Monitoring and early warning of loess landslide based on distributed environment and effectiveness calculation of physical training

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Abstract
Loess landslide has become a major geological hazard due to its high distribution, high occurrence frequency, and high loss. More than 1800 landslides occur every year in China, causing an average of more than 400 deaths every year, and the direct economic loss is as high as 4.6 billion yuan. This is a serious threat to the lives and property safety of the people in the disaster area, and caused huge losses to the country. China’s “one belt, one road” like a cooperative project has been like a raging fire in recent years, and the new mode of economic development and regional cooperation has been opened. However, one belt, one road, is seriously threatened by landslides. From 1900 to 2015 one belt, one road, along the more than 330 landslides, caused more than 20 thousand deaths. Therefore, this document collects the basic x-di loess data, uses ArcGIS software and distributed environment network, analyzes the spatial and temporal distribution characteristics of landslides, obtains the factors affecting landslides, and develops the loess landslide monitoring and early warning system. Then this paper studies the sports training, as an important part of college physical education curriculum, should carry out the corresponding reform to play a positive role and effectiveness of sports training. Some colleges and universities lack scientific management of sports teams in the process of sports training. The overall quality and teaching ability of teachers are not high. We must cultivate students’ interest and further strengthen the reform of sports teaching. It is necessary to strengthen the psychological training of teachers and students, improve the training methods and standard training, in order to improve the effect of sports training. In this paper, through the study of loess landslide geological disasters, the monitoring and early warning system is developed, which is applied to sports training to make sports training more effective.

Keywords
Distributed environment · Loess landslide · Monitoring and early warning · Physical training · Effectiveness

Introduction
China has the largest and most concentrated loess area in the world, and it is 4.9% of the world free zone. These melts are mainly distributed in semiarid areas, where there is no rainfall throughout the year. Therefore, the agricultural development in such areas needs a lot of irrigation, which has lasted for many years. Decent irrigation method changed the groundwater balance in the loose area, and caused a lot of loess landslide. This paper discusses the X Valley, which is located in the western border of China and inland of Eurasia, has 9 first-class national ports. China is an important China one belt, one Road East and the other countries (Pini et al. 2010). It is an important node of China’s “one belt and one way” policy. X Valley is one of the main liquidity distribution areas in China. More than 1360 potential landslides have been investigated for the landslide condition of Y valley. In recent years, due to the melting of snow and other factors, a large number of loose debris appeared in Y valley area, causing more than 30 people to die, k13–k16 part completely destroyed, s316 line was interrupted for a year, which affected the economic loss and people’s safety of y-valley (Pruess et al. 2004). In the middle of 19 years, a landslide occurred in Y Valley town, causing one person to die and a large number of livestock missing. One belt, one road, was caused by the landslide of loess,
which caused great disaster to the Y people. Considering the large traction cracks on the back edge of loose side of Y Valley, taking x River landslide as an example, the research team carried out monitoring and warning, and conducted a series of unsaturated geothermal tests in this loess area. Nuclear magnetic resonance imaging and scanning electron microscope test were carried out in combination with particle image velocity measurement system (PIV), distributed environment, water content and microstructure of loess, the tensile strength, the formation process of X-shaped trailing edge, and the development of crack tensile force of loess were examined. However, in recent years, with the rapid development of China’s economy and the improvement of living standards, Chinese education has paid more and more attention to improving the overall quality of students (Sayyafzadeh et al. 2015). Due to the increasing pressure of work, the physical training is ignored in the process of university education, and the physical fitness of college students has declined. In order to improve the effectiveness of sports training, we must combine special conditions to ensure the multilevel scientific and professional sports, so as to improve the effectiveness of sports training. Sports training can help improve students’ sports skills and performance (Qaroush et al. 2018). Under the guidance of the coach, the sports activities are organized in an organized way, and the students’ sports activities and professional skills are improved through specific physical training (Zhang and Ranjith 2019). Sports plays an increasingly important role in the overall development of students (Rutqvist and Tsang 2002). In the process of fitness, colleges and universities should consider the effectiveness of sports training. Through organizing practical training and theoretical knowledge, the natural sports training method is designed according to the actual situation of students, so as to improve the physical quality and sports quality of students and promote the overall development of students (Rutqvist 2012).

