Effect of Music Activities and Rhythm Stress Perception Training on the Psychological Pressure of Students

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Abstract: In today's society, many young students are in the period of adolescent rebellion, and they are prone to conflict with their parents due to trivial matters and easily bullied by their classmates, resulting in excessive psychological pressure. Therefore, it is not easy to relieve students' psychological pressure. How to relieve students' psychological pressure? This study showed that music activities and rhythmic stress perception training can relieve students' psychological pressure. Music activities can improve students' emotional experience process and psychological quality. This paper used feature extraction algorithm to analyze both of them. The results suggested that the "anxiety" factor and "terror" factor of A and B before music activity and rhythmic stress perception training had the highest scores of 2.65 and 2.96 respectively, and the values after the training decreased to 1.52 and 1.62. Although it is still higher than the average score of 1.5, the gap between the two is not large, indicating that music activities and rhythmic stress perception training are conducive to relieving students' psychological stress, and there is an obvious positive relationship between the two.

1. Introduction

At present, many teenagers are in adolescence in China, and their physical and psychological development is in a period of rapid development. In addition, social and cultural life has a great impact on teenagers, so it is easy to generate some psychological pressure for them. In particular, many schools now advocate "exam oriented education" and "score first", resulting in poor academic performance of many students and less communication with parents and teachers, which are bringing pressure to students and even affecting their future development. In addition, the social environment and parents also have many misunderstandings when educating students, which causes many students to bear great psychological pressure. This psychological pressure is mainly manifested as psychological imbalance. For example, because of some small things, students often

have conflicts with their classmates and parents, affecting interpersonal relationships; Due to the high pressure of study, students choose to skip class or play truant at home for various violations of discipline; Excessive psychological pressure may lead to serious psychological problems. Therefore, how to relieve students' psychological pressure is a problem that needs to be concerned and studied in the society at present, and music activities play an important role in it.

Based on this, this paper started from music activities and rhythmic stress perception training to guide and train students, and it is hoped to help students.

2. Related work

In the modern society, while strengthening the professional quality, physical quality and ideological quality of college students, colleges and universities should also pay attention to the timely counseling of college students' psychological problems. For the students' psychological pressure, there have been a lot of research results. Among them, Bowling A M aimed to determine the process used by school-based agricultural education (SBAE) teachers to support students' psychological needs and motivations [1]. Xiang Z adopted the innovative and integrated teaching mode of ancient Chinese literature and film and television to analyze the characteristics and interrelationships of college students' psychological pressure and imitation methods, with a view to reducing pressure and improving students' psychological adaptability and mental health by developing a set of self-regulation[2]. Wang Y developed a set of self-regulation methods from the teaching of modern literature and contemporary literature to improve students' psychological quality and pressure resistance [3]. However, the above research is to reduce students' psychological pressure through teaching and education methods with a simple form, which is not conducive to further solving students' psychological pressure problems. Therefore, a more scientific method needs to be provided.

On this basis, music activities and rhythmic stress perception training can be used to reduce students' psychological stress. There have been a lot of related research results. Among them, Feng X's research has found that college music courses can regulate students' psychological pressure [4]. Bokiev D's research showed that the use of music and songs in language teaching can effectively reduce students' psychological pressure, thus improving their academic performance [5]. Joshi A's research proved that music and yoga breathing can help students to manage and control their psychological stress [6]. The above research shows that music is a good way to reduce students' psychological pressure and also points out a new direction for future research.

3. Construction of Music Activities and Rhythmic Stress Perception Training

3.1 Relationship between Music Activities and Rhythmic Stress Perception Training and Students

(1) The role of music activities (mainly group dance) in students' cognitive activities

