Monitoring of mountain ecological environment based on Bayesian estimation and testing of motor memory function in mice

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Abstract
In this paper, the Bayesian estimation method is used to estimate the coefficients of wavelet transform to reconstruct the desired signal and reduce the noise. Using SNR and RMS error as noise reduction estimation indexes, we compare Bayesian estimation algorithm and global threshold algorithm, which improves the shortcomings of threshold algorithm and adaptive threshold algorithm. According to Bayesian estimation, according to the geological vulnerability characteristics of the mountain ecological environment, the geological change and its promotion mechanism of the mountain environment are selected. The paper analyzes the influence of LUCC remote sensing monitoring and dynamic changes, such as rainfall erosion and topography, and the influence of individual natural management factors, and analyzes the propulsion effect of nearby residential areas. It combines natural management with artificial management, and discusses deeply in various aspects, including the assessment and analysis of environmental geological vulnerability, and obtains relevant research results. The paper studies the function of motor memory in mice experimental model, and provides experimental basis for PD treatment in GTP. The methods were 25-30g male mice were randomly divided into normal group, control group, low dose GTP group, and high dose GTP group. After modeling mice in the control group, low dose GTP group, and high dose GTP group, climbing bar, and other experiments were carried out to detect. By studying Bayesian estimation and mountain ecological environment monitoring, it was applied to the detection of motor memory function in mice, which promoted the development of motor memory function.

Keywords Bayesian estimation · Monitoring of mountain ecological environment · Mice experiment · Motor memory function

Introduction
The comparison shows that the Bayesian estimation algorithm has a significantly higher signal-to-noise ratio than other algorithms, and this method obtains larger signal coefficients and noise peaks (Akpan et al. 2013). For the secondary analysis data, the error obtained by using the Bayesian estimation algorithm is smaller, and it has a better degradation effect. In the power and energy spectrum analysis, the benefits of the Bayesian estimation algorithm are fully demonstrated, and the detailed information of the high-frequency and low-frequency parts of the original signal is effectively stored (Batayneh 2009). When monitoring the ecological environment of mountainous areas, the ecological environment of mountainous areas is not only a typical mountain basin but also an important golden channel connecting central resources, domestic water, and economic corridors in the middle and lower reaches of the Yangtze River (Batayneh et al. 2014a). The long-term development and utilization of resources have led to serious problems such as deterioration of water quality, expansion of soil pollution, ecological destruction, and soil erosion (Batayneh et al. 2014b). At the same time, the continuous increase of rocky desertification, wetland pollution, and reduction of biodiversity has led to more and more serious environmental problems. Therefore, the monitoring of the ecological environment of the mountainous regions in the southern river basin plays an important role in the construction of a province’s national ecological civilization experimental zone (Corwin 1990). In order to prove the effectiveness of the Bayesian evaluation algorithm, this article uses...
mouse experiments to test the motor memory function. Regarding the effect of GTPs on PD model animals, studies have shown that EGCG can cross the blood-brain barrier and enter the nervous system, which can improve the overall internal environment’s antioxidative capacity and scavenging free radicals. It reduces the degree and severity of abnormal changes and protects dopaminergic neurons on the soil surface. Intraperitoneal injection of GTPs can significantly reduce the loss of midbrain dopaminergic neurons caused by MPTP. Acupuncture and moxibustion together with GTPs can protect neurons, inhibit cell apoptosis, and inhibit oxidative stress, thereby protecting the PD mouse model (Dias 2000). The purpose of this study is to observe the therapeutic effect of GTPs on PD model mice after MPTP modeling. In the experimental results, even during exercise and exercise, GTP can improve the exercise and learning and memory impairment of PD model mice to a certain extent. Improve effectiveness by exerting memory function. In human daily life, most activities can be broken down into a series of simple and continuous actions. It is confirmed by many studies that through the practice of sequence technology, people spontaneously characterize the technology as a series of continuous and stable moving blocks, and the speed and accuracy of the movement are steadily improved. With the latest developments in cognitive neuroscience, people are paying more and more attention to neural mechanisms. Therefore, it provides an important theoretical basis for understanding the neural mechanisms that can reveal the motor memory function involved in sequence skills, and plays an important role in inducing specific guidelines for motor learning and rehabilitation.

