Influence of soil rock mixture in mountain area based on machine learning and psychological intervention of left-behind children

Pengcheng Yan

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Abstract
With the rapid popularization of the Internet plus China and China’s rapid economic development, machine learning is playing an increasingly important role in model research. This paper presents a cold start method based on a hybrid Dirichlet process model and isolated forest. As we all know, the soil rock mixed slope is between the slope of soil and rock, most of its structure is loose and has large porosity, high permeability, and poor slope stability. Compared with soil slope and rock slope, the research on soil rock mixed slope is not comprehensive enough. Based on the study of geological environment conditions of highway slope, the mechanical properties of soil rock mixed slope are tested by traditional boundary equilibrium method and numerical simulation method. The stability of the three-dimensional slope is systematically studied in this paper. Nowadays, the mental health of left-behind children is still the focus of social attention. In this paper, a special school for left-behind children in a city is selected as the research object. The school is located between urban and rural areas. Since the children who stay in the school are from urban and rural areas, they will be selected as the research objects. Compared with ordinary children, left-behind children are more likely to have concerns, and their psychological changes are difficult to predict. What is more worrying is the long-term mental health problems. This paper aims to find the correlation between sports games and left-behind children’s mental health by introducing sports games in order to provide some methods and theoretical reference materials for solving the mental health problems of left-behind children.

Keywords Machine learning · Earth rock mixture · Children left behind · Psychological intervention

Introduction
The data description of this study is very rich, so it is meaningful to use big data, machine learning, and other technologies to design an internal credit rating system suitable for China’s national conditions. In this paper, the model is analyzed by machine learning algorithm. The default anomaly of unmarked samples is calculated by iforst (Lu et al. 2015). The reliable normal samples and potential default samples are filtered out by combining the similarity of default and default anomaly, and sufficient samples are provided for the subsequent research. The earth rock mixture is mainly formed by the accumulation of weathering residual, gravity, and tap water (Perkins and Alexander 2013). It is located between the stone and the ground, and it is usually made up of different components and different sizes and shapes (Piticar 2018). Most of its structures are loose, with the characteristics of a large void ratio, strong permeability, and poor stability. Compared with the soil and rock slopes, the research on mixed earth rock slope is not deep enough, and its internal structure is much more complex than the soil structure, which leads to the current stability estimation is often not accurate (Rahimzadeh et al. 2009). In this paper, the concept of rock block threshold and rock grade index is introduced to redefine the mixed slope of earth and rock, and the slope is systematically divided into three categories: soil slope, rock slope, and earth rock mixed slope. This paper introduces the theory of this classification and establishes a connection between the technical site and the laboratory test. The maximum density of the earth rock mixture in a dry state has a linear decreasing logarithmic
relationship, which has a similar gray modulus ratio, and depends on the content of the rock, and it increases in a quadratic parabola in the slow settlement (Schar et al. 2004). Although the total number of left-behind children has decreased in recent years, the age stage is becoming smaller and smaller (Varfi et al. 2009). According to a survey by the Ministry of Civil Affairs, as of August 2020, 6.97 million children still live in rural areas, of which 60% of them are between the ages of 6 and 13, and the compulsory education and enrollment policies of children of migrant workers in cities are gradually improving. However, because of the limited financial resources of parents and the lack of understanding of the importance of accompanying education, most migrant workers continue to choose to leave their children at home for education, so that a large number of children stay at home. The research shows that participating in sports can have a positive impact on children’s mental health, and the game is full of fun, competition, and flexibility (Tomczyk and Sulikowska 2018). The researchers found that after intervention in sports events, the psychological problems of the subjects were significantly improved. In the intervention study of left-behind children, scientists found that exercise can improve the social adaptability of left-behind children, reduce loneliness and social anxiety, improve school performance and subjective well-being, and have a positive impact on left-behind children (Smida et al. 2019).