The collective dance can connect the brain and body to form a psychological connection [7]. When a person's body starts to make actions, a signal is sent to the body by the brain to determine what people do or say through the interconnection of information between the body and the brain. Therefore, group dance can remind people of what the body is doing or wants [8]. When a person wants to finish something, he may turn his body to the parts he has did (such as head, hips, legs, abdomen) [9]. In group dance, human activities are different from the movements of muscles and joints. It depends more on how people feel about body movements. Group dancing exercises the flexibility of the body - the process allows people to complete actions without using their brains [10]. Students communicate more through body language, so as to better understand their body and

brain better. Through this combination, students can get better experience. Through this process, students can better solve problems and adapt to the environment, which is very important for the future development [11]. Therefore, it is also in line with the training theory of cognitive ability in the field of psychology. Figure 1 shows the impact of music activities on students.
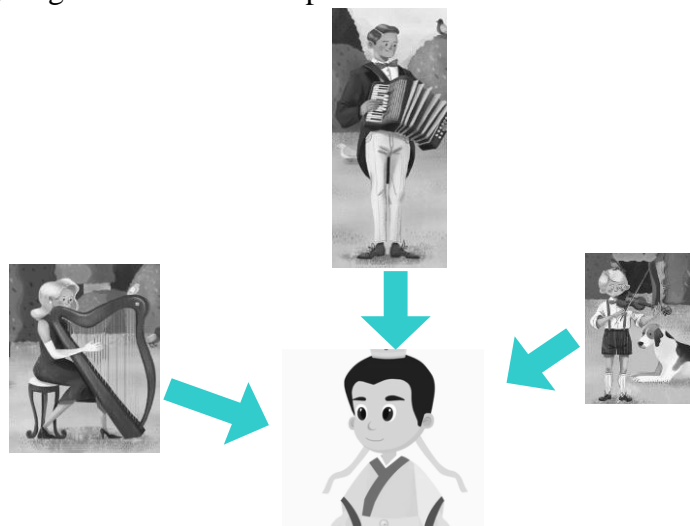
Figure 1. The impact of music sctivities on students

(2) Influence of prosodic training on students' cognitive activities

Cognition is an important part of human cognitive activities. The basic contents of cognitive activities include attention and memory ability [12-13]. The core content of prosody training is to improve students' reaction ability and memory ability to a certain extent by controlling and adjusting human vision, hearing and body movements, thus improving students' academic performance. This training method requires students to play and listen to songs repeatedly during training and the rhythm and tone should be changed. When the training is over, the corresponding evaluation and feedback should be repeated [14]. Prosody training mainly includes three ways. The first is to let students recall the lyrics of the songs they listen to, mainly by recalling the voice, rhythm changes and tone changes in the songs. The second is simple music appreciation of the song, which is mainly through the overall phrase, melody and timbre of the song, and it can also be expressed through the content and length of the phrase. The third is through music performance, which is mainly through the change of phrase form and timbre, as shown in Figure 2. Specifically, there is no difference between the two groups [15]. In this study, prosodic training can effectively improve the subjects' perception of the changes in lyrics and sentence forms, the perception of rhythm changes and tonal changes as well as the combination of length and length; Prosodic training can effectively improve the cognitive level of subjects on the overall image and rhythm changes of songs [16-17].
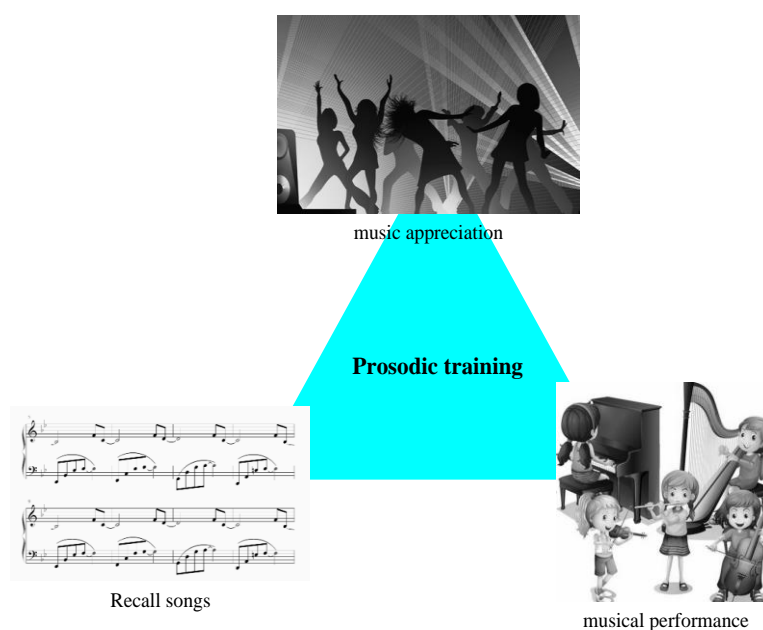
Figure 2. Prosodic training

