

Computer Engineering Research: Innovative Treatment Methods and Genetic Analysis of Digestive Tract Diseases based on Neuroscience and VR Technology

-- An Innovative Intelligent Medical Economic Product Modeling

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Abstract. Background: According to the data from the Autonomous University of Barcelona, Spain, at present, 20% of people in the world may suffer from irritable bowel syndrome. Research methods: The research group has carried out computational engineering modeling for music therapy of irritable bowel syndrome, which uses virtual reality technology that can interfere with human biological neural network, and has also carried out the process design of biological neural network working mechanism, using computer engineering to complete necessary stimulation, and using neural network algorithm model to complete in-depth learning, After the algorithm modeling is successful, it can complete the prediction of the improvement of patients by music chords of different emotional colors, and provide clinicians with new ideas for treatment and health economic intelligent products. The first author looks forward to the cooperation between Chifeng University and Barcelona Autonomous University in the research of irritable bowel syndrome, expounds the advantages of both sides, and expresses a strong willingness to communicate. At the same time, the advantages of the Sakharov Institute in Belarus are discussed. Results: The research team carried out research in combination with biological neural network experiment and social experiment, and completed the market demand survey. Conclusion: The chord trend in this model can complete the intervention for patients. Patients have better subjective feelings, and the algorithm model is highly popularized. Virtual reality technology can be used as an important medium to complete this work, which is suitable for promotion.

Keywords: Gastroenterology; Rritable Bowel Syndrome; Computational Neuroscience.

1. Background

In the most cutting-edge research, in VR system, virtual reality technology is an important direction of simulation technology, which is the combination of simulation technology and computer graphics, human-computer interface technology, multimedia technology, sensor technology, network technology, and other technologies. It is a challenging cross-technology frontier discipline and research field. At present, research in music therapy English has shown that the current function has met the needs of this field of digestive medicine. At the same time, in the current AI technology, the artificial neural network can be applied in this field as a whole. In the treatment of irritable bowel syndrome, this technology can be used for primary clinical experiments. Therefore, the research team has designed this intelligent medical model through relevant research in the Department of

Gastroenterology, Medical College of Barcelona Autonomous University. Through this model, we can solve the recommendation of music therapy on the indications of digestive diseases and explore the mechanism of brain neuroscience [1-5].

2. Researching Method:

As shown in Figure 1, the current virtual reality technology has been able to complete the role of emotional neuroscience on patients through the stimulation of sound and video. In Figure 1, we have shown in detail the necessary hardware and network information path required for music therapy.

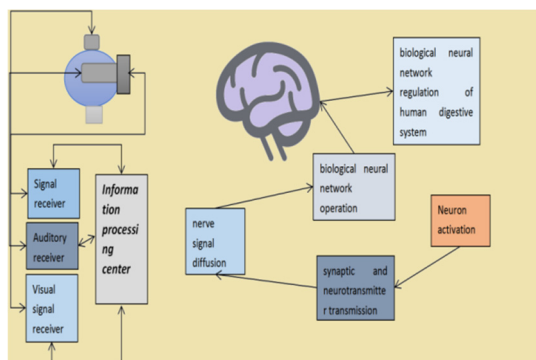


Fig 1. Brain nerve stimulation mechanism based on virtual reality technology

In the cognitive and emotional neuroscience of emotion, the mechanism of biological neural network is shown in Figure 1. Through the above four steps, music therapy will be used to conduct complete intervention on this disease, and data can be cleaned after data collection, and the patients' mood after treatment can be integrated for questionnaire survey to complete the overall.

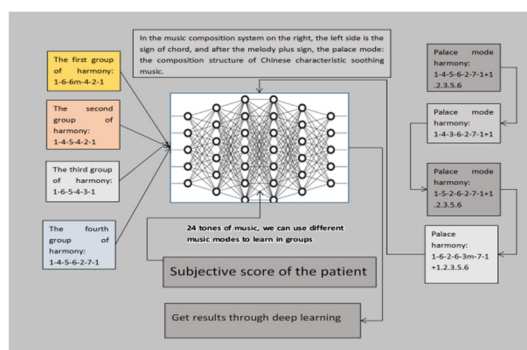


Fig 2. Establishment mechanism of treatment database for irritable bowel syndrome patients based on music therapy

As shown in Figure 2, the impact of Chinese traditional music and Spanish traditional music, as well as traditional music of Russia and the Republic of Belarus, on the people of different countries is obviously different. We have verified it through experiments. Therefore, we think it is very necessary to use and acoustics (basic music theory discipline) as an analysis model for the mechanism of brain neuroscience. As shown in Figure 2, the artificial neural network integrates the harmony trend (chord combinations with different emotional colors in basic music theory), and it is very appropriate to use different melodies for data collection in the database for different harmony trends. After the operation of the artificial neural network, the data input end will have the data that has been clearly marked, and the feedback data that uses the harmony direction to stimulate the human brain nerve will operate as a whole. The hidden computing layer will recognize and process the data in the data. After the activation function is activated, this neural network will be able to predict the degree of intervention of different music on patients with irritable bowel syndrome.