Materials and methods

Data source

Our L is located in the middle of mountain l with higher terrain and lower central terrain (Fig. 1). L mountains cover the whole area from north to south, with an average altitude of 1000–2000 M. G mountain is 2762m above sea level, which is the highest peak of L mountain. The mountains on both sides of the mountain are wide, with ravines and serious soil erosion. The East is flat, at the west end of Taiyuan cottage, is the main agricultural area. L is a hilly loess region, with mountainous and semi mountainous areas accounting for 92%. The geological structure of the study area is restricted by geological structure, oscillatory movement and geology. According to its form and genetic type, it can be divided into four types, such as loess hilly area and valley accumulated on the mountain (Szima and Cormos 2018).

Framework design of distributed environment

MapReduce is a distributed framework provided by Google, which mainly solves large-scale computer problems. In early 2000, Google released two presentations about distributed document system and MapReduce, among which the key design ideas of MapReduce “Trade and victory” is a typical concept of MapReduce. MapReduce is mainly composed of two levels: map level and decrement level. Each level has input and output in the form of key value pairs. The mapping function and reduction function are written by programmers. The map function takes a key / value < key, value > pair as input, maps it to a new key value pair, and sends it as an intermediate object. MapReduce repeat cluster groups the same key values, combines them into < key, value list >, and then hands the over to other functions for processing (Wang et al. 2011). The decrease function accepts with the map function, merges the values corresponding to the same key to reduce the list/value, and finally writes the output to HDFS. These results will be saved to HDFS and copied, but the intermediate key values processed by the card function will not be saved (Neniger et al. 2012). In the random play stage, the output of map stage is regarded as the input of minimize stage, which is located between map and minimize, and is the key stage of optimizing MapReduce (Wong et al. 2007). Figure 2 shows the process of processing the MapReduce database.

MapReduce framework adopts master / slave architecture, including master node and multiple slave nodes. MapReduce machine consists of jobtracker and tracker. Tracker runs jobtracker, which is responsible for initializing and distributing jobs and communicating with tasktracker slave. Slave runs tasktracker, communicates with jobtracker regularly, implements map and simplifies tasks.

Design of susceptibility evaluation index system

After ranking each evaluation index, the study area is composed of nine parts, including height, slope, aspect, slope shape, undulation, topography, vegetation index, and stratum lithology. Table 1 shows the indicator system used to evaluate development.

Susceptibility assessment method

Information method is essentially one of the statistical methods, which was first used by scientist Van Westen
Fig. 1. Topography of the study area

Fig. 2. The process of MapReduce processing data sets
(1997) for GIS based geological hazard assessment, and then used by Çevik and Topal (2003), Oztekin and Topal (2005). In the investigation, there are many factors that affect the formation of geological disasters, and each factor leads to the occurrence of geological disasters. When the information model is applied to geological hazard assessment, the relationship between geological hazard and its sensitivity can be determined according to the information of each factor. The greater the value of information, the stronger the correlation between this factor and geological disasters. The basic formula of information quantity is as follows:

\[
I(Y; X_1, X_2, \ldots, X_n) = \log_2 \frac{p(y|x_1, x_2, \ldots, x_n)}{p(y)}
\]  

(1)

According to the conditional probability, the equation can be further written as follows:

\[
I(Y; X_1, X_2, \ldots, X_n) = I(Y; X_1) + I(Y; X_2|X_1) + \cdots + I(Y; X_n|X_1, X_2, \ldots, X_{n-1})
\]

(2)

In geological hazard susceptibility zoning, area ratio can be used to calculate the contribution value of each evaluation factor, and the amount of information is calculated by conditional probability, the method is as follows:

\[
I(X_1; A) = \log \frac{N_i/N}{S_i/S}
\]

(3)

The sum of the information of each factor is the total information of the basin:

\[
I_{all} = \sum_{i=1}^{n} \log \frac{N_i/N}{S_i/S}
\]

(4)

The mean value of the standard logistic distribution is equal to 0, and the variance is equal to 0.15.2/3≈3.29, the function is as follows:

\[
P = \frac{1}{1 + e^{-\xi}}
\]

(5)

Taking the probability of disaster occurrence IP as the dependent variable and the influence factor index as the