The impact of rhythmic pressure perception training on students' cognitive activities is that in the process of rhythmic pressure perception training, students can combine learning pressure perception with music activities, so that they can fully experience the pleasure brought by the rhythmic situation, thus improving students' awareness of music works. In terms of research results, students have improved their cognitive ability and changes in the brain under the influence of music activities and rhythmic situations, including image recognition, spatial computing ability, spatial imagination ability, etc. [18]. From the perspective of cognitive ability, students' interpersonal skills have been improved, and they became more outgoing and confident [19]. According to the research results, it can be seen that music activities and rhythmic situations may have some help to the mental health of middle school students [20-21].

3.2 Method of Extracting Melody Features of Waveform Music Files Based on Feature Extraction Algorithm

WAV (Wave Form) file is a kind of non-destructive audio file. It has good compression performance, so it can better extract the music information in the video. Although WAV files occupy a large amount of memory, users usually only need a little time to hum, so this defect can be accepted. The melody characteristics in WAV files are much more complex than MIDI (Musical Instrument Digital Interface) format. It needs to preprocess the music information in the WAV file and extract the tone cycle to segment and convert it into the melody characteristics of the song at the end.

The preprocessing in this paper is a special processing of humming, including pre emphasis, high frequency and framing. In the high frequency band, when it is 800 HZ, the 6 dB/s frequency domain can be attenuated, so it is necessary to preprocess it. The purpose of pre emphasis is to increase the frequency band to flatten the spectrum and facilitate the analysis of spectrum and channel parameters. Generally, the pre emphasis digital filter is used, and its frequency is increased by 6 dB/times, which is   one time, namely:

$$H(z) = 1 - \lambda \bullet Z^{-1} \quad (1)$$

The value of λ is close to 1, generally 0.94.

Speech signal analysis is usually carried out by segments or frames, usually between 33~100 frames/second. According to the actual situation, that is short-term analysis of speech signal analysis. In order to ensure the smooth transition and continuity between frames, there is often overlap between the front and back frames, which is called "frame shift". Generally, the frame offset is 0~1/2. Short-term analysis essentially uses a window to obtain signals. However, which window function should be selected?

There are two commonly used e (m) window functions, namely, rectangular window and Hamming window, which are defined as: assuming that the window length is M.

Rectangular window is:

$$e(m) = \begin{cases} 1,2, & 0 \le m \le M \\ 0, & \text{other} \end{cases} \quad (2)$$

Hamming window is:

$$e(m) = \begin{cases} 0.54 - 0.46 \cdot \cos\left(2\pi \dfrac{m}{M-1}\right), 0 \le m \le M \\ 0, \quad \text{other} \end{cases} \quad (3)$$

Hamming window is often used to analyze the spectrum of speech. In the calculation of short-time power and average amplitude, rectangular window is commonly used.

Pitch extraction algorithm

The calculation of pitch period is very difficult. In the hums of different users, the pitch period fluctuates greatly, from 1/70S of bass to 1/500S of soprano, which makes it difficult to calculate the pitch period. There is a certain relationship between the tone profile and the tone profile of songs. Therefore, how to determine the relationship between the two is an important content of this paper, and the most important is the calculation of pitch period. Many scholars have made in-depth research on this and given some practical solutions.

Different algorithms have differences in computation, accuracy, noise, etc. In general, the time domain correlation method is prone to frequency doubling errors, while the frequency domain correlation method is prone to sub pitch errors. Therefore, in different cases, this paper proposed a variety of improved and integrated methods to increase the accuracy and robustness of pitch extraction. Here are some common methods.