**Materials and methods**

**Overview of the study area**

The landform of this place is mountainous, with the outline of high mountain and low mountain crisscross features. The terrain is very wavy, and the relative elevation difference is very large. On the whole, it is high in the southeast, low in the northeast, gentle in the north, steep in the north, and intersected by rivers and valleys. The study area is parallel, and both sides of the valley are seriously eroded by the current. In the terrain, there are several watersheds in the whole study area, which are the largest in the study area (Watts et al. 2018). As shown in Fig. 1, according to the topography, it can be divided into valley terrace area, low mountain area, and middle mountain area.

The valley terrace area is about 6.64 km², accounting for 1.54% of the total area of the study area. The height is usually less than 100 m, and the lowest point is 416 m. Due to the strong erosion, it only diffuses along the two banks of the entrance of Chu River and Renhe River. The terrace is less than 1000 m and about 100 m wide.

The low mountain area is about 106.01 km², accounting for 24.67% of the total area of the study area. The altitude is mainly 600–1000 m, and the terrain is low and gentle, mainly distributed on both sides of the Chu River and Jingyang River. The cutting depth is usually about 400 m, and the inclination is usually more than 35°. Due to the increasing frequency of human engineering activities, geological disasters become more and more serious and involve the areas most seriously affected by natural disasters. The valley appears in the low mountain area of this area, with steep terrain, structural cracks, weak lithology, great impact on the surface, destruction of rock mass, large amount of precipitation, and extremely serious geological disasters such as landslides and ocean currents.

Zhongshan District covers an area of 317.11 km², accounting for 73.8% of the total area of the study area. The altitude is mainly between 1000 and 2000 m, and the highest point can reach 2534 m, mainly at the top. The cutting depth is usually 600–1000 m, the river valley section is V-shaped, and the vegetation coverage is high (Yang et al. 2019).

**Analysis of the climate in mountainous areas**

The Mann–Kendall analysis is a rank-based mutation detection method, which is mainly used to detect the mutation in precipitation elements (Zhang et al. 2017). Most importantly, the precipitation, data collected do not have to have a specific distribution and are not affected by the emission effect. In the Mann–Kendall (MK) test, the calculation of s-statistics and standardized ZMK statistics is as follows:

\[
S = \sum_{i=1}^{n-1} a_{ij} = \text{sgn}(X_j - X_i)
\]

\[
S = \begin{cases} 
+1, & \text{if } (X_j - X_i) > 0 \\
0, & \text{if } (X_j - X_i) = 0 \quad \text{Var}(S) \\
-1, & \text{if } (X_j - X_i) < 0 
\end{cases}
\]

\[
S = \frac{1}{18} [n(n-1)(2n+5)]
\]

In general, if the time series are the same, the value of b will change with the value of a, and b can be omitted. The value of S has mean value and variance, where \( e(s) = 0 \), \( \text{VAR}(S) = 3 \). If the condition is not set, it is \( Xi > Xj \), and the value is 0. When the condition is set, it is \( Xj > Xi \), and the value is 1. When \( n > 10 \), the formula for calculating standard statistical variables is as follows (formula 2):

\[
Z_{MK} = \begin{cases} 
\frac{S-1}{\sqrt{\text{Var}(S)}}, & S > 0 \\
0, & S = 0 \\
\frac{S+1}{\sqrt{\text{Var}(S)}}, & S < 0
\end{cases}
\]

**Sample preparation and experimental design**

In this experiment, a special large-scale permeameter was used to study the permeability of soil rock mixture in Qinba
highland. According to the proportion of natural cavities and the grade of soil studied, undisturbed soil is divided into seven categories, which are < 0.075 mm, < 0.25 mm, < 0.5 mm, < 1 mm, < 2 mm, < 5 mm, and > 5 mm. In this paper, a series of permeability tests are carried out in the process of soil rock mixture saturation. The test takes into account the five-grade gradation. According to the undisturbed soil grade data obtained in this paper, the gravel content in the 0–25 m soil layer ranges from 0 to 22%. In order to restore the classification parameters and permeability law of the undisturbed soil layer, five groups of soil rock mixture samples with gravel content of 10%, 15%, 20%, 25%, and 30% were prepared. The particle size distribution curve of different gravel content is shown in Fig. 2.