In BP neural network, the number of nodes in the input layer and the output layer is determined, while the number of nodes in the hidden layer is uncertain, so how many nodes should be set, as follows.

Where h is the number of hidden layer nodes, m is the number of input layer nodes, n is the number of output layer nodes, and a is the adjustment constant between.

$$h = \sqrt{m + n} + a$$

In the overall deep learning, neurons can be activated through the two activation functions mentioned above. After the completion of the overall deep learning mechanism, the database can be processed and the prediction results can be obtained.

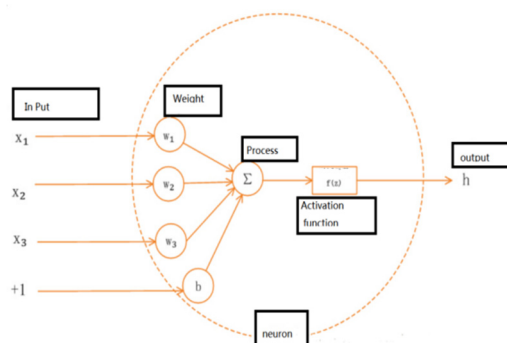


Fig 3. Working mechanism of computational neuroscience: application of neurons and activation functions

Each neuron node in the neural network accepts the output value of the upper neuron as the input value of this neuron, and transfers the input value to the next layer. The input layer neuron node will directly transfer the input attribute value to the next layer (hidden layer or output layer). In the multi-layer neural network, there is a functional relationship between the output of the upper node and the input of the lower node. This function is called the activation function (also called the excitation function).

The research team believes that SIG function is the preferred activation function, and sigmoid is the commonly used nonlinear activation function. Its mathematical form is as follows.

$$F(e) = \frac{1}{1 + e^{-z}}$$

It can transform the continuous real value of the input into an output between 0 and 1. In particular, if it is a very large negative number, the output is 0; If it is a very large positive number, the output is 1. However, in the deep neural network, the gradient explosion and gradient disappearance are caused by the gradient reverse transfer. The probability of gradient explosion is very small, and the probability of gradient disappearance is relatively large.

Tanh is read as Hyperbolic Tangent. It solves the problem that the sigmoid function is not zero-centered output. However, the problem of gradient vanishing and power operation still exist.

The analytical formula of the tanh function is as follows.

$$\text{Tanh}(X) = \frac{e^X - e^{-X}}{e^X + e^{-X}}$$

$y = \tanh x$; Definition domain: $\mathbb{R}$, value domain: $(-1, 1)$. $Y = \tanh x$ is an odd function whose function image is a strictly monotonic increasing curve that crosses the origin and crosses the I and III quadrants. Its image is limited to the two horizontal asymptotes $y=1$ and $y=-1$.

Virtual reality technology can complete the overall patient stimulation hardware configuration. And according to the network access, the overall information configuration can be completed, first of all, the audio selection in the media library, each harmony, etc. When the clinical intervention is completed, a questionnaire survey will be carried out for patients with irritable bowel syndrome, and long-term follow-up will be carried out to check whether the clinical effect is limited after the long-term intervention. When the conditions are met, the research team believes that piano can be used to

optimize the overall curative effect, because the sound of piano is more suitable than that of electronic equipment.

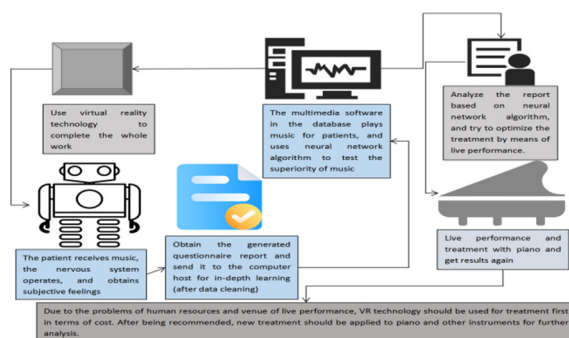


Fig 4. Working mechanism of medicine and AI technology

In terms of music theory knowledge, it supplements the models of cognitive neuroscience and computer science. In piano music at all times and all over the world, composers wrote down many kinds of chords and many specific applications of the same kind of chords, which resulted in the extremely rich color of chords. Among various chords, beginners should at least understand and feel the colors of three chords:

The color tone of the major triad is bright and bright, as if it were sunny, with a sense of stability, harmony and completeness. Music in major mode always ends with a major third. The color tone of the minor triad is dim and depressing. It seems to be cloudy, but it is also stable and harmonious, but it is not as strong as the major triad. A piece of music in minor, usually ending with a minor triad. However, in the Baroque period, sometimes minor music also ended with a major triad to obtain a greater degree of stability. This is the most basic and general statement. In specific music, because of a variety of other factors, especially the differences in mode, tonality, tone zone, arrangement of chord notes, connection of front and back chords, etc., the tone of the chord will have subtle and sometimes great changes. The difference in the color and tone of the major and minor triads constitutes the most important harmony basis for various changes and comparisons in European music works. To learn the piano, you should understand this from the perspective of auditory perception. Therefore, it is very effective to use chords to stimulate nerves and treat diseases by regulating emotions.

3. Discussion based on Intelligent Medical Economic Product

Facing the national strategic needs of "Healthy China 2030", based on modern medical and biological theories, with intelligent human-computer interaction as the main line, and focusing on the urgent needs of artificial intelligence-related fields and clinical applications such as brain cognition, big data, cloud computing, machine learning, we will carry out key and common technology research and development and new intelligent products research and development. In the future, the Intelligent Medical Engineering Center will be committed to multi-disciplinary intersection and integration, realize human-computer collaborative intelligent diagnosis and treatment methods and efficient and safe clinical applications, and provide product and technical support for the development of national economy, national health and special needs.

Chifeng University of China can integrate three affiliated hospitals, with the total number of beds reaching 5200. Hunan Medical University of China can integrate seven affiliated hospitals, with the total number of beds exceeding 10000. At the same time, the total number of people covered by the two regional medicine is 20 million. After studying the literature of the Autonomous University of Barcelona in Spain, the research team believed that relevant cooperation could be carried out in the field of basic medicine, especially in the comparative experiment of different races and different languages. It is worth mentioning that Chifeng University and the National University of Belarus

have published scientific research documents in the field of digestive medicine research, which will have broad prospects for global music therapy research in the future.

4. Experimental Design and Visualization of Experimental Results

Experimental design:1. We selected 10 patients with irritable bowel syndrome in China for the emotional experiment of applied neuroscience. A: Chinese version: Liang Shanbo and Zhu Yingtai, B: English version: Ice Rain, C: Russian version: Katyusha, D: Spanish version: Sophia. And score the music and visually analyze the scoring results.2.2. Using the computer software, A: Wechat, we conducted a questionnaire survey for doctors at Shijitan Hospital of Capital Medical University, Shanghai People's Hospital, Chifeng Tumor Hospital, and Huaihua People's Hospital. The content of the questionnaire is whether there will be digestive tract abnormal reaction after continuous night shift and high intensity work (48 hours). The experimental results were analyzed visually.



Fig 5. Analysis: Music treating pathway

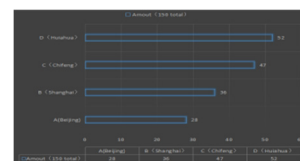


Fig 6. Analysis: Social research of digest disease

Analysis: As shown in Figure 5: In China, perhaps because of different music styles and language problems in different regions, Chinese people prefer Chinese songs more, while songs in other languages have a poor effect. As shown in Figure 6: Due to the work pressure of doctors in China, it may lead to a large number of people suffering from digestive tract diseases in the future. At the same time, the research team also proposed the assumption that the high pressure of emotional neuroscience will lead doctors to prefer greasy and spicy food, which may also be the cause of the disease.

5. Gene Prospect of Cytogenetics and Conclusion

Expectation: Although irritable bowel syndrome does not have the problem of organic disease, it will bring a lot of hidden problems to patients, and will cause a lot of damage to psychological and mental factors. From the perspective of genetic susceptibility, research shows that irritable bowel syndrome has an obvious genetic tendency, which is caused by the mutation of this gene in the family. Therefore, people who have a family history of irritable bowel syndrome in their families need more attention.

Conclusion: The chord trend in this model can complete the intervention of patients. Patients have better subjective feelings, and the algorithm model has been highly popular. Virtual reality technology can be used as an important medium to complete this work and is suitable for promotion.

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