

## LETTER TO THE EDITOR

## Application of Interactive Music Therapy in Cognitive Neurohealth Education of College Students from the Perspective of Ecology

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Music therapy is a new type of cross-cutting application that was founded in the mid-20th century in Europe and America by combining the theory and practice of music, medicine, and psychology. It emphasizes the cognitive model of emotions, ‘emotions determine cognition’, through the music, which is deeply concerned and welcomed by people. In order to realize the application analysis of interactive music therapy in cognitive neurological health education of undergraduates, the BP neural network method was used to construct the influence model of music therapy on the cognitive and neurological health of undergraduates based on the forward propagation of the input signal and the back propagation of the output error of the BP network algorithm, so as to achieve the application of interactive music therapy in cognitive neurological health education of undergraduates

interactive; music therapy; undergraduates; mental health education

### 1 Introduction

Health is the eternal theme of human society, including both physical and mental health (Yu et al. 2017). In recent years, due to the influence of external factors on the imperfections of cognitive neurological health education for undergraduates, the cognitive neurological health problems of undergraduates have become increasingly prominent. It is clear that improving the cognitive neurological health education system for undergraduates is imminent (Wang 2016).

Ma (2019) published an article entitled “Traditional Music Protection System from the Ecological Perspective based on Big Data Analysis” in Ekoloji (Issue 107). In order to explore new ideas for the inheritance and development of traditional music, the current situation of Chinese traditional music in the context of big data era is further studied through data analysis and investigation of the survival status of specific types of music from the ecological perspective, and a database protecting the traditional music is constructed. The results show that the development of traditional music is declining with the change of information media technology and society, and it is facing the crisis of survival. Only through the reform represented by “New Folk Music”, the support of local literary and artistic groups, the training of young local music talents, and the combination with other comprehensive arts such as movies and TV plays, can people continuously expand the living space of traditional music, adapt to the development needs of the times, and gradually expand their influence. Therefore, it is necessary to actively make use of the vast development opportunities and platforms provided by the information

age. In this process, it is inevitable to change the original content to meet the needs of the times. On the premise of maintaining the artistry of traditional music, it is of positive historical significance to further expand its living and development space and sublimate it on the original basis. The viewpoint of this paper can be applied to the cognitive nerve health education of college students. On this basis, this paper puts forward the application of interactive music therapy in the cognitive nerve health education of college students from the ecological point of view (Fernandez-Limon et al. 2018, Gulmezoglu and Daghan 2017).

## 2 Idea description

In order to realize the role of interactive music therapy in undergraduates' cognitive neurological health education, a BP neural network (Tolsgaard et al. 2016) was used to construct a promoting model for the mental health of undergraduates based on the interactive music therapy. The specific process is described as follows:

The basic BP network algorithm contains two propagation directions (Auerbach et al. 2016): the forward propagation of the input signal and the back propagation of the output error, that is to say, calculation of the actual network output should follow the direction from the input to the output. However, the correction of weights and thresholds at each layer of the network is reversed from output to input

Prior to the construction of the neural network, data samples of interactive music therapy in undergraduates' cognitive neurological health education need to be normalized (Ananat et al. 2017). According to the different influence degrees of factors on cognitive neurological health, the input and output data of neural network samples are limited to  $[0,1]$  or  $[-1,1]$ . The process of converting the input and output data to the value within the interval  $[0,1]$  can be expressed as:

$$\bar{x}_i = \frac{x_i - x_{\min}}{x_{\max} - x_{\min}} \quad (1)$$

In the above formula,  $x_i$  represents the input or output data of the neural network,  $x_{\min}$  represents the minimum value in the data set, and  $x_{\max}$  represents the maximum value in the data set.

The process of converting the input and output data into the interval  $[-1,1]$  can be expressed as:

$$\bar{x}_i = \frac{x_i - x_{mid}}{\frac{1}{2}(x_{\max} - x_{\min})} \quad (2)$$

Where  $x_{mid}$  represents the median of the data variation range, which can be calculated by:

$$x_{mid} = \frac{x_{\max} + x_{\min}}{2} \quad (3)$$

Through the above formula, the data samples of applying interactive music therapy to students' cognitive neurological health education are normalized, and the processed data samples are used to construct a neural network to realize the application of interactive music therapy.

Based on the correction amount obtained in the above formula, a neural network model was constructed and interactive music was input into the model to determine the role of interactive music in the cognitive neurological health education of students. The specific process is shown below.

1) Design of input layer and output layer. The input and output layers mainly receive the input data and output the final processing results. Under normal circumstances, the input number of the input layer of the network should be equal to the input number of the problem processed, and the number of neurons in the output layer should be equal to the number of outputs of the processed problem. The number of neurons in the input layer used in this network model is 10, and the number of neurons in the output layer is 1.

2) Design of the hidden layer. That is, neural networks have hidden layers, so it can deal with more complicated problems. Generally, the hidden layers are one layer or two layers. The number of neurons can be flexibly selected according to the actual situation. This network model uses one hidden layer and the number of neurons is 15.

3) Training of the neural network. The training process of BP neural network is implemented by the trainbp function.