Materials and methods

Mountain ecological environment monitoring indicators

Based on the VSD model that has been widely used for vulnerability assessment, the VSD model decomposes the vulnerability into three dimensions of exposure, sensitivity, and adaptability, and organizes it in a step-by-step analysis method of “target level-reference level-element level-indicator level.” Assessed data, this method can effectively implement this concept, which has a great effect on the clear integration of data and indicators. This research combines the existing VSD model of ecological environment vulnerability assessment indicators in karst areas, and according to the principles of ecological environment vulnerability assessment, combined with actual ecological characteristics, appropriate indicators are selected from the three dimensions of VSD. Country G the W watershed establishes an indicator system for evaluating the vulnerability of the ecological environment. The reference layer is eight auxiliary indicators such as population industrial distribution, land use, soil, vegetation, geology, and topography. The element level is 16 three-level indicators, see Table 1 for details.

Bayesian estimation method design

For engineering structures with N0 degrees of freedom according to the principle of maximum entropy, according to the stiffness distribution, the structural stiffness parameter θ represents θ to Γ (α, β). The formula is

\[
p(\theta; \theta_{MPE}) = \prod_{i=1}^{N_0} p(\theta_i; \theta_{i,MPE}) = \prod_{i=1}^{N_0} \frac{\beta_i^{\alpha_i-1}}{\Gamma(\alpha_i)} e^{-\beta_i \theta_i}
\]

(1)

This formula is the maximum estimate of structural stiffness parameters before the θMPE vibration test. α is the shape factor and β is the inverse scale factor. α and β are related to the mathematical expectation μ and standard deviation σ of the parameter θ. The equations are

\[
\alpha_i = \frac{\mu_i^2}{\sigma_i^2} = \frac{1}{c^{2}}
\]

(2)

\[
\beta_i = \frac{\alpha_i}{\mu_i} = \frac{\sigma_i^2}{c^{2}}
\]

(3)

You can also limit the variance of the proposed distribution to a reasonable range, so as not to be too large or too small. After improving the variance of the proposed distribution in this way, the SCAM algorithm achieves adaptation while fitting the sample sequence to the Markov chain without any difference.

If the response vector measured at the structure is y_j, and the theoretical response vector is y_j(θ), then the relationship between the two is as follows:

\[
\bar{y}_j = y_j(\theta) + \eta_j
\]

(4)

When Nm is the number of observation positions, the equation of parameter θ is

\[
L(\theta) \propto \exp \left[ -\frac{\sum_{j=1}^{N_m} (y_j(\theta) - \bar{y}_j)^2}{2\sigma^2_j} \right]
\]

(5)

According to the Bayesian formula, we can obtain the structure probability density function according to the measured response as:

\[
\begin{align*}
C \prod_{i=1}^{N_0} \frac{\beta_i^{\alpha_i-1}}{\Gamma(\alpha_i)} e^{-\beta_i \theta_i} \exp \left[ -\frac{\sum_{j=1}^{N_m} (y_j(\theta) - \bar{y}_j)^2}{2\sigma^2_j} \right]
\end{align*}
\]

(6)
In the equation, C is a constant to ensure that the integral within the posterior probability density function is equal to 1. The above formula is to obtain the best estimate of posterior probability distribution and structure parameter \( \theta \).

**Selection of experimental materials and instruments for mice**

Forty male adult mice C57BL weighing 25-30g were selected and manufactured by Laboratory Animal Co., Ltd. The license number is SCXK. These mice were reared in groups, eat freely, and were adaptively fed for 1 week.

Self-made Morris water fan, Rotor-Rod system (San Diego Instrument Company), self-made climbing pole. MPTP, tea polyphenol with CAS number 84650-60-2.

**Detection method of mouse exercise memory function**

Forty mice were randomly divided into normal group, control group, low-dose GTP group, and high-dose GTP group, with 10 mice in each group. Before use, dilute MPTP to a concentration of 0.45% with normal saline. In the GTP model group and the low-dose and high-dose groups of mice, MPTP was injected once a day with ip30 mg/kg. Injection time: 9:30, and continuous injection for 7 days.

After successful modeling, the mice in the low GTP dose group and the high GTP dose group of ip100mg/kg and 625mg/kg GTP were administered for 14 consecutive days. The mice in the normal group and the model group were injected with the same amount of normal saline intraperitoneally.

