuable reference for relevant research.

Many scholars have studied vocal music teaching strategies. Fu Lei believed that the traditional vocal music education model can no longer meet the needs of the current social development for high-quality talents and put forward some strategies for the reform and innovation of vocal music teaching [1]. Zhou Na analyzed the significance of vocal music teaching innovation, elaborated some specific measures of vocal music teaching innovation based on the perspective of aesthetic education, and provided theoretical reference for school vocal music educators [2]. Simones Lilian Lima discussed the necessity of developing instrumental music and vocal music teaching and put forward relevant suggestions [3]. Huang Xuejun analyzed the importance of art practice for vocal music teaching and put forward suggestions on strengthening the foundation, increasing students' practical experience, and increasing cultural exchanges [4]. Khurramovich Abdukhalilov Jamshid analyzed the significance of vocal music teaching and proposed some methods to improve the efficiency of vocal music teaching [5]. Liu Chenchen proposed a mobile peer assessment method for the problems in vocal music teaching [6]. Many scholars have participated in the research on vocal music teaching and put forward some valuable suggestions.

Many scholars have studied the psychological health perception characteristics of music. Gustavson Daniel E reached relevant conclusions through research on the psychological health perception characteristics of music [7]. Bibb Jennifer believed that music therapy is a way to promote the recovery process of mental health and put forward the suggestion of using group singing to restore the sense of health of patients with mental diseases [8]. Kresovich Alex believed that pop rap music can effectively protect human mental health and proved the connection between them through experiments [9]. Shakespeare Tom believed that the combination of singing and socializing can make people have a continuous sense of belonging and happiness, and music can provide a low commitment, low-cost mental health rehabilitation tool for people with mental health problems [10]. Gold Christian showed that music is an important part of teenagers' life and identity, which can have a positive or negative impact on teenagers' mental health [11]. Silverman Michael J believed that there is a lack of empirical research on the way of using music to enhance emotion and self-regulation [12]. The research of the above scholars showed that the psychological health perception characteristics of music play an important role in protecting people's mental health.

This paper put forward some vocal music teaching strategies, such as establishing a vocal music teaching network platform, using multimedia network and AI technology to improve students' singing skills. It carried out experimental research from the aspects of students' emotional involvement level in vocal music learning, students' vocal music learning efficiency, and the evaluation of cardiovascular disease patients on music psychological health perception characteristics.

2. Perceived Characteristics of Music Mental Health

(1)Theoretical basis of music's psychological health perception

1) Physical perspective

Music contains unique physical properties, and the essence of music is the generation of sound waves. By applying regular sound waves to the human body, music can make the physiological rhythm of some parts of the human body the same as its frequency. Through this harmonious resonance, music can continuously promote the physical health of the human body, thus indirectly affecting the mental health of people.

2) Physiological perspective

Music can stimulate the auditory center of the human body to promote the excitement of the brain. As a rhythmic activity, music affects the physiological rhythm of the human body and can improve the physiological functions of the human nervous system and endocrine system, thus

preventing some diseases caused by physiological or psychological stress.

3) Psychological perspective

Music can directly affect the cerebral cortex.

Music with beautiful melody and slow rhythm can help people relieve anxiety, eliminate psychological distractions, psychological tension, psychological anxiety, mental depression and other unhealthy psychological states. It can help people to have positive emotions, so as to protect the mental health of the human body.

4) Sociological perspective

Music activities have the attribute of interpersonal communication. In the process of organizing and participating in music activities, people can establish a harmonious interpersonal relationship. The friendly communication between music activity participants with music as a link is conducive to helping music activity participants relieve psychological pressure and anxiety, improve self cognition, self-esteem and self-confidence, thereby promoting the psychological health of music activity participants.