Water is added to the soil sample by means of a constant head device, which is loaded into a large saturator under a stable shell and saturated for 24 h until the sample is fully saturated and the test begins. Record the discharge time of every 10 ml of water, and calculate the permeability coefficient changes under various grade conditions and porosity using permeability test formula 3 and formula 4.

In this case, a thermometer is used to measure the temperature of the water, and the permeability coefficient is corrected to the temperature coefficient. This paper studies the functional relationship between the porosity and the gradient of the sample and the permeability coefficient of the soil rock mixture under the influence of different gradients and porosity.

\[
e = \frac{\rho_s (1 + \omega)}{\rho} - 1 
\]

(3)

\[
K_T = \frac{QL}{AHt}
\]

(4)

Fig. 1 Topographic map of the study area

Fig. 2 Grain size distribution curve of remolded sample
In formula 5, \( \rho \) is the density of soil particles, \( P \) is the natural density of soil, and \( W \) is the moisture content of the soil. In formula 6, \( q \) is the amount of seepage water, \( l \) is the height of the sample 20 cm, \( a \) is the cross-sectional area of the sample, \( h \) is the average difference of water level, and \( t \) is the permeability test.

### Design of XGBoost algorithm based on machine learning

The full name of XGBoost is extreme gradient boosting, which is the C++ implementation of the gradient boosting tree algorithm. Gbdt is a classical enhancement algorithm. The main idea of the loading algorithm is to combine several weak classifiers into a strong classifier in order. XGBoost has been enhanced based on gbdt. By applying the second-order expansion method to the loss function and adding L1 and L2 regularization to reduce overfitting, XGBoost can realize parallel decision tree construction.

Suppose the objective function is formula 5:

\[
L(\varphi) = \sum_i l(y_i, \hat{y}_i) + \sum_k \Omega(f_k)
\]

The second-order Taylor expansion of the loss function is performed at the point \( y_i(t) \), and the formula 6 is obtained:

\[
L(\varphi) = \sum_i l(y_i, \hat{y}_i) + \sum_k \Omega(f_k) = \sum_{i=1}^T \left[ g f_i(x_i) + \frac{1}{2} h f_i(x_i)^2 \right] + \gamma T
\]

\[
+ \frac{1}{2} \lambda \sum_{j=1}^J w_j^2
\]

where \( G_i \) is the first derivative and \( h_i \) is the second derivative.

Then we can get formula 7:

\[
L^{(i)} = \sum_{j=1}^T \left[ \sum_{i=1}^J g_i \right] w_j + \gamma T + \frac{1}{2} \left( \sum_{i=1}^J h_i + \lambda \right) w_j^2
\]

If the tree structure \( q \) is known and the weight of leaf node \( w_j \) in the earlier formula has a closed-form solution, then the objective function as follows (formula 8):

\[
w^* = \frac{\sum_{i=1}^T g_i}{\sum_{i=1}^J h_i + \lambda} f_i^{(i)}(q) = \frac{1}{2} \sum_{i=1}^T \left( \sum_{i=1}^J g_i \right)^2 \left( \sum_{i=1}^J h_i + \lambda \right) + \gamma T
\]

### Design of psychological intervention for left-behind children

Control group: to maintain the stable lifestyle and learning ability before.

Test group: compared with the previous stable life, the last self-study course was conducted on Monday, Wednesday, and Friday afternoon, and physical exercises were conducted.

Before the experiment, a questionnaire was issued to carry out the pretest.

**Hourly implementation plan of sports competition:**

Preparation: take the child for two runs 10 min before class, which makes the body sweat easily.

Prepare for activities with music, fully move all joints of the body, and avoid sports injury in sports games.