For ipMPTP7d or GTPs14d, 3 days of continuous training, 1 day of testing, and a total of 4 days of experiments were carried out from 10:00 to 11:30 the next morning. During the training process, the rotation speed of the drum was set to 16r/min, each group of mice was placed on the drum, and the crawling distance and total crawling distance of the mice were tested during the incubation. During the test, the drum speed was set to 20r/min, and each mouse was taken as the average creep distance during the 3 test incubation periods. After each test, the following tests will be performed at the following intervals. Interval duration: 5 minutes.

The experiment was carried out for 8 days from 13pm to 16pm the next day after ipMPTP7d or GTPs14d. The day before the official test, the training to find a platform is carried out. Official tests include 7 consecutive days of positioning and exploration experiments, and one hour of space exploration experiments after the completion of positioning and exploration on the 7th day. In the positioning experiment, we found that the transparent platform had a short escape within 60 seconds, and in the space exploration experiment, we
found the number of times the mouse passed through the original position of the transparent platform in 60 seconds.

The experiment was carried out at 17:30 to 19:30 the day after ipMPTP7d or GTPs14d. Each mouse was tested three times in a row for two consecutive days before the test, and three times a day. Make a wooden stick with a diameter of 1 cm and a length of 60 cm. Draw a marking line in the center of the rod, fix the wooden stick vertically on a horizontal surface, and then fix it on a molding ball with a diameter of 1.5 cm. Wrap the top of the stick and apply gauze to increase friction. The experimenter placed the mouse’s head down, grabbed the shaping ball on the mouse’s hind limbs, and recorded the time until the forelimb of each mouse dropped to the center mark line of the rod. If the mouse crawls in the middle or changes direction and ascends while crawling down, the test is considered invalid and should be repeated.

Statistical analysis

Using SPSS18.0 statistical software, the data was submitted for statistical analysis, including two-way analysis of variance through repeated measures and two sets of t-tests. The measured data is expressed as the mean±standard deviation (x±s). From a statistical point of view, P should be less than 0.05.

A brief introduction to the location of the water maze and the experiment. After MPTP modeling, two-way analysis of variance using repeated measures can be used to perform statistical tests on the data briefly after the mouse has crawled. The difference between test dates when P<0.01 in statistical significance, but it is the same in the MPTP group as the normal group. However, re-testing was performed 14 days after modeling. From day 5 to day 7, when P<0.05 or P<0.01, the escape time of mice in the model group was slightly longer than that in the normal group, and the MPTP learning function was impaired only in appears later after modeling.

Results

Analysis of monitoring factors of mountain ecological environment

According to the Landsat8 image with a resolution of 30 m, the sub-categories were segmented through visual interpretation, and 300 points were randomly generated in the basin for field verification using ArcMap. 275 sampling points and land types were analyzed through the land. Due to the consistency of use, the accuracy of on-site verification reached 92%, which met the accuracy requirements for data use. In addition, we unify the land use types by referring to the UMD land cover types classified into 6 categories. The land use types are extracted from the construction site and obtain the percentage of the construction site. Next, the land use data and slope data are processed together, and the cultivated land data with a slope equal to 25° is selected, as shown in Figure 1.

Plants can protect the ecosystem, protect water resources and reasonably use water resources, reduce the intensity of soil erosion, and play an important role in accelerating the formation of rocks. Vegetation coverage is an important indicator of surface vegetation status, which can directly reflect the intensity of soil erosion in the area. Its value range is 0-1. The higher the value, the better the plant growth. The higher the ratio, the greater the ability of the ecosystem to resist disturbance, self-regulation, and recovery. On the contrary, the lower the value, the better the system’s ability to resist disturbance. The lower the value, the lower the ability to self-regulate and recover. If the area is slowly to be free of bare rock or construction sites and other vegetation, the vegetation coverage rate is 0.

For data processing based on the Landsat8 image, we first run a single-band fusion to obtain multi-band images in the infrared and near-infrared bands. The near-infrared band is 5 bands and the 4 bands are infrared bands. The model was calculated using ERDAS software. Figure 2 shows the final data.

In the K zone, the formation of carbonate rock soil has a long time, and the soil is thin and low in fertility. In addition, the vegetation in the karst area is mainly calcium-loving plants, and because relatively few organisms are susceptible to the influence of the food chain, the background condition that causes the fragile ecosystem in the karst area is exposure to a large amount of rocks.