Autocorrelation is the most commonly used method for short-term correlation analysis of signals. Through the window with length N, the music signal D (n) is regarded as a windowed signal $D_m(n)$ (meaning that it is divided into frames, and $D_m(n)$ is the signal in 11 frames). Therefore, the autocorrelation function $D_m(n)$ of determination $T_m(l)$ is:

$$T_m(l) = \sum_{n=0}^{M-l-1} D_m(n) D_n(n+l) \quad (4)$$

At the integral multiple of the fundamental frequency period, the autocorrelation function of the signal can have a peak value. Therefore, the fundamental frequency period can be extracted by the position of wave crest. The most typical method is to use autocorrelation to extract pitch.

Average amplitude difference method

Short-term average amplitude difference function (AMDF) of speech signal is defined $F_m(l)$ as:

$$F_m(l) = \sum_{n=0}^{M-l-1} \left| D_m(n+l) - D_m(n) \right| \quad (5)$$

Like the short-time autocorrelation function, for the periodic voiced voice, $F_m(l)$ also shows the periodic characteristics consistent with the voiced voice cycle. The difference between the two is that $F_m(l)$ has a valley value feature rather than a peak value feature at the integral multiple of different periods. For unvoiced voice signals, $F_m(l)$ does not have such characteristics. The short-term average amplitude difference function requires a longer window length when estimating pitch period. LPC (linear predictive coding) anti filtering and central wave elimination can reduce the channel characteristics or resonant peak value in the input speech to improve the effectiveness of pitch period estimation. This method does not need multiplication, so its computation is small.

Parallel processing method (PPROC)

PPROC is a successful pitch detection method. When the sampling rate is 10 kHz, the estimation accuracy of pitch period can reach 1/10000 s. The preprocessing is a low-pass filter with a cut-off frequency of 900 Hz, which can effectively filter the resonant peak in the signal spectrum and maintain a strong harmonic structure, so as to achieve peak detection. This method can not only estimate the fundamental frequency period, but also get the position of the wave crest, which has a certain practical value in some operations with the fundamental frequency as the unit.

Cepstrum

Cepstrum is a typical signal processing and detection technology. The voice d (m) can be regarded as the glottic pulse excitation r (m) filtered by the channel response c (m), which can be expressed as:

$$d(m) = r(m) \cdot c(m) \quad (6)$$

Assuming the cepstrum of the three is $d(m)', r(m)', c(m)'$ respectively, it can be obtained:

$$d(m)' = r(m)' + c(m)' \quad (7)$$

4. Empirical Evidence of the Role of Musical Activities and Rhythm Stress Perception Training in Relieving Psychological Stress of College Students

4.1 Investigation on Mental Health of Non Music Majors in Higher Vocational Colleges

(1) Investigation methods

In this study, psychological stress was investigated by SCL (Symptom Check List) - 90 self rating scale. In other words, the symptom self-evaluation questionnaire of SCL-90 was completed by the participants. The investigators collected the answers to the questionnaire according to the scoring rules and calculated the scores of each test item and its factor category. Factor score can reflect the mental health status more intensively of the subjects. This survey used factor score to describe and evaluate the subject's mental health index and mental health level in each factor type.

(2) Investigation process

In this study, 200 SCL-90 symptom self-evaluation forms were distributed to a college and a vocational and technical college, and 190 were collected, of which 186 were valid.