(2) Positive role of music mental health perception characteristics in alleviating mental health problems

In terms of alleviating mental health problems, music can be achieved through two ways: ensuring emotional stability and enhancing self-confidence. Ensuring emotional stability: emotions can reflect people's psychological activities in a certain period of time and describe people's emotional world in this period of time. Music is an important tool to adjust people's psychological emotions. Different tones of music have different effects on people's emotions. High pitched music can cheer people up; middle pitched music can make people happy, and low pitched music can make people calm and quiet. Using music of different tones to create specific scenes can enable people to deeply analyze their own psychological problems in their own inner world, relieve their own psychological pressure, and ensure their emotional stability. Enhance self-confidence: High music stimulates people's enterprising spirit, enabling people to suppress the impact of negative emotions such as inferiority and loss. By awakening the positive power contained in people's hearts, music can cultivate people's healthy psychological quality and indomitable spirit of striving, so that people can maintain a confident and optimistic attitude towards life and face setbacks with a better attitude.

3. Problems in Vocal Music Teaching

The problems in vocal music teaching include the lack of correct singing concepts, the lack of students' subjective initiative, and the lack of advanced technology utilization, as shown in Figure 1.

Lack of correct singing concept: due to the lack of understanding and perception of the works, some students may ignore the creative significance of the music works and can not appreciate the rich feelings left by the creators in the works from vocal music learning. This situation is not conducive to the formation of students' unique singing style in line with their own characteristics and actual conditions, nor to the cultivation of students' self-awareness and creative consciousness. Lack of students' subjective initiative: due to the limitations of traditional vocal music teaching, such as single teaching structure and deviation of teaching focus, students' willingness to take the initiative to learn is not strong. Students only practice vocal music according to the teacher's requirements in the classroom, and students lack a positive attitude of emotional input to vocal music practice [13]. Lack of advanced technology utilization: Due to poor economic conditions, backward teaching concepts and other factors, some schools still use traditional vocal music teaching and fail to apply AI, multimedia technology and other modern information technologies to vocal music teaching, resulting in difficulty in improving the quality of vocal music teaching.

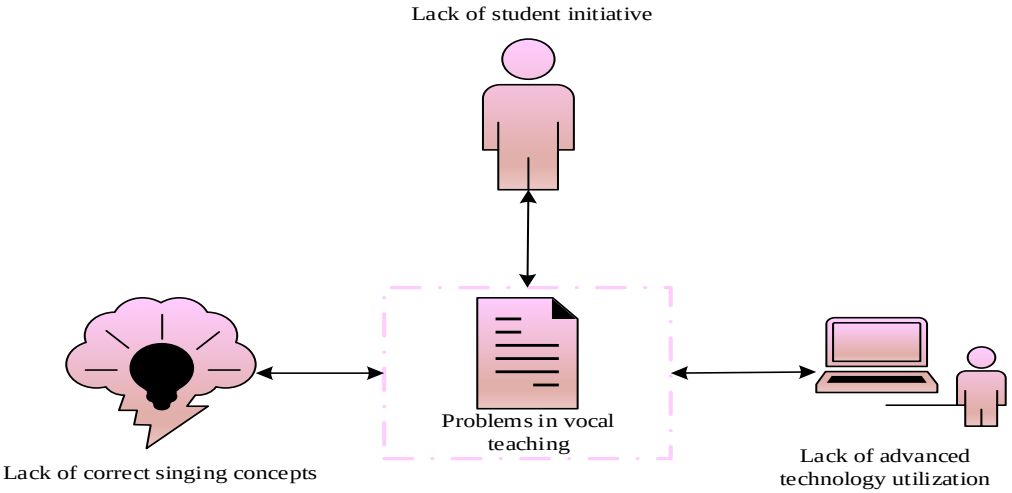

Figure 1: Problems in vocal teaching

4. Vocal Music Teaching Strategy Based on Multimedia Network and AI

The vocal music teaching strategy based on multimedia network and AI proposed in this paper includes the establishment of a vocal music teaching network platform, the use of multimedia network and AI technology to improve students' singing skills, and the use of multimedia network and AI technology to evaluate the effect of vocal music teaching, as shown in Figure 2.