After the overall modeling calculation, based on the land use data, we select all the waters, paddy fields, and other areas of the construction site, and specify the exposure rate of the rock mass as 0. Figure 3 is the last exposed rock mass data.

One of the basic indicators of topography is slope, which affects the structure of the surface soil layer by affecting gravity, affects surface outflow, soil erosion, and indirectly creates certain obstacles to the ecological vulnerability of karst areas. Up to now, people have usually been able to obtain the slope value of a specific point with lower accuracy, which is complicated and expensive to use manual measurement or estimation. With the continuous improvement of GIS spatial analysis functions, more and more TINs are directly created by contour lines. By creating irregular grid files and directly calculating the slope through surface analysis, computer automation can greatly reduce manual work, thereby increasing the accuracy of the data.

The main step is to use ArcGIS software to extract the surface undulation index based on DEM data in a certain province. Activate DEM data domain analysis and raster calculator in the spatial analysis module of ArcGIS software. The first setting sets the field statistics type to the maximum value
of 1 km², and the selected window type is a rectangular window. A rectangular window is formed by extending one or more grids in eight directions in the center of the target grid. Analyze the area, and use A to represent the layer obtained by this method. According to this method, set the field statistic information type to the smallest, select a window with the same rectangle for the window type, and then obtain the B layer. Finally, a raster calculator is used in map algebra. This tool calculates the degree of undulation = the largest raster layer A-the smallest raster layer B.

Fig. 1 Land use map

Fig. 2 Vegetation coverage map
The data processing step is to download the location coordinates of the weather stations in a certain province from the National Meteorological Science Data Sharing Service Platform, and collect the statistical data of the monitored monthly average precipitation and temperature. ArcGIS is generated using distance-weighted interpolation and spatially interpolated state precipitation or temperature trend graphs, as shown in Figure 4.

The main factor that affects the surface difference is the climate, water, and heat conditions, which are also important factors to ensure the normal growth of most organisms. The climatic conditions mainly determine the types of plants that grow on the surface and directly affect the size of the vegetation cover. High rainfall intensity tends to cause surface erosion and may reduce the stability of ecosystems that cause soil erosion. See Figure 5 for details.

Each element is assigned a weight. Based on the vector data, the rock map and the land cover map are allocated, and the specified vector diagram is rasterized to obtain the rock top and land cover weight map. The gradient weight map is
generated based on DEM. In China’s standard topographic map, we use the above table to classify slopes and assign weights. According to the above indicators, the vegetation coverage rate and rock exposure rate are weighted and mapped, and the vegetation coverage rate map and rock mass exposure rate map calculated by the following system are weighted. See Figure 6 for details.

The calculation method of soil erosion currently adopts the current calculation method of soil erosion. The land characteristic information of the assessed area refers to the national ecological pattern. Note 1: 500,000 digital soil map data. The classification standard is based on the “Soil Erosion Classification and Grading Standard” SL190-2007 issued by the Ministry of Water Resources, referring to the technical documents issued by China to classify the intensity of soil erosion. Figure 7 shows the final result.

The number of key factors is determined by the cumulative contribution rate of the factors. Usually, the cumulative contribution rate exceeds 85%, thus, completing the determination of the main element classification. It can be seen from

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**Fig. 5** Temperature distribution map

**Fig. 6** Rocky desertification map
Table 2 that the cumulative contribution rate of the first 10 indicators is 96.4%, which is greater than 85%, and the loss rate is only 3.6%. These 10 elements can perfectly represent most of the information contained in the original 16 elements, which improves reliability. Therefore, the number of main factors in this survey is determined by 10 factors.

**Analysis of Morris water maze experiment results**

Table 3 shows the comparison of the incubation period positioning and exploration experiments after MPTP modeling.

Table 4 shows the influence of the location exploration experiment of PD mice on the escape latency.

**Analysis of experimental results of mouse exercise**

After the first injection of ipMPTP, the model group mice used for normal exercise performance observation showed symptoms such as erect hair, tremors, and stiff tails. After 7 consecutive days of injection, there were obvious symptoms such as decreased exercise capacity and lack of exercise, and the Morris water maze showed increased floating. After the administration of GTPs, the activity frequency of the mice was increased, the activity ability was improved, the symptoms of vertical tail would not appear, and the symptoms of tremor or vertical tail were alleviated.