The questionnaire of 186 SCL-90 vocational and technical college students is shown in Figure 3:
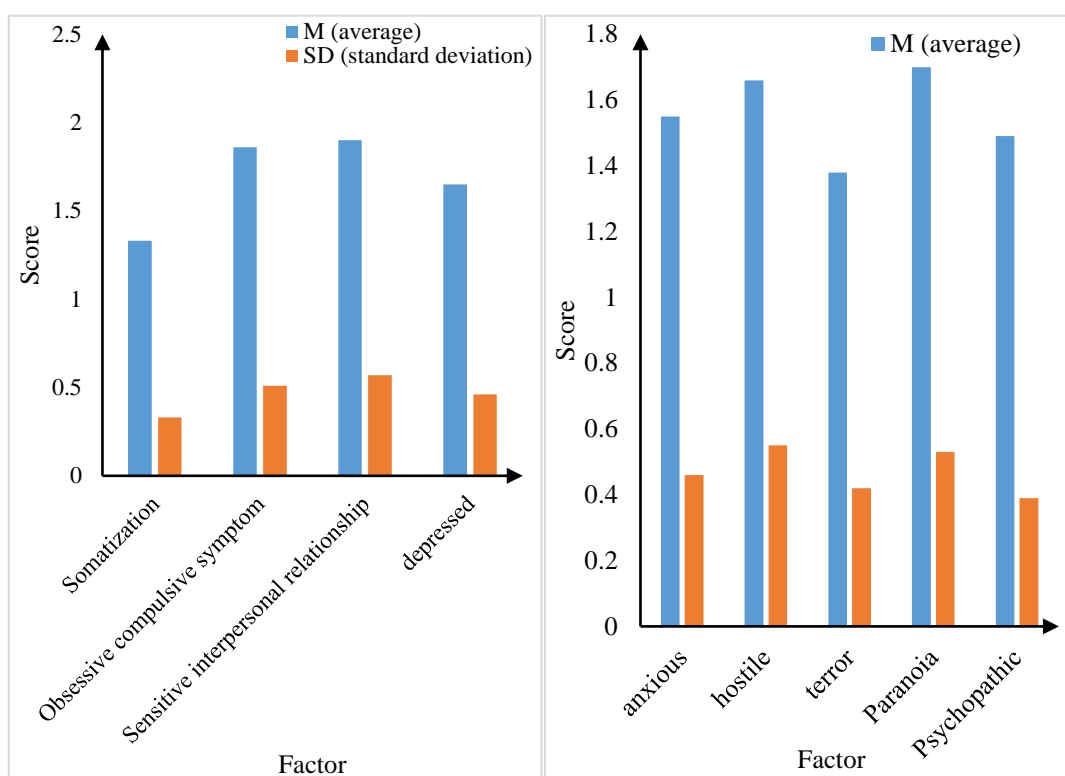
Figure 3. Questionnaire results

In the SCL-90 scale, if the average score of a specific symptom item or category factor is between 0-1.5, it means that the subject does not feel that he or she has one or more psychological symptoms described by a certain factor item. If the score is between 1.5 and 2.5, it means that the subject has a psychological symptom described by one or a class of factors, but it is not very serious and the symptoms are not very frequent. If the score is between 2.5 and 3.5, it means that the subject has one or a series of psychological symptoms described in this item or a certain category of factors, and the degree is moderate. If the score is 3.5-4.5, it means that the subject has one or more of the psychological symptoms described in this item or a certain category of factors, and the situation is relatively serious with frequent symptoms. If the score is 4.5-5, it indicates that the subject has one or more psychological symptoms, which run through the subject's daily life and accumulate to a certain extent. It can be seen from Figure 3 that among the six factors of "obsessive compulsive symptoms", "sensitive interpersonal relationship", "depression", "anxiety", "hostility" and "paranoia", the scores are all above 1.5. This shows that the students participating in the survey have a group of mild psychological symptoms belonging to the above factors.

These data only reflect the mental health of 186 non music majors in vocational colleges. If the average M equals 1.5, many students' project factor scores may be higher than this average. This research is based on SCL-90 as the research method, and 186 non music major college students are taken as the research objects. It is found that "obsessive compulsive symptoms", "sensitive interpersonal relationship", "depression", "anxiety", "hostility" and "paranoia" are high in the severity of symptoms.

4.2 Test Objects and Preparation

Selection of subjects

Through case and experimental analysis, this paper selected the students with the highest scores

in multiple items of the SCL-90 self-evaluation scale as the case tracking study. On this basis, male student A of a vocational college and female student B of a kindergarten teacher's college were selected as samples to conduct a one-year case tracking.

As A and B had two typical psychological performances of non music majors in vocational and technical colleges, they were selected as the follow-up subjects. This paper examined their psychological and emotional changes at all levels through a school year of music psychological regulation education and discussed the application of music activities and rhythmic stress perception training in vocational colleges.