### 3 Results

In order to determine the role of interactive music in undergraduates' cognitive neurological health education, an experiment was conducted. In the course of the experiment, a total of 41 students who chose to voluntarily register for group interactive music therapy were selected as subjects and were aged between 17 and 21 years old. The Symptom Checklist was developed using Derogatis, L.R. (1975), a total of 90 items, including 9 factors. Each item is scored on a 0-4 scale, where "none" means no symptoms and 0 points; "severe" means 4 points. Each item's score is added. The higher the total score, the lower the physical and mental health level.

**Table 1 Symptom Checklist**

Each factor	Items	Measurement content
Somatization	1, 4, 12, 27, 40, 42, 48, 52, 53, 56, 58	Reflects physical discomfort
Obsessive-compulsive symptom	3, 9, 10, 28, 38, 45, 51, 55, 65	Reflects the uncontrollable behavior that don't need to be done
Relationship sensitivity	6, 21, 34, 36, 37, 41, 61, 69, 73	Reflects the feeling of uncomfortableness and inferiority
Depression	5, 14, 15, 20, 22, 26, 29, 30, 31, 54, 71, 79	Reflects emotional and moody feelings of depression, cognitive and physical feelings associated with depression
Anxiety	2, 17, 23, 33, 39, 57, 72, 78, 80, 86	Reflects physical signs due to irritability, nervousness, etc.
Hostility	11, 24, 63, 67, 74, 81	Reflects the hostile characteristics manifested in the thought, feeling and behavior
Terror	13, 25, 47, 50, 70, 75, 82	Reflects some items of social terror
Paranoid	8, 18, 43, 68, 76, 83	Reflects the basic characteristics of paranoid thinking
Psychotic	7, 16, 35, 62, 77, 84, 85, 87, 88, 90	Reflect a wide range of acute symptoms and behaviors

In the course of the experiment, the "Symptom Checklist" and "Coping Checklist" were distributed to all members and were retired on the spot after completing the checklists anonymously.

Before the music is transmitted to the auditory organ of human, it exists in the form of sound waves, so at this time all the music do not have the emotional nature. When sound waves pass through the ear drum, the middle ear, inner ear, cochlea, and finally to the auditory nerve, music is converted into hydraulic waves in the form of sound waves, and the hydraulic waves in the cochlea are converted into electrical signals. Electrical signals are transmitted from the cochlear nerve to the brain, which produces hearing. The electrical signal is transmitted from

different nerve fibers to different parts of the brain auditory center, ie different musical experiences are generated. The largest and most important relay station in the music transmission process is the hypothalamus. The hypothalamus plays a crucial role in the formation of emotions and is a key physiological area in which music is transformed into emotions.

Different music is changed into different signal modes, and different signal modes can produce different emotional modes. The increase, maintain, and decrease of the electrical signal are based on the three stimulus level patterns produced by changes in the electrical pulse density of the nerve fibers. A rapid increase in the density of electrical pulses produces a surprising and startling emotion; a slightly slower rate of increase produces a dreadful emotion; a slow increase results in a person’s attention and evokes interest; instead, if the density of electrical pulses decrease suddenly, a happy mood is resulted; a steady decrease produces a positive mood, such as happiness; but if the electric pulse is maintained for a long time, a stressful experience is created.

The human nervous system is divided into the sympathetic nervous system and the parasympathetic nervous system. When a person is stimulated, the sympathetic nervous system is activated and the level of physiological arousal is relatively increased, giving rise to emotions such as excitement and nervousness. In contrast to the sympathetic nervous system, the parasympathetic nervous system is activated, the level of physiological arousal is decreased, and the human body enters a relaxed state. Musical stimulation is the activation of the parasympathetic nervous system. Therefore, people will experience relaxation while listening to music. In the course of the experiment, with the treatment of music and the therapist’s relaxation, imagining the guide, the subject was relieved from the tension.

During the experiment, interactive music was played and the SCL90 Symptom Checklist of the students before and after the play were compared. The results obtained are shown in Table 2.

**Table 2 Comparison of scl-90 before and after treatment**

Experiment times	Score before the experiment	Score after the experiment
1	67.5	59.1
2	68.2	58.4
3	67.7	58.7
4	68.6	59.1
5	68.3	58.6
6	67.4	59.5
7	68.1	58.8

From the above, we can see that the higher the score, the more serious the problem of cognitive neurological health of students. Table 2 showed that after the experiment, the student’s score of SCL90 was low, indicating that interactive music therapy can effectively improve the cognitive neurological health of students.

#### 4 Conclusions

Through the analysis of the impact of interactive music therapy on undergraduates’ cognitive neurological health education, the use of interactive music therapy methods achieved students’ cognitive neurological health education and ensured that students’ cognitive neurological health. This paper proposed a method of analyzing the impact of interactive music therapy based on BP neural network on undergraduates’ cognitive neurological health education. According to the forward propagation of the input signal and the backward propagation of the output error of the BP network algorithm, a network model of neurological health was established to determine

the factors affecting the cognitive neurological health of students and assign different weights to each factor. Based on the weights, the impact of interactive music therapy on cognitive neurological health education for undergraduates' was analyzed.

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