### Table 1: Evaluation index system of landslide susceptibility in study area

| Index factor | Classification | Index factor | Classification |
|--------------|----------------|--------------|----------------|
| Height (m)   |                | Slope (°)    |                |
| <700         |                | <13°         |                |
| 700–900      |                | 13~22°       |                |
| 900–1700     |                | 22~37°       |                |
| 1700–2100    |                | 37~47°       |                |
| >2100        |                | >47°         |                |
| Aspect (°)   |                |              |                |
| 0~45°        |                |              |                |
| 45~90°       |                |              |                |
| 90~135°      |                |              |                |
| 135~180°     |                |              |                |
| 180~225°     |                |              |                |
| 225~270°     |                |              |                |
| 270~315°     |                |              |                |
| 315~360°     |                |              |                |
| Topographic features | Huangtuliangang District on the east bank of the Yellow River | Vegetation index | <−0.05 |
|                | Huangtuliang District, West Foot of L Mountain |              | −0.05 ~0.15 |
|                | Yinzhongshan fold fault block Gaozhongshan |              | 0.15~0.25 |
|                | Jingle Structural Basin of Lanxian County |              | >0.25 |
|                | Guanzhong Mountain Dome Demuded Gaozhong Mountain | Stratigraphic lithology | Loess |
|                | L mountain fold fault block Zhongshan District |              | Carbonate |
|                | Alluvial plain of Taiyuan Basin |              | Metamorphic rocks |
| Road (m)      |                |              |                |
| <200          |                |              |                |
| 200~400       |                |              |                |
| 400~900       |                |              | Sedimentary rock |
| 900~1200      |                |              | Loose deposits |
| >1200         |                |              |                |

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independent variable, the regression equation is established:

\[
\logit p = \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k
\]  

(6)

Results

Analysis of temporal and spatial distribution characteristics of loess landslide development

L city is located in the Loess Plateau in the west of SX, most of the surface is covered with loess. A special kind of rock and soil means that the development of landslide must be regional. Figure 3 shows that the landslides mainly occur in the huangtuliang area on the East Bank of the Yellow River, the huangtuliang area on the West foot of L, and the Fjallbrot mountain area in the middle, but the distribution of lowlands and waters is less, and they are widely distributed from west to East. Therefore, the geomorphic morphology of the Loess Plateau has a certain role in promoting the formation of landslides.

Comparing the distribution maps and disaster points of main roads, railways and water systems in L City, it is found that landslides are mainly distributed on both sides of roads and water systems, and most disasters are distributed in the north, along rivers or expressways to the south. Among them, landslides mainly occurred near the tributaries of the Yellow River system and f river system. Due to the erosion of the river (lateral erosion and erosion), the shape of the slope has changed and rock has formed. The soil that initially maintains slope stability should be continuously cleaned and...
exposed to the weather. It leads to the distribution of the stress position of the slope, the stress resistance is formed in the area exposed to the element, and the slope is deformed and empty in the direction. The construction of highway and railway has a similar effect on the load condition of slope.

Loose landslides occurred in the rainy season, and the weather was mainly concentrated in the rainy season. A large number of loose landslides and landslides delayed the rainfall. Huang Qiangbing (2016) statistics of meteorological data and landslide frequency in L City for many years show that geological disasters of collapse and landslide occur almost every month, but the seasonality is obvious and the difference is very large. The high frequency period is in July and August of each year, and the average frequency range is from June to August. There are few events from January to February and from November to December, with an average of less than once a month (Fig. 3). In addition, from the distribution of annual average precipitation, the annual average precipitation between landslides is concentrated between 500mm and 550mm (Fig. 4). The study also found that the rainfall occurred in the affected area before the landslide. It can be seen that the frequency of landslide in L area is directly proportional to precipitation, which indicates that precipitation is one of the main factors causing landslide.

It can be seen from Fig. 4 that the precipitation in L city increases from west to East, especially the average annual precipitation in Wenshui County reaches 600mm, which is related to the landform of Hubei Province. High East and low west study area, usually in a mountainous area. From the point of view of the distribution of disaster areas, there are less disasters in heavy rain areas, which shows that landslides in L City not only affect rainfall, but also engineering activities and other factors cannot be ignored.

The precipitation and construction of the study area have an important impact on the landslide, which is the main driving factor of the landslide and significantly reduces the influence between landslides.
of other stimulating factors (freezing and thawing, earthquake). Therefore, the study on the temporal and spatial distribution characteristics of landslides can not only include the correct triggering factors of loess landslides, but also provide decision-making basis for the prevention and monitoring of regional disasters.

**Selection of susceptibility evaluation index**

With the increase of slope, the number of landslides in the study area first increases and then decreases. Among them, the number of landslides ranges from 10 to 15° The mutation point of density curve is 13°, 22°, 42°, and 47°. Therefore, 13°, 22°, 37°, and 47° as an inclination, the inclination is shown in Fig. 5.