4.3 Test Results

Mental health status of subjects

The mental health status of A and B before the implementation of music activities and rhythmic stress perception training has been described in the previous article: A has obvious psychological symptoms such as panic and anxiety; B has obvious psychological symptoms such as depression, inferiority, anxiety, etc; while the control subjects C and D do not have obvious psychological symptoms. Table 1, Table 2, Table 3 and Table 4 are the data results of SCL-90 self-assessment questionnaire filled by subjects A, B, C and D before the implementation of music teaching:

Table 1. A's scores on SCL-90 self assessment scale before music teaching experiment

Item factor	Score
Somatization	1.63
Obsessive compulsive symptom	1.90
Sensitive interpersonal relationship	1.66
Depressed	2.24
Anxious	2.66
Hostile	1.57
Terror	2.05
Paranoia	1.74
Psychopathic	1.02

Table 2. B's scores on SCL-90 self assessment scale before music teaching experiment

Item factor	Score
Somatization	1.84
Obsessive compulsive symptom	2.15
Sensitive interpersonal relationship	2.47
Depressed	2.33
Anxious	2.79
Hostile	1.58
Terror	2.97
Paranoia	1.42
Psychopathic	0.87

Table 3. C's scores on SCL-90 self assessment scale before music teaching experiment

Item factor	Score
Somatization	0.51
Obsessive compulsive symptom	0.83
Sensitive interpersonal relationship	0.97
Depressed	0.99
Anxious	1.13
Hostile	0.57
Terror	0.75
Paranoia	0.93
Psychopathic	0.53

Table 4. D's scores on SCL-90 self assessment scale before music teaching experiment

Item factor	Score
Somatization	0.63
Obsessive compulsive symptom	0.94
Sensitive interpersonal relationship	0.85
Depressed	0.79
Anxious	0.95
Hostile	0.77
Terror	0.89
Paranoia	0.73
Psychopathic	0.69

During the musical activities and rhythmic stress perception training in a school year, the psychological and emotional conditions of students A and B were significantly improved. According to the subjective observation of teacher x, A's academic performance transited from the dissociative state when he first participated in the activity to the wholehearted involvement in the music activity when the teaching activity was about to end. He actively cooperated with his classmates in various rhythm training. According to the subjective observation of teacher Y, B's performance from the beginning was frustrated and timid. At the end, she could sing in public, communicate, discuss and cooperate with classmates, and successfully completed the music rhythm training. It can be found that after a year of music activities and rhythmic stress perception training, A and B's external spirit and outlook have been greatly improved.

The score of SCL-90 self evaluation scale showed that the internal psychological quality of A and B has been significantly improved in teaching experiments. The following are the scores of SCL-90 at the beginning, during and at the end of the teaching experiment.
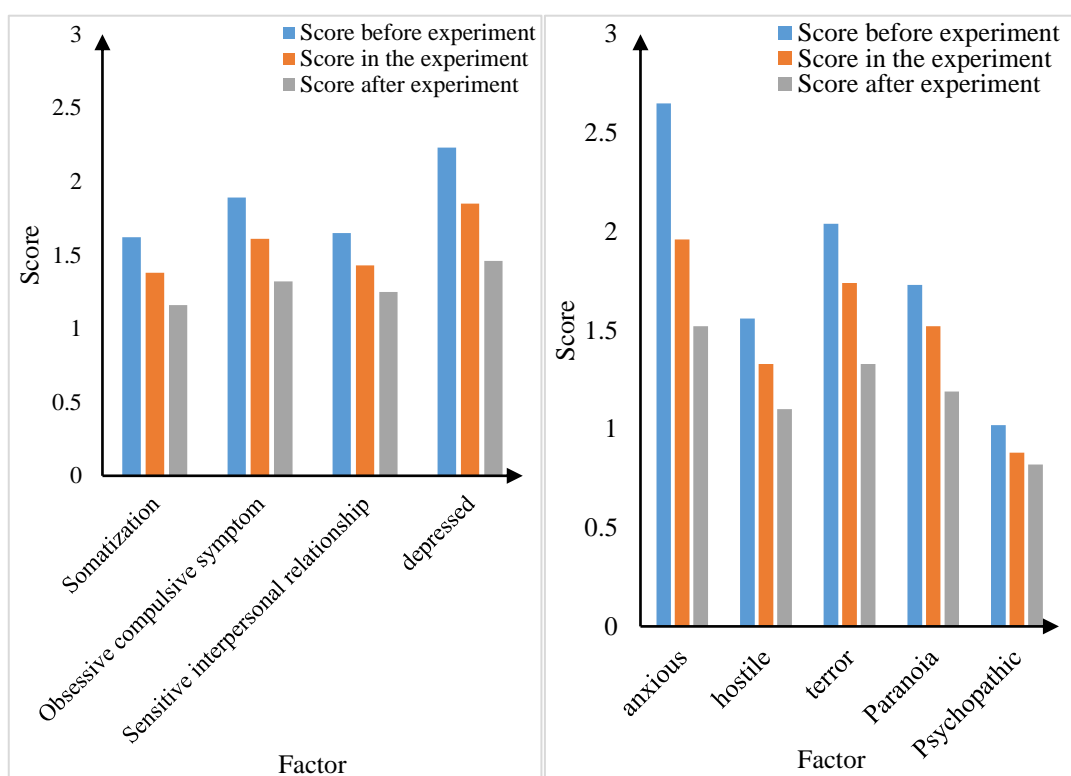
Figure 4. A's SCL-90 scores before and after music activities and rhythmic stress perception training