After the MPTP modeling, the 30 mice rod climbed the experimental rod climb time (8.91±2.97) seconds, which was more obvious than the normal group. A retest was carried out on the 14th day after modeling. The results showed that the climbing time of the model group was still longer than that of the normal group (P<0.01), indicating that MPTP mice had an adverse effect on the climbing ability. Through one-way analysis of variance and pairwise comparison between groups, the climb time data of the climbing rod experiment 14 days after GTPs treatment showed that the climbing time of mice in the low-dose and high-dose groups was the same as that of the model group, indicating that GTPs were the same as shorten. It can improve the climbing ability of PD mice.

The experimental results of the rotor-rod system. In the experiment of the rotor-rod system after MPTP modeling, 30...
rats crawled the distance (22.88±1.88) cm, while the normal group was (35.41±21.65) cm, which was greatly shortened. The control test was performed again on the 14th day, and the difference between the model group and the normal group was still statistically significant, indicating that the MPTP and the negative value affect the exercise ability of the mice. Through further analysis of the experimental crawling distance of the rotor-rod system 14 days after GTP administration, the crawling distance of the high-dose GTPs group was longer. Compared with the low-dose GTPs group, it is suggested that GTPs can improve the exercise performance of the drum in a dose-dependent manner.

Discussion

The neurobiological basis of exercise to promote cognitive function

Mammals have a high degree of plasticity, indicating that they can adapt to adaptive responses to new stimuli from their external environment. As an environmental stimulus, exercise can have a profound impact on the cognitive behavior of animals and the structure and function of the brain. In rodent research, it is known that autonomous runners can promote the production of hippocampal neurons and improve their cognitive functions. Human studies have shown that physical activity can promote administrative decision-making functions and improve administrative decision-making functions by relying on learning and memory of the hippocampus and the prefrontal cortex. Increasing the amount of white matter, physical exercise can not only quickly adjust the structure and behavior of the brain, but as the exercise time increases, it can lead to permanent changes in brain function. On the other hand, exercise can quickly regulate the levels of brain and peripheral neurotransmitters, and upregulate the levels of nerve growth factors such as insulin growth factor. These changes in neurotransmitters and neurotrophic factors promote the structural reconstruction of neurons and neurons, thereby promoting and improving cognitive function.

The hippocampus is an important structure for acquiring new memories in the brain, including three subregions CA1, CA3, and DG. CA1 is related to the encoding of the memory, CA3 is related to the search of the spatial memory, and the DG area is considered to be related to the separation and storage of the spatial pattern. Studies have shown that exercise can greatly promote neurogenesis in the DG area of the hippocampus. It is believed that this phenomenon is functionally related to synaptic plasticity, memory function, and pattern separation processing. In the cell layer below the granules in the DG area, stem cells contain latent astrocytes (expressing GFAP and other molecules) and neural progenitor cells during proliferation (Kalyani and Sharma 2013). After several weeks of development, the progenitor cells can be differentiated into granular cell layers in the DG. These cells transiently express PSA-NCAM and DCX, and eventually form mature granular cells, expressing NeuN and coumarin. After 2 weeks of development, in the presence of obvious dendrites and axon branches, and expanded dendrites and axons, the cell morphology changes, forming synaptic

| Group         | n   | Escape latency (s) | First day | Next day | Third day | Fourth day | Fifth day | Sixth day | Seventh day |
|---------------|-----|--------------------|----------|----------|-----------|------------|-----------|-----------|-------------|
| Normal group  | 10  | 20.07±6.37         | 18.16+5.12| 15.96+5.57| 16.04+6.15| 15.54+9.22| 8.32+2.54| 7.81+2.54|             |
| Model group   | 10  | 25.61+8.53         | 22.06+10.02| 17.09+3.63| 15.66+4.91| 21.79+5.38| 14.41+3.98| 12.86+2.06|             |
| CTPs low-dose group | 10  | 17.64+14.05        | 11.16+4.36| 11.11+4.316| 14.26+4.80| 10.54+3.72| 8.72+3.11| 9.41+3.98|             |
| GTPs high-dose group | 5   | 10.14+2.78         | 12.81+5.11| 8.26+2.61 | 10.56+6.64| 8.16+3.77 | 3.84+1.64| 9.64+1.51|             |
bonds with the pyramidal cells that have changed in CA3. By the third week, the branches of the process extend to the outer layer of the molecule, thereby increasing the density of synapses (Karim and Al-dami 2012).