Geology is an important factor in the formation and development of landslide, which provides material basis for the development of landslide. Slopes composed of different rocks and soils have different physical and mechanical properties. The rock material with loose structure, poor impermeability, and resistance to atmospheric medium is the material source of landslide. The main loess found in the landslide of L City is Malan Loess after Lishi loess. According to the geological map 1:100,000 of city L, the mineralogy of each layer in the area is in vector form, as shown in Fig. 6. The main strata in the study area are loess, carbonate rock, metamorphic rock, magmatic rock, and sediment of Songshan. Among them, the most stable magmatic rock slope is followed by the most unstable metamorphic rock slope and sedimentary rock slope. Many igneous rock crystals are formed under high temperature and high pressure, but the rock sediments lack crystallization under high temperature, and most of the cemented intercalations are physical cementation. It can be seen from the point scale map that the hazards of loess and carbonate rocks are more than those of metamorphic rocks, while the hazards of sediments are less. Because loess has the characteristics of vertical development, loose, loose, and strong collapse, it is prone to geological disasters caused by rainfall or irrigation.
flood. Due to the erosion of groundwater, carbonate strata are likely to be destroyed and cause geological disasters.

**Analysis of monitoring and early warning results of loess landslide**

Logistic regression itself has the function of selecting variables. Elements with little or no correlation are stripped from the model. After three repetitions, the influencing factors selected in this paper are based on the planning and information connection of seven natural factors such as height, road, aspect, vegetation index, and slope model, as shown in Table 2. As can be seen from the table, variables except for each plot < 0.05 means that the significance of this factor has a significant impact on the dependent variable, and the final success rate of prediction is 71%.

The formula (3) obtained from the connection model of information quantity and transportation equipment is input.
into the network calculator in ArcGIS to calculate the geological disaster probability value $p$ in each network unit, and the final results range from 0.0017 to 0.9772. Using the method of natural discontinuity in ArcGIS classifier, the results are divided into four categories, with discontinuity points of 0.17, 0.44, 0.64, and 0.97, and they are divided into four areas, i.e., non-prone area, low-prone area, medium-prone area, and high-prone area, as shown in Fig. 7. According to the statistical analysis, the four areas are as follows.

The core area accounts for 21.47% of the total area of L City, including 85 disaster areas, accounting for 38.28% of the total disaster rate. The central region is mainly close to valleys and rivers. This part of the embankment is developed, and the river erosion on the embankment slope often causes landslides.

The least developed areas account for 44.42% of the urban area, including 20 landslides, accounting for 9% of the total disaster rate. Most areas are located in urban areas, while rural areas are places of residence, which is usually caused by buildings.

The area without danger accounted for 10.58% of L City, including landslide area, which accounted for 0.45% of the disaster. Most of the secondary risk areas are located in the mountainous areas above 2100 m above sea level. The area is sparsely populated, and the slope is very stable under natural conditions. In principle, there will be no disaster.

It can be seen from Fig. 8 that the average height of L City is high, and the middle slope area accounts for 45% of the total area, of which the disaster level is 2, accounting for 90.08% of the total disaster level, indicating that the development of
Discussion

Problems in college sports training

Lack of scientific management system of university sports team

Chinese sports clubs have made continuous progress and pay more and more attention to college physical education. The management system of college sports teams has gradually formed, but there is still a gap. Usually, the management system is unscientific, which hinders the development of sports training. In the process of selecting athletes, most colleges and universities only evaluate students’ physical quality and sports ability, but have no clear requirements on students’ performance, psychological quality, ideological, and moral level, which leads to the decline of students’ academic performance (Ahmed et al. 2020). University athletes must strengthen ideological and moral cultivation. Secondly, in the aspect of university sports training, some universities do not set up special coaches, but part-time physical education teachers in universities. In addition, part-time teachers are also responsible for other aspects of sports, so the workload is very large, they cannot engage in sports that hinder the success of sports (Cho et al. 2019). Through a series of actions, a scientific and professional teacher training team has been established, which lays a foundation for the effective development of daily sports training.