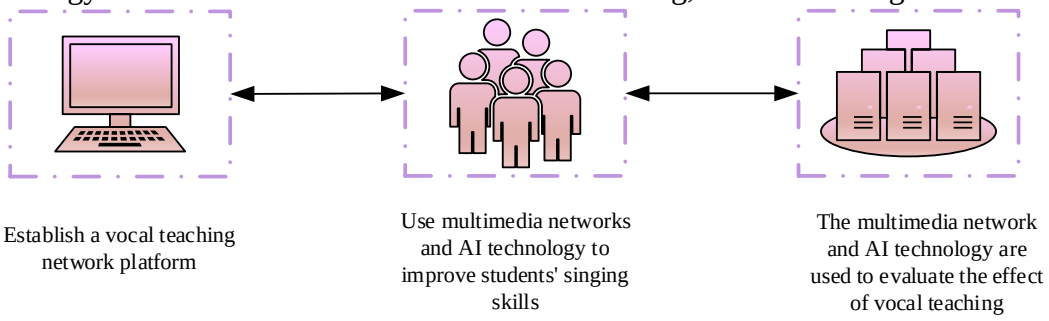

Figure 2: Vocal teaching strategies

(1) Establishing a Vocal Music Teaching Network Platform

School administrators can use multimedia network, AI technology, computer technology and other modern information technologies to establish a vocal music teaching network platform and combine network teaching methods to carry out vocal music teaching [14]. Teachers can obtain more vocal music teaching resources through the network platform. Teachers can use rich resources to attract students' attention and positive emotional input to vocal music learning, so as to improve students' learning efficiency and teaching quality. In addition to using the network platform to obtain resources, teachers can also analyze the vocal music learning data of students on the vocal music teaching network platform. Teachers can use AI to analyze these data and judge students' real learning ability and learning attitude, so as to develop appropriate teaching methods for students. For students, network teaching is conducive to breaking through the limitations of time and space on vocal music teaching, enabling students to carry out learning activities even if they are not in the classroom and facilitating the cultivation of students' own abilities.

(2) Improving students' singing skills based on multimedia network and AI technology

With the help of multimedia network and AI technology, teachers can improve students' singing skills through intelligent accompaniment in the following aspects: guiding students to sing, guiding

students to practice lyrics, helping students find voice positions, and cultivating students' subjective initiative in music learning, as shown in Figure 3.