It can be seen from Figure 4 that the scores of various factors of A have improved significantly with the advancement of teaching experiments in SCL-90 self evaluation scale. The results showed that the scores of "somatization", "obsessive compulsive symptoms", "sensitive interpersonal relationship", "depression", "hostility", "terror" and "paranoia" were all lower than 1.5. The score of "anxiety" decreased from 2.65 to 1.52. Although it was still higher than 1.5, it was much lower than the previous score, which indicated that A's anxiety has also been greatly improved. If music activities and rhythmic stress perception training are continued, the score of A "anxiety" is likely to drop below 1.5.
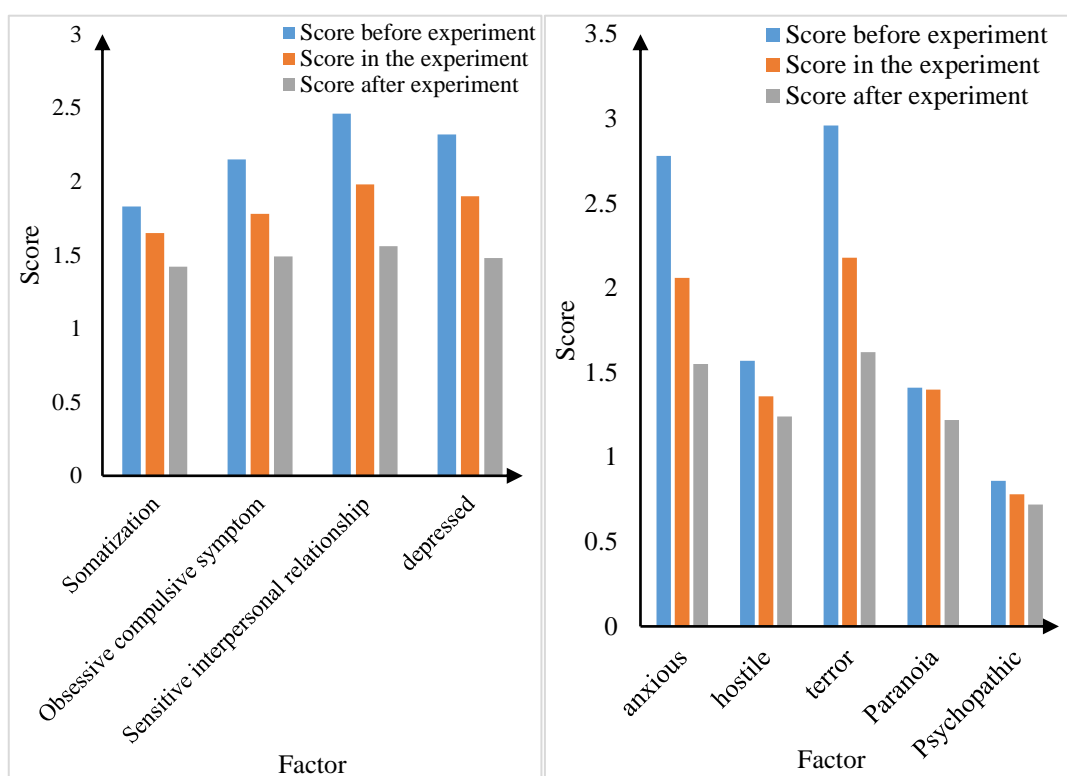
Figure 5. B's SCL-90 scores before and after music activities and rhythmic stress perception training