The main part: play two team games. Through the first play, left-behind children can enter the state quickly, improve the emotional communication between each other, establish a harmonious partnership. Then, through the games between groups, children realized the importance of cooperation and mutual help, established a sense of collective honor in the group, and increased the enthusiasm of left-behind children to participate.

End: after the competition, left-behind children, under the guidance of the teacher, organize and relax to avoid muscle pain after exercise.

### Results

**Analysis on test results of saturated permeability of soil rock mixture in mountainous area**

The results of the screening test are shown in Figs. 3 and 4. With the increase of soil depth, the gravel content along the soil depth continues to decrease, and the content of clay and powder particles increases with the increase of soil depth. The content of clay powder particles is in the range of 20%, the content of gravel soil is 0–20%, and the content of clay particles is usually 0–5%.

From the aforementioned tests, it can be seen that the content of clay particles and powder particles measured in the two tests are quite different. This is due to the phenomenon of pseudo silt and pseudo sand in the vibrating screen method, and the content of clay particles and silt particles is very different. Particles and gravel can form lumps, which are difficult to remove. Therefore, the content of cohesive silt measured by laser particle size analyzer is more reliable.

It can be seen from Fig. 5 that the slopes of the two curves are relatively consistent at all stages, and there is a certain correlation, that is, the gravel content is positively correlated with the porosity. At the same time, the change of gravel
content with soil depth is more obvious, that is, gravel content changes sharply by 0–3m; with the increase of depth, the change of gravel content is gradually stable, and the gravel content appears at 18 m. On the shallow surface, the content of gravel will affect the porosity to a certain extent.

Figure 6 shows that the soil becomes more and more loose with increasing porosity and porosity. The relationship between porosity and permeability is exponential, especially when the gravel content is low. Longitudinal section analysis shows that the effect of porosity on permeability increases with the increase of porosity. Horizontal analysis shows that the influence of gravel grade on permeability decreases with the increase of gravel grade. Therefore, with the increase of soil depth in the study area, the porosity decreases and the total permeability tends to decrease layer by layer.

Analysis of unsaturated permeability test results of soil rock mixture in mountainous area

The evaluation curve obtained during the test is shown in Fig. 7. Figure 8 shows the water and soil characteristics of the deformed soil with different porosity and gravel content. According to the calculation of the variance gamma model, the particle size distribution of the soil particles in the study...
area shows the obvious dual distribution, that is, the content of clay particles, powder particles, and gravel is more.

It can be seen from the curve that the volume water content in the dehumidification channel is usually higher than that in the moisture absorption channel, and the final residual water remains unchanged. The permeability function of the dehumidification path is higher than that of the water absorption path and has an obvious lag effect. For the soil rock mixture in the study area, the pore water is transferred from the soil through the preferred macroporous channel of gravel soil, and in the process of moisture absorption, the pore water enters the soil through the clay with high matrix absorptivity, and the hydraulic characteristics of the two layers are different. The gas entering in the process of moisture absorption reduces the permeability coefficient in the process of moisture absorption, resulting in a more obvious lag effect.

Rainfall infiltration process and stability analysis based on soil rock mixture characteristics in mountainous areas

According to the field drilling data, the soil layer in the study area is thick, and the groundwater level in the study area is deep. Therefore, the lower boundary of the model is designated as the zero pressure region, and the left and right sides are designated as impermeable boundaries. In order to simulate the characteristics of soil and water before sediment infiltration, the negative pore water pressure on the slope is set to \(-130\) kPa, which is consistent with the actual data of negative pore water pressure monitoring on site. According to the previous precipitation constraints, conditions are added to simulate the infiltration on the slope, as shown in Figs. 9 and 10.

The precipitation process is very random. The seepage process of the slope is qualitatively analyzed by using the software/w module. When the precipitation exceeds the saturated permeability coefficient, runoff will be generated on the slope.