In addition to increasing neurogenesis in the hippocampus, exercise also promotes the remodeling of the hippocampal dendritic structure and synaptic plasticity. Studies have shown that the density and shape of the dendritic branches and dendritic sides of hippocampal granular cells have changed significantly, which is mainly achieved by increasing the length and number of dendritic branches after the mice receive autonomous roller or treadmill exercise (Kaszás-Lažetić et al. 2015). Increase the density of bumps, the ratio of thorns to mushroom-like protrusions. Exercise training can effectively prevent the model from losing hippocampal granular neurons and dendritic spines in disease models such as stress and depression. This helps training exercise to improve cognitive function and reshape the hippocampus and circulate it under disease conditions (Kruschwitz et al. 2010).

**Plasticity and function of cortical inhibitory interneurons**

Inhibitory intervention neurons regulate the balance of cortical nerve development and stability. As mentioned above, empirical or environmental stimuli can regulate the plasticity of cortical excitatory dendritic spines and the remodeling of excitatory neural circuits, while inhibitory intervention in neuronal plasticity can balance the excitatory inhibition of neural circuits. Synaptic reinforcement and the development of learning and memory are very important.

Inhibitory interventional neurons adjust adaptive repetitive stimulation. Excitatory neurons gradually weaken their response to the same continuous stimulus in the outer space until a new stimulus appears. For example, the adaptation specific to this stimulus depends on the inhibitory interventional neuron. In the auditory cortex, the researchers used two different sounds to stimulate neurons in the auditory cortex, and found that inhibiting paraerythromycin intervention by genetic techniques would lead to excitatory neural responses to high-frequency and low-frequency sound stimulation. Somatostatin interferes with neurons to selectively increase the activity of excitatory neurons to high-frequency sound stimulation, but does not respond to low-frequency sound stimulation.

Inhibitory interventions in neurons regulate the activity of dendritic processes. As expressed above, some intervening neurons innervate somatic cells and dendritic activity near somatic cells on nerves. For example, paraerythromycin intervention neurons mainly regulate the activity of organelles and protrusions near the fifth layer of spinal cord cells, while somatostatin intervention neurons mainly regulate pyramidal cells and the fifth layer of vasoactive intestinal peptide. Somatostatin interferes with neurons and paraerythromycin interferes with axons of neurons.
Inhibitory intervention neurons regulate the plasticity of learning. Inhibitory neurons play an important role in learning and long-term excitement. When studying the mechanism of working memory, the researchers found that although somatostatin interferes with neuronal activity during the task-dependent delay period, the side effects Ruby yellow interfered with neuronal activity but did not change significantly. During the reward phase, paracrythromycin interferes with neuronal activity and changes significantly. Cortical vasactive peptides interfere with neurons to specifically remove ErbB4, the production of excitatory neurons increases, and visual responses and perceptual learning are also very abnormal. Cortical incretin intervention on neurons may reduce their ability to encode spatial information for abnormal activities. In the process of motor learning, the use of chemical generation technology that specifically inhibits somatostatin intervention in neuronal activity will reduce synaptic plasticity and motor function learning. See Figure 8 for details.

The relationship between Parkinson’s disease and motor cortex

Parkinson’s disease is a chronic neurological disease. It is currently estimated that there are more than 4 million Parkinson’s disease patients in the world over 50 years old. It is estimated that this value will double with aging. Nitrogen dopamine neuron death and striatal dopamine deficiency are the main pathological causes that affect the motor control of Parkinson’s disease. However, with the deepening of the research, some important brain regions, such as the basal ganglia and medial and lateral globus pallidus, are closely related to the pathological changes of Parkinson’s disease. The loss of dopamine neurons increases the inhibitory properties of the motor thalamus, thereby reducing the excitatory properties of the cortex, leading to the next abnormal motor cortical pathway. The main symptom of Parkinson’s disease is tremor, which is relatively slow to reflect. The main pathological cause is the imbalance of the brain basal ganglia-thalamus-cortex pathway.