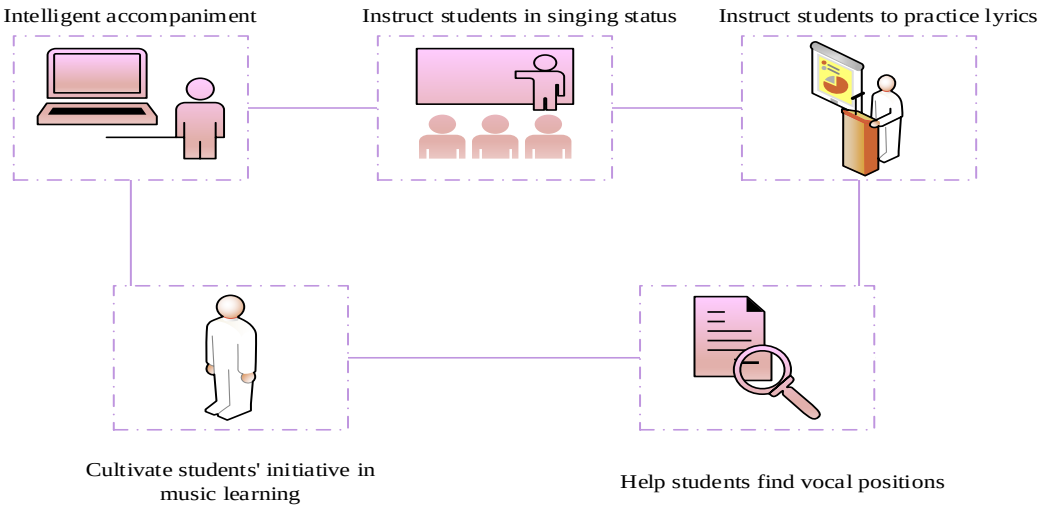

Figure 3: Improvement students' singing skills

Intelligent accompaniment: teachers can use intelligent multimedia tools to provide accompaniment for students' vocal music practice. According to the students' ability level and the performance dynamics in the teaching situation, the fragments that students need to learn are arranged from easy to difficult, so as to improve the flexibility of vocal music practice and enhance the self-confidence of students in vocal music learning. Instructing students' singing state: teachers can provide targeted guidance for students' problems in vocal music practice, so as to help students in a more reasonable singing state. Instructing students to practice lyrics: students' pronunciation of lyrics can be recorded through the multimedia network platform. If students make mistakes in pronouncing words and can't grasp the rhythm well, the multimedia network platform is conducive to correcting students' wrong behaviors in a timely manner. Teachers can use AI to describe the timbre phenomenon of students' singing voice, and evaluate the voice quality of students' singing vowels from the perspective of music experts through supervised machine learning [15]. Helping students find the voice location: teachers use the multimedia network platform to let students intuitively understand their own body state in the process of vocal music practice and help students find a better voice location. Cultivating students' subjective initiative in music learning: compared with traditional classroom teaching, multimedia teaching network platform teaching can cultivate students' active learning ability with more abundant teaching resources and teaching means. It can activate the classroom atmosphere of vocal music teaching, increase students' sense of vocal music learning experience and learning efficiency, and thus improve the quality of vocal music teaching.

(3) Evaluating vocal music classroom teaching effect based on multimedia network and AI technology

In the teaching network platform based on multimedia network and AI, teachers can effectively evaluate students' situation by analyzing students' vocal learning data. After receiving the teacher's evaluation, students can adjust their vocal music learning methods and correct their vocal music learning attitude in time, so as to achieve better vocal music learning results. Students can evaluate teachers' teaching quality through multimedia network platform, which can effectively promote teachers to improve teaching methods and strategies in a timely manner. Students can also use the multimedia network platform for self-evaluation, which can help students understand their vocal music learning more clearly. In addition, for school administrators, the teaching network platform can help school administrators clearly understand the students' vocal music practice and teachers'

vocal music teaching, urge school administrators to reasonably adjust the school's vocal music teaching plan and teaching progress, and develop a more realistic vocal music teaching management system.

5. Application of Analytic Hierarchy Process in the Evaluation of Vocal Music Teaching Quality

Analytic Hierarchy Process (AHP) is a systematic analysis method that uses mathematical means and multi factor analysis to evaluate the quality of vocal music teaching, which is conducive to promoting teachers to constantly adjust and improve educational strategies and students to adjust their learning attitudes and methods in time.

The factors that affect the quality of vocal music teaching are classified and combined to form a hierarchical structure, which is generally divided into three levels. Relevant factors at the same level should be compared to construct the judgment matrix:

$$B: B = \left(b_{pq}\right)_{m*m} \tag{1}$$

$$B = \begin{Bmatrix} b_{11} & b_{12} & \ldots & b_{1m} \\ b_{21} & b_{22} & \ldots & b_{2m} \\ & & \ldots & \\ b_{m1} & b_{m2} & \ldots & b_{mm} \end{Bmatrix} \tag{2}$$

Among them, b_{pq} is the relative importance of the p factor compared with the q factor. Matrix B satisfies two conditions, namely:

$$b_{pq} = 1\left(p = q\right) \tag{3}$$

$$b_{pq} = \frac{1}{b_{qp}} \tag{4}$$

The weight value of each influencing factor of vocal music teaching quality relative to the upper level is calculated, and the specific process is as follows:

$$N_p = \prod_{q=1}^{m} b_{pq} \tag{5}$$

$$\overline{V}_p = \sqrt[m]{N_p} \tag{6}$$

$$V_p = \frac{\overline{V}_p}{\sum_{p=1}^{m} \overline{V}_p} \tag{7}$$

For judgment matrix B, if the following condition is met:

$$b_{pq} = b_{pc} * b_{cq} \tag{8}$$

Then B meets the consistency. If the consistency is not met, the data needs to be adjusted.