If the rainfall is less than the saturated permeability coefficient, it is assumed that all rainwater permeates the soil in a saturated way, that is, the single flow corresponds to the rainfall intensity. Since the settlement process is a temporary process, after the initial static conditions are determined, we analyze the model infiltration process through the temporary infiltration in the seep/w module. Figures 11 and 12 show the simulation results based on the actual precipitation and the interval between the two precipitation.

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**Fig. 5** Variation of gravel content and the void ratio at different depths

**Fig. 6** Relationship between void ratio and permeability coefficient
It can be seen from the test results that in the initial static stage, the volume water content is relatively low, and the absorption rate of the matrix is relatively high. At the beginning of the first precipitation, soil infiltration accelerated, volume water content increased rapidly, and matrix absorption decreased sharply. At this point, the permeability of precipitation is less than that of soil.

With the continuous infiltration of rainwater, the water content in the landslide is less than the previous precipitation. With the infiltration of water, the volume water content increases by 2.5–3 M, but in general, with the accumulation of precipitation, the infiltration depth gradually decreases, and finally, the infiltration depth tends to be stable, about 4 m. Pore water pressure increases with depth, as shown in Fig. 13.

Generally, the slope stability coefficient decreases significantly with the increase of precipitation, but it is slightly different in each precipitation cycle. Generally, the slope stability coefficient decreases with the increase of precipitation. After 7 days, 14 days, 21 days, and 28 days, the slope stability coefficient decreased by 15.1%, 9.1%, 3.9%, and 2.2%, respectively.

Analysis of the effect of psychological intervention on left-behind children

Table 1 shows the test results of the significance test on the test data of mental health of left-behind children in the experimental group and the control group by using an independent sample t-test before the intervention of sports games. It can be seen from the data that before the intervention of physical education, the average Mgt value of left-behind children is not significantly different between the two groups, $P = 0.467, P > 0.05$. In the two groups, the average learning value of anxiety, loneliness, self-responsibility, and the allergic tendency is slightly higher than that of the two groups, which may be mainly due to the higher scores of these four factors, which leads to mental health problems.

The values in Table 2 show that the overall average value of mental health test before the experiment is 57.23, and the value of mental health diagnosis test after the experiment is 57.57, but after the test, the $P$ value is the total anxiety trend of the two groups, $P = 0.450, P < 0.05$. It can be seen from the data that, because the control group did not participate in the sports competition, the value of the control group before and after the experiment had no significant difference. Therefore, the mental health level of the left-behind children in the control group remained at the medium level.

The experimental data show that anxiety and self-blame tendency have been reduced. The fear of people is reflected in the fact that they are too concerned about their appearance and afraid to communicate with others or dare not look directly into the eyes in the process of communication. The trend of self-blame shows that children will get worse, which is not conducive to good mental health. However, the data show that the possibility of self-blame is significantly reduced under the intervention of sports games. In sports competition, the...
tendency to win the game for self-entertainment may gradually gain trust, which will lead to the decrease of the tendency of self-blame. According to the data before and after the control group and the data before and after the experimental group, it can be concluded that sports games can be used to positively affect the determinants of left-behind children’s mental health, as shown in Table 3.

From Table 4, it can be seen that after intervention in sports competitions, the overall anxiety trend of the experimental group and the control group shows a very significant difference according to the independent t-test mode. Before the experiment, there was no significant difference between the experimental group and the control group, but after the experiment, the difference was very significant. The lower the score of the mental health diagnosis test, the higher the health level of the children. After sports, the treatment group and the control group showed great differences in learning and self-responsibility tendency, loneliness, and physical symptoms. There are significant differences in the tendency of fear and terrorism. In the control group, there is no physical game interference, so there is no significant difference in various determinants of mental health, and the mental health level has not improved. Therefore, sports can be used to improve the mental health of left-behind children.