It can be seen from Figure 5 that the performance of various factors of B's SCL-90 self evaluation scale in teaching experiments has also been greatly improved. The scores of "somatization", "obsessive compulsive symptoms", "depression", "hostility" and "paranoia" were all lower than 1.5. The scores of "sensitive interpersonal relationship", "anxiety" and "terror" were all above 1.5 , which has decreased significantly compared with that before the experiment.

The score of "sensitive interpersonal relationship" was only 0.06 more than 1.5, and the average score of 186 non music major students shown in Figure 3 on the SCL-90 self evaluation scale was 1.9. The "anxiety" score was only 0.05 more than 1.5. The score of "terror" was 1.62, more than 1.5, and it was higher than the average value of 1.38 in the SCL-90 self evaluation scale of 186 non music majors shown in Figure 3. However, before the start of the experiment, B got a high score of 2.96 in the "terror" factor, and it dropped to 1.62 after the end. This showed that music activities and rhythmic stress perception training can effectively reduce B's fear. On the other hand, it also proved that music learning can not be completed overnight, and those suffering from mental disorders can better alleviate their mental state through music activities. However, from the point of B in the "terror" item, B's score in the "terror" item may drop to less than 1.5 points.

Evaluation of psychological adjustment function of non music major college students by music activities and rhythmic stress perception training

From the above investigation and experimental results, it can be seen that music has a great role in promoting the psychological and emotional regulation of the audience with a certain therapeutic effect. This paper suggested that the multimedia music situation, rhythm practice and the teaching design of "micro music salon" are the important reasons. The multimedia teaching environment can bring a variety of visual stimuli to students and a good atmosphere for the adjustment of music psychology, thus laying a good foundation for students to play the role of psychological regulation

in music teaching. Rhythm teaching, visual, auditory, tactile and other different dimensions can enhance the positive influence of music on students' nervous system, thus enhancing the psychological control ability of music. As the "micro music salon" includes a large number of communication, interaction and cooperation activities between teachers and students, students can not only experience the charm of music, but also share their own music feelings with others, thus freeing them from the narrow and closed space. In the process of cooperation and creation, students' potential can be fully exerted, so as to improve their self-confidence to know themselves and appreciate others. In this way, students can form a more positive and correct views on the world and values, so that music plays an important role in the ideological and moral character of college students.

In a word, music plays a regulatory role in students' psychology. Negative music appreciation needs to be transformed into positive music forms and interactive and collaborative music themes, so that students can recognize themselves, reaffirm themselves and accept themselves while listening, discussing and expressing music. Only in this way can the regulatory role of music be better played, thus forming a healthy and positive outlook on the world and values. In this way, the music activities and rhythmic pressure perception training function of "teaching in music" can be realized more naturally, so that students can walk a vigorous life path with a high spirited when encountering difficulties.

5. Conclusions

The relief of students' psychological pressure requires the joint efforts of schools, parents and teachers. The effective improvement of students' psychological conditions can reduce students' psychological pressure and achieve the goal of students' physical and mental health development, thus providing students with a good learning environment and atmosphere at the university. However, it should also be noted that the effects of music activities and rhythmic stress perception training are accidental, and the exertion of the effects requires the joint efforts of people. Therefore, on the basis of mastering music knowledge, students can get better development by regularly participating in music activities or rhythmic stress perception training. In a word, schools, parents and teachers need to make good communication to constantly stimulate students' interest and enthusiasm in music activities and rhythmic stress perception training, wich can help students adjust and control themselves to better complete the learning tasks at the university stage.

Funding

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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