The consistency of the method is checked, and the maximum eigenvalue of the judgment matrix

B is obtained:

$$\rho_{\max} = \sum_{p=1}^{m} \frac{(BV)_p}{mV_p} \tag{9}$$

Among them, $(BV)_p$ is the p-th element of vector BV, and its expression formula is:

$$(BV)_p = b_{p1}V_1 + b_{p2}V_2 + ... + b_{pm}V_m \tag{10}$$

Data consistency indicator is calculated:

$$\sigma = \frac{\rho_{\max} - m}{m-1} \tag{11}$$

Data consistency ratio is calculated:

$$\upsilon = \frac{\sigma}{\eta} \tag{12}$$

Among them, η is the average consistency index of matrix of the same order. If $\upsilon < 0.1$, the data consistency of judgment matrix B is acceptable. If $\upsilon \geq 0.1$, the matrix B needs to be readjusted.

6. Vocal Music Teaching and Experiments on Perceived Characteristics of Music Psychological Health

One hundred and fifty students of vocal music major in H School with similar learning efficiency and academic level were selected and divided into two classes. One class carried out teaching activities based on multimedia network and AI vocal music teaching network platform, which is called Class X. The other class used traditional vocal music teaching methods for teaching activities, which is called Class T. From the aspects of students' emotional involvement in vocal music learning, students' vocal music learning efficiency, students' assessment results, and students' recognition of vocal music teaching methods, this paper conducted a 4-week experimental study on the teaching activities of Class X and Class T, and the relevant results were obtained and analyzed. After the completion of the teaching experiment research, the psychological health perception characteristics of music were studied. The specific methods were as follows: 80 patients with cardiovascular diseases in N hospital were selected, and after the consent of doctors and patients with cardiovascular diseases, AI equipment was used to play music for patients with cardiovascular diseases for 6 weeks. The 80 patients with cardiovascular diseases were divided into four groups: A, B, C, D, and after playing music, the psychological feelings of patients with cardiovascular diseases were interviewed. The influence of music's mental health perception characteristics on the mental health of patients with cardiovascular disease was observed.

(1) Students' emotional involvement in vocal music learning

The level of students' positive emotional input during vocal music learning was recorded. The value range of the positive emotional input level index is 1-100, as shown in Figure 4.