Discussion

Analysis of the basic situation of left-behind children

Among the left-behind children, the primary guardian is the guardian of one of the parents. This kind of guardianship usually involves the mother taking care of the child at home and the father working outside. The supervision of single
parents is one of the reasons for the mental illness of left-behind children. In the types of guardianship, the proportion of single-parent guardianship is higher than other types of guardianship. Grandparents and other elders exercise inter-generational guardianship when they exercise the responsibility of parenting and guardianship. Most of these left-behind children will be spoiled under the care of grandparents, which is not conducive to the formation of good living habits (Aalijahan et al. 2019).

In rural areas, fathers mostly work, while mothers work on farms to take care of children or the elderly. However, the left-behind children lack the love of their parents or communication with their mother in time, and the mother does not take care of them in time, which leads to the children’s mental health problems. Even if the father alone cannot take care of all aspects of the child, at least the mother stays at home to take care of the child, but when both parents go to work, it is more difficult to take care of the child (Austin et al. 2020).

Some parents of left-behind children leave home from 6 months to a year. However, some parents are migrant workers. Because they are far away from home, they need a lot of travel expenses and time to go back and forth every time (Darand et al. 2015). This will delay their work, so the frequency of returning home is decreasing. The long journey of parents leads to the loss of parents’ love for some children on the road of growth and has a psychological impact on the children (Barnett et al. 2012). They tend to feel lonely, unwilling to open their hearts to others, and trust their own hearts.

Fig. 11 Infiltration process (0 day)

Fig. 12 Infiltration process (28 days)
Factor analysis of significant change of mental health diagnosis score of left-behind children after sports game intervention

The mental health status of left-behind children is in the stage of slight psychological problems. Through the research and analysis of the data of left-behind schools, it is found that the overall mental health of left-behind children has a small mental health problem in the left-behind schools, but the left-behind children who do not have serious mental problems may be improved by the attention of all sectors of society to the left-behind children (Ekamper et al. 2010).

The left-behind children in the control group did not participate in sports competition, so there was no significant difference in the results of the mental health diagnosis test before and after the experiment, while the overall score of left-behind children in the control group was not found (Feudale and Shukla 2011). The total score of the experiment was significantly lower than that before the experiment, but the interference to sports games was not obvious. It has a significant impact on all mental health factors, but also on anxiety, loneliness, learning fear, and other factors (Ghavidel Rahimi...
This also shows that appropriate sports activities can improve the mental health of left-behind children, and the use of sports games can reduce mental pressure, which is conducive to the mental health of left-behind children.

Learning anxiety factor decreased significantly

Nowadays, students usually have learning anxiety, so teachers should reduce the burden of left-behind children in class in time and try to avoid excessive anxiety in the teaching process. The experiment shows that after the intervention of sports, the learning anxiety of the children in the experimental group is reduced, which is very significant compared with before the experiment (Ghavidel Rahimi and Ahmadi 2015). The study of anxiety factors between the experimental group and the control group also showed a very significant difference, indicating that although sports can reduce emotion and pressure, they can also reduce learning anxiety and pressure caused by daily learning. Sports games play a positive role in reducing learning anxiety.

The data obtained from the experimental group after the experiment show that the loneliness level of the subjects before the experiment is low, and there is a very significant difference. This shows that in the process of interacting with people in sports competitions, the left-behind children also make many new friends (Gosling et al. 2009).

After the intervention of sports games, the mental health diagnosis score of left-behind children changed little

After the intervention in the sports competition, we found that the value of the anaphylaxis factor was higher than that before the experiment and had no contribution to this factor, and the influence on self-blame tendency and impulse tendency was relatively small, and there was no significant difference with the data before the experiment (Hoseini et al. 2013). It can be seen that although the intervention of sports games has a positive impact on various factors of mental health, the resources