In addition to the main movement disorders, the symptoms of Parkinson’s disease include insensitivity, insomnia, and dementia, which also appear in the pathological process of Parkinson’s disease and appear before the movement disorders. There is a certain degree of cognitive impairment in the diagnosis of Parkinson’s disease, but the development stage of Parkinson’s disease, especially in Parkinson’s disease patients over 70 years old, is too obvious. With the continuous degeneration of dopaminergic neurons and the acceleration of the pathological process, the main pathological feature of patients with advanced Parkinson’s disease is the non-motor function of cognitive impairment and the loss of autonomic nerve function.

The motor cortex is located in front of the central groove, adjacent to the premotor cortex and the somatosensory cortex. It is the main input of the primary key ganglia and cerebellum, and is the main origin of the cortical spinal cord. The ventrolateral thalamus receives input from the basal ganglia of the brain and outputs it to the primary motor area, secondary motor area, and motor cortex. Recently, more and more studies have found that changes in the basal ganglia of the brain can cause abnormalities in the motor cortex nerve activity in Parkinson’s disease. Through functional magnetic resonance imaging, the motor cortex activity of Parkinson’s disease patients increased, while the mouse Parkinson’s model found that the organ enhancement of motor cortex neurons decreased, while the dendritic surface conversion rate increased significantly. Therefore, focusing on the motor cortex and studying the changes in neuronal activity will help us better understand and solve the dyskinesia or non-dyskinesia in Parkinson’s disease.

Analysis of test results of mouse exercise memory function

In this study, we studied the effects of GTPs on the exercise, learning, and memory functions of PD model mice produced by MPTP.

Patients with Parkinson’s disease are very likely to have cognitive dysfunction and a series of dyskinesia symptoms, such as resting tremor, hypertonicity, and reduced movement. According to reports, this proportion will reach 79%. PD patients mainly have impaired spatial reference memory. In terms of memory characteristics, the Morris water maze test can more effectively screen drugs for the treatment of PD patients. In this study, we used the Morris water maze to test the changes in spatial learning and memory capabilities of PD model mice after MPTP modeling. The spatial learning ability of mice is embodied in the latent period to avoid positioning and exploration experiments. In the space exploration experiment, the spatial memory ability is embodied in mice. It has been reported in the literature that the spatial memory ability of chronic PD model mice prepared with MPTP may be reduced, which can sometimes be observed by significantly prolonged escape sleep, which has almost no spatial memory in subacute or acute PD model mice.

Although it is possible to improve the spatial learning ability of rats by repeatedly training the Morris water maze, there are also reports in the literature that it does not affect the spatial memory ability. In this study, the results of MPTP modeling showed that the early stages of modeling mainly appeared with changes in motor function, while later learning and memory functions were affected. This is basically consistent with reports in related literature, that is, dyskinesia in the PD model. Mice are universal. When tested in the Morris water maze of PD model mice, the measurement of learning
and memory impairment cannot exclude the effects of sensory and dyskinesia. Regarding motor function, both the crawling distance test and the rotor bar system test showed that the motor performance of PD mice modeled by MPTP was reduced, indicating that the main feature of PD model mice is dyskinesia.

For the complex etiology of neurodegenerative diseases, there are many targets and approaches suitable for natural antioxidant therapy. Human epidemiology and animal experiment data show that drinking tea can slow down the aging of the brain, thereby reducing the incidence of PD. Research on the neuroprotective mechanism of GTPs has shown that the role of GTPs is not only as a chelator of metal oxides but also as a regulator of intracellular nerve signals, cell survival/death genes, and mitochondrial function. Therefore, GTPs can be used as a multifunctional cytoprotective agent for the treatment of neurodegenerative diseases.

Conclusion

Combining the Bayesian estimation algorithm, the global threshold algorithm, and the comparison between the improved threshold algorithm and the adaptive threshold algorithm, the Bayesian estimation algorithm achieves the best signal-to-noise ratio and the smallest root mean square error. In terms of energy ratio and power spectrum, the Bayesian estimation algorithm is not only simple in structure but also has efficient calculation speed. It can also save almost all the information in the high frequency and low-frequency parts and can provide a large number of signals without damaging the useful EEG signal. In the experimental results, GTPs can improve the motor learning and memory impairment of PD model mice to a certain extent, and further improve the motor learning and memory. It can provide a concrete experimental basis for the development of safer and more effective drugs for PD patients. Regarding the improvement of learning and memory impairment in PD patients, whether it can achieve a more ideal clinical effect and focus on the choice of dose, further research is needed.

Declarations

Conflict of interest  The authors declare no competing interests.

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