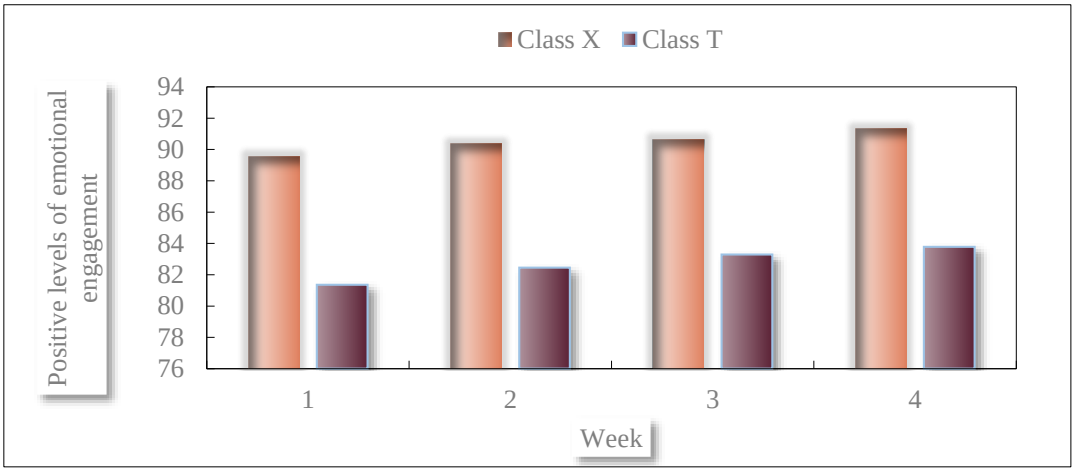

Figure 4: The level of emotional engagement of students in vocal learning

As shown in Figure 4, on the whole, the emotional input level index of students in Class X was higher than that of students in Class T. Analyzing from specific data, in the first week, the emotional input level index of students in Class X was 89.57, and that of students in Class T was 81.36. The emotional input level index of students in Class X was 8.21 higher than that of students in Class T. In the second week, the emotional input level index of students in Class X was 90.35, and that of students in Class T was 82.45. The emotional input level index of students in Class X was 7.9 higher than that of students in Class T. In the third week, the emotional input level index of students in Class X was 90.64, and that of students in Class T was 83.29. The emotional input level index of students in Class X was 7.35 higher than that of students in Class T. In the fourth week, the emotional input level index of students in Class X was 91.33, and that of students in Class T was 83.78. The emotional input level index of students in Class X was 7.55 higher than that of students in Class T. From the average emotional input level of students in four weeks, the average emotional input level index of students in Class X was 90.47, and the average emotional input level index of students in Class T was 82.72. The average emotional input level index of students in Class X was 7.75 higher than that of students in Class T, with 9.37% higher.

(2) Students' vocal learning efficiency

The learning efficiency of students in the process of vocal music learning was recorded. The value range of learning efficiency is 1% - 100%, as shown in Figure 5 for details.

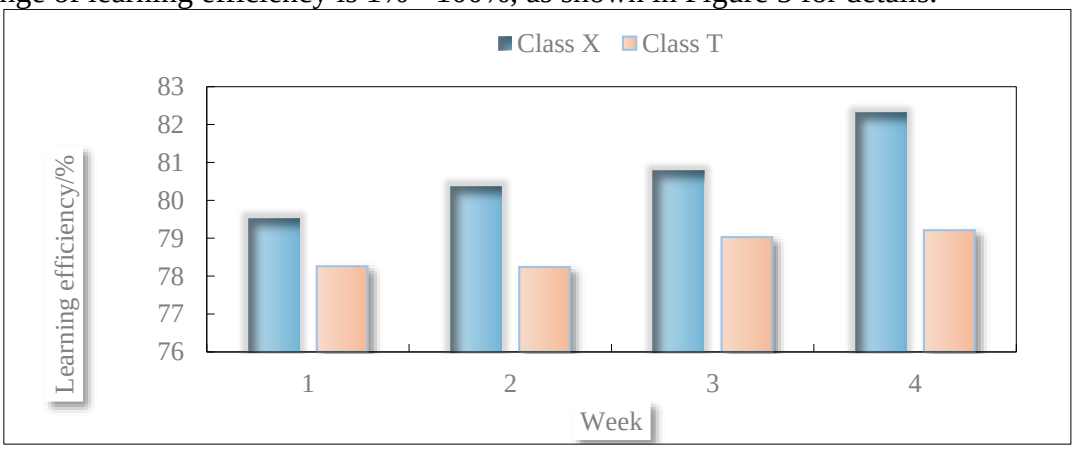

Figure 5: Students' vocal learning efficiency

As shown in Figure 5, the efficiency of students in Class X in the first week was 79.52%, and that of students in Class T was 78.26%. It can be seen that the efficiency of students in Class X in

the first week was slightly higher than that of students in Class T. The efficiency of students in Class X in the second week was 80.37%, and that of students in Class T was 78.24%. The efficiency of students in Class X in the second week was higher than that of students in Class T. The efficiency of students of Class X in the third week was 80.78%, and that of students of Class T in the third week was 79.03%. The efficiency of students of Class X in the third week was 1.75% higher than that of students of Class T. The efficiency of students of Class X in the fourth week was 82.31%, and that of students of Class T in the fourth week was 79.21%. The efficiency of students of Class X in the fourth week was 3.1% higher than that of students of Class T. The average efficiency of students of Class X in four weeks was 80.75%, and that of students of Class T in four weeks was 78.69%. The average efficiency of students of Class X in four weeks was 2.06% higher than that of students of Class T.