### Table 1 Comparison of mental health between experimental group and control group before sports game intervention

| Mental health factor             | Experimental group before game intervention | Control group before game intervention | Difference test value $t$ | $P$ value |
|---------------------------------|---------------------------------------------|----------------------------------------|--------------------------|-----------|
| Learning anxiety                | $9.23 \pm 1.345$                           | $8.65 \pm 1.087$                       | $2.6113$                 | 0.010     |
| Anxiety about people            | $6.78 \pm 1.367$                           | $6.80 \pm 1.190$                       | $-0.071$                 | 0.943     |
| Loneliness                      | $7.32 \pm 1.420$                           | $7.40 \pm 1.429$                       | $-0.320$                 | 0.749     |
| Self-blame                      | $7.15 \pm 1.471$                           | $7.23 \pm 1.320$                       | $-0.327$                 | 0.745     |
| Allergic tendency               | $7.05 \pm 1.383$                           | $7.37 \pm 1.529$                       | $-1.190$                 | 0.227     |
| Physical symptoms               | $6.95 \pm 1.383$                           | $7.00 \pm 1.518$                       | $-0.189$                 | 0.851     |
| Terrorism                        | $6.47 \pm 1.241$                           | $6.27 \pm 1.364$                       | $0.840$                  | 0.403     |
| Impulsivity                      | $6.65 \pm 1.388$                           | $6.52 \pm 1.321$                       | $0.49$                   | 0.659     |
| General anxiety tendency         | $57.60 \pm 3.098$                          | $57.23 \pm 2.360$                      | $0.72$                   | 0.467     |

### Table 2 The control group was given psychological intervention before and after the experiment

| Mental health factor             | Experimental group before game intervention | Control group before game intervention | Difference test value $t$ | $P$ value |
|---------------------------------|---------------------------------------------|----------------------------------------|--------------------------|-----------|
| Learning anxiety                | $8.65 \pm 1.087$                           | $8.90 \pm 1.423$                       | $1.622$                  | 0.313     |
| Anxiety about people            | $6.80 \pm 1.190$                           | $6.75 \pm 1.257$                       | $-1.085$                 | 0.791     |
| Loneliness                      | $7.40 \pm 1.429$                           | $6.93 \pm 1.471$                       | $-1.621$                 | 0.079     |
| Self-blame                      | $7.23 \pm 1.320$                           | $7.62 \pm 1.379$                       | $0.541$                  | 0.626     |
| Allergic tendency               | $7.37 \pm 1.529$                           | $7.33 \pm 1.492$                       | $0.173$                  | 0.879     |
| Physical symptoms               | $7.00 \pm 1.518$                           | $7.62 \pm 1.541$                       | $1.038$                  | 0.006     |
| Terrorism                        | $6.27 \pm 1.364$                           | $6.23 \pm 1.277$                       | $-1.000$                 | 0.901     |
| Impulsivity                      | $6.52 \pm 1.321$                           | $6.18 \pm 1.334$                       | $1.000$                  | 0.089     |
| General anxiety tendency         | $57.23 \pm 2.360$                          | $57.57 \pm 2.913$                      | $0.471$                  | 0.450     |
of sports games are not omnipotent and will not have a positive impact on all factors. In order to raise left-behind children, healthy growth also needs the joint efforts of many aspects.

Impulsive tendency factor has little effect

There was no significant difference between the experimental group and the control group. Sports games can control emotions and release the body of left-behind children. Left-behind children’s self-control ability is still relatively weak in adolescence. Learning and life need teachers to teach and supervise, in order to reduce the impulse tendency of left-behind children, but also need long-term persistence (Jaagus 2006).

The influence of physical symptom factors is small

After exercise, there was no significant difference in the factors of physical symptoms between the experimental group and the control group, indicating that the other factors affecting the physical symptoms of left-behind children indirectly showed the possible physical condition. It may be that the intervention time is relatively short, and the influence of exercise on the physical symptoms of left-behind children has not been reflected in the factors of physical symptoms. It may also be that the fear of left-behind children is light and the physical symptoms are not seriously serious. Therefore, the interference of sports competition has little effect on physical symptoms. However, the score of physical symptoms is still declining, which indicates that the physical and mental health symptoms of left-behind children may worsen due to exercise.