(3) Assessment results of students

The students' vocal music learning effect is assessed every week, and the assessment results of students are obtained. The range of assessment results is 1-100, as shown in Table 1 for details.

Table 1: Students' assessment results

	Class X	Class T
1	86.35	85.23
2	87.26	84.59
3	87.59	85.67
4	89.64	85.43

As shown in Table 1, in the first week, students in Class X scored 86.35, while students in Class T scored 85.23; the assessment score of students in Class X was 1.12 higher than that of students in Class T. In the second week, students in Class X scored 87.26, while students in Class T scored 84.59; the assessment score of students in Class X was 2.67 higher than that of students in Class T. In the third week, students in Class X scored 87.59, and students in Class T scored 85.67; the assessment score of students in Class X was 1.92 higher than that of students in Class T. In the fourth week, students of Class X scored 89.64 and students of Class T 85.43; the assessment score of students in Class X is 4.21 higher than that of students in Class T. The average assessment score of students in Class X was 87.71, and that of students in Class T was 85.23; the average assessment score of students in Class X was 2.48 higher than that of students in Class T. To sum up, the vocal music assessment results of students in Class X were higher than those of students in Class T, which showed that compared with traditional vocal music teaching, multimedia network platform vocal music teaching method can improve students' vocal music academic level.

(4) Students' recognition of vocal music teaching methods

The students of Class X and Class T are investigated weekly on their recognition of their respective vocal music teaching methods. The range of recognition is 1% - 100%, as shown in Figure 6.

As shown in Figure 6, in the first week, the recognition degree of students in Class X was 83.25%, and that of students in Class T was 76.58%; the students in Class X had a higher degree of recognition than those in Class T. In the second week, the recognition degree of students in Class X was 85.46%, while that of students in Class T was 77.25%; the recognition degree of students in Class X was still higher than that of students in Class T. In the third week, the recognition degree of students in Class X was 85.79%, and that of students in Class T was 76.95%; the recognition degree of students in Class X was 8.84% higher than that of students in Class T. In the fourth week, students in Class X recognized 86.05%, while students in Class T recognized 77.26%; the recognition degree of students in Class X was 8.79% higher than that of students in Class T. In four weeks, the average recognition of students in Class X was 85.14%, and that of students in Class T

was 77.01%; the average recognition of students in Class X was 8.13% higher than that of students in Class T. The above data showed that the teaching method combined with the vocal music teaching network platform is more recognized by students than the traditional teaching method.

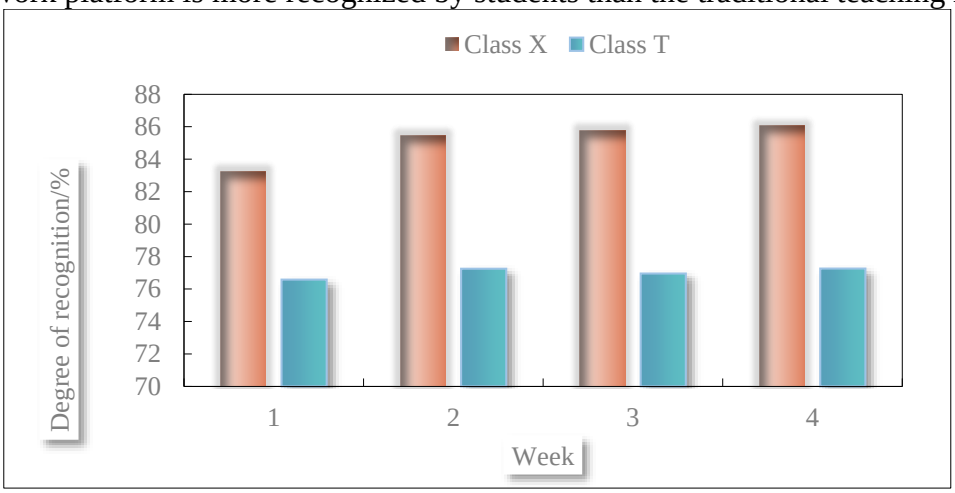

Figure 6: The degree of student recognition of vocal teaching methods

(5) Evaluation of psychological health perception of patients with cardiovascular diseases to music

By interviewing the psychological feelings of patients with cardiovascular diseases, the perception characteristics of music psychological health of patients with cardiovascular diseases are obtained, as shown in Figure 7 for details.

As shown in Figure 7, after playing music for 6 weeks, 14 members of Group A believed that music was conducive to promoting mental health, while 6 members believed that music had no role in promoting mental health. Among the members of group B, 15 believed that music was helpful to promote mental health, and 5 believed that music did not promote mental health. Among the members of group C, 11 believed that music was helpful to promote mental health, and 9 believed that music did not promote mental health. In group D, 17 people believed that music could promote mental health, while 3 people believed that music had no effect on mental health. Among 80 patients with cardiovascular disease, 57 patients with cardiovascular disease believed that music was helpful to promote mental health, accounting for 71.25%, which indicated that music had obvious psychological health perception characteristics.

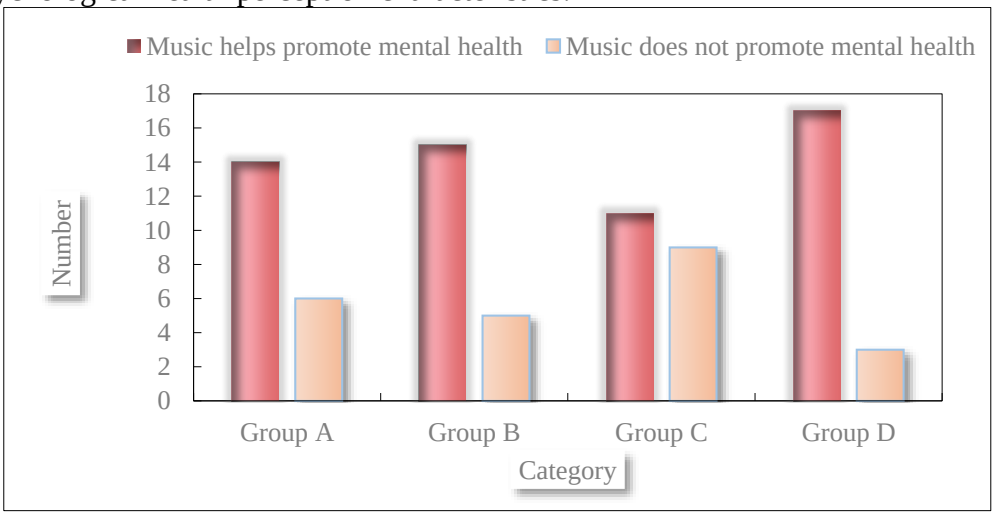

Figure 7: Perceived characteristics of music mental health in patients with cardiovascular disease

7. Conclusions

This paper analyzed the psychological health perception characteristics of music and put forward the vocal music teaching strategy based on multimedia network and AI, as well as the application of AHP in the evaluation of vocal music teaching quality. It carried out an experimental study on vocal music teaching and music psychological health perception characteristics. Through the experiment, the following conclusions were drawn: the vocal music teaching strategy based on multimedia network and AI plays an important role in improving students' active emotional involvement in vocal music learning, vocal music learning efficiency, and vocal music test scores; students are more recognized for vocal music teaching based on multimedia network and AI; the psychological health perception characteristics of music can play an important role in promoting human psychological health.

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