The influence of anaphylactic predisposing factors was small

The results showed that after the intervention in sports games, the average value of allergic factors of children in the experimental group increased and exceeded the value before the experiment, but there was no significant difference. The interference in the sports competition has little influence on the subjects’ allergic tendency and the index of allergic tendency. They are too sensitive to the surrounding things or things, and their emotions fluctuate greatly. The intervention time in sports games with a normal mentality may be too short, and the allergy trend has not been positively affected.

| Mental health factor | Experimental group before game intervention | Control group before game intervention | Difference test value t | P value |
|----------------------|--------------------------------------------|---------------------------------------|------------------------|--------|
| Learning anxiety     | 9.23 ± 1.345                               | 7.67 ± 1.084                          | 5.910                  | 0.000***|
| Anxiety about people | 6.78 ± 1.367                               | 6.25 ± 1.244                          | 2.456                  | 0.017*  |
| Loneliness           | 7.32 ± 1.420                               | 6.20 ± 1.338                          | 4.418                  | 0.000***|
| Self-blame           | 7.15 ± 1.471                               | 6.65 ± 1.191                          | 2.316                  | 0.024***|
| Allergic tendency    | 7.05 ± 1.383                               | 7.33 ± 1.298                          | −1.316                 | 0.193   |
| Physical symptoms    | 6.95 ± 1.383                               | 6.72 ± 1.485                          | 0.937                  | 0.351   |
| Terrorism            | 6.47 ± 1.241                               | 5.70 ± 1.357                          | 3.393                  | 0.001***|
| Impulsivity          | 6.65 ± 1.388                               | 6.58 ± 1.344                          | 0.408                  | 0.701   |
| General anxiety tendency | 57.60 ± 3.098                          | 53.10 ± 2.961                          | 4.676                  | 0.000***|
Conclusion

In this paper, the XGBoost transform function is used, because the linear regression (LR) model cannot be well used with nonlinear function, and the output of the end node is used as the input of LR. The boxing mechanism is used to further improve the prediction effect of the model. Randomly change row and column scan parameters to generate multiple XGBoost LR models, and then merge the model output. The simulation results show that the design method is effective, but the droop mechanism has little effect on the improvement of the model. Due to the rapid development of China’s economy, the share of large-scale transportation, water protection, mining, and other infrastructure in western mountainous areas is increasing. The instability of soil rock mixed slope is usually accompanied by external factors, such as short-term heavy rainfall, long-term rainfall, earthquake, and excavation. In recent years, major geological disasters, mainly landslides, have occurred, causing great loss of life and property, which has attracted the attention of society. In this paper, the geological environment research, mechanical testing, 3D analysis of limit equilibrium, and 3D numerical simulation of creep will be used to study the mixed earth rock slope more systematically. In order to overcome the shortcomings of inaccuracy and poor generality of the results of field test and laboratory soil rock test, the similarity classification theory is introduced, and the relationship between the maximum dry density of soil rock mixture in the technical field and the internal test is established. Left-behind children are minors, and their elders, relatives, or others take care of them for a long time, because both parents or one of them go to work, business, or other affairs. Due to the lack of parents and children’s education, long-term separation from parents, lack of effective communication with parents or poor care environment, personality, mental health, behavior, and other degrees will affect the frustration and pressure of left-behind children. In recent years, the number of experts and scientists who study the influence of sports on left-behind children’s mental health is increasing, and sports has become an important way to participate in sports. In this study, for the left-behind children in the experimental group to develop a reasonable sports game exercise plan, in order to carry out the sports game intervention, we compare and analyze the experimental data of the experimental group and the control group and then study the effect of the experimental data. Experimental evidence shows that appropriate intervention in sports has a positive effect on mental health. It is suggested to increase the proportion of sports in school physical education, pay attention to sports, and actively guide left-behind children to participate in more sports competitions and extracurricular activities, so as to promote their mental health.

Declarations

Conflict of interest The authors declare that they have no competing interests.

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