The comprehensive quality and teaching ability of training teachers are not high

The actual training work also shows that the comprehensive quality and teaching ability of some college teachers are not high, which affects the effective development of sports training. On the one hand, because the entrance threshold of some college physical education teachers is not high, nonphysical education teachers also participate in sports activities. On the other hand, the university does not provide regular training for internal teachers, which makes it impossible to effectively improve the overall quality and teaching skills of teachers. In sports training, some training teachers do not know enough about the importance of sports training, which only leads to the formalization of sports training (Dutka 2019). In addition, some teachers do not know that they keep up with the development of the times in the training process, and cannot according to the actual situation and students’ physical and mental needs, targeted training students’ interest in sports, therefore, the effect of university sports training is not high.

Students’ interest needs to be cultivated

Hobbies are the best teachers. Cultivating good interests can improve the effect of sports training. In the daily work of sports training in Colleges and universities, it is found that some students are not interested in training. In sports training, they are not in a good mood and have a rebellious psychology (Fan et al. 2020). Learners’ low interest in training is due to the unique and boring content of training and comprehensive training; On the other hand, they don’t teach according to their sports training skills, but adapt to the actual situation of the students. For example, for some students with good physical quality and superiority, it is easier for them to complete the
activity training, but for some students with poor health, it is more difficult to complete the same daily training activities. According to the actual situation of students, the systematic adjustment will affect students’ interest in training to a certain extent, and it is difficult to cultivate students’ interest in training, which eventually leads to the low efficiency of college sports training (Fitzgerald et al. 2005).

The reform of physical education should be further strengthened

At present, with the continuous improvement of the teaching quality of higher education, sports reform has achieved certain results. In response to the call of the state, some colleges and universities have introduced and implemented a number of reform programs, and formulated a series of teaching reform programs. Measures to promote sports training are also more effective (Khan and Tahir 2019). However, in principle, physical education in universities needs to be reformed, playground and gymnasium facilities are also damaged, and the degree of aging affects the progress of teaching improvement to a certain extent. Therefore, in order to really improve physical education, all sectors of the society, including education departments at all levels, schools and students, must work together to further promote the reform of physical education, so that physical education can really improve and increase physical education (Li and Fang 2014).

Calculation method of sports training effectiveness

Fifteen main selection indexes are used to predict male basketball players in regular universities, and the test results are analyzed. Finally, the physical fitness test indexes of university basketball players in specific regions and colleges are determined. As shown in Table 3, men’s university basketball have bench (absolute strength of upper limbs), weight-bearing knee (absolute strength of lower limbs), The recovery ability of full strength (endurance), The difference between vertical high jump and straight arm height (explosive force, 30 ends, stroking speed and acceleration), back and forth 10 m (sensitivity), and static forward (flexibility).

After the above data are normalized, the weight values of each test index are shown in Table 4.

Methods to improve the effectiveness of college sports training

Strengthen the team building of training teachers

In order to give full play to the success of university sports training, it is necessary to strengthen the structure of the teaching staff and ensure the effective development of university sports training by improving the professional quality of the teaching staff. Colleges and universities should improve the barriers of teacher training, employ teachers for training, make appropriate rules and regulations, avoid part-time teachers, and improve the professional quality of coaches (Li et al. 2010). Colleges and universities should also strengthen the regular training of teachers in the workplace by holding courses, employment relations, exchange of experience and professional lectures, so as to continuously improve teachers’ professional quality and teaching skills, strengthen the guidance of students in daily sports training, and fully plan the contents of training methods (Mavor and Gunter 2004).

Strengthen psychological training for students

In the process of sports training in Colleges and universities, not only practical training but also psychological training should be considered. Sports training is a long-term process, which needs continuous efforts to see its effect. However, in the actual training process, some students may feel mental distress due to high training intensity and frequent training, and there will be some psychological pressure, making it difficult for them to continue to practice. This is why good psychological quality is particularly important in the process of sports training. Through psychological training, we can cultivate students’ sports spirit, improve their psychological quality, and improve the influence of students’ daily training. Training teachers should deepen the understanding of track

| Table 3: Physical fitness test index table of high level male basketball players in Colleges and universities of a province |
| Serial number | Index name | Serial number | Index name |
|----------------|-------------|----------------|-------------|
| X_1            | height      | X_6            | The difference between the vertical jump and the straight arm |
| X_2            | body weight | X_7            | Full-court variable-distance turnback run |
| X_3            | Bench press barbell | X_8 | 10m round trip |
| X_4            | Weight squat | X_9 | Standing forward bend |
| X_5            | 30m run     | X_10           | Harvard Step Test Index |
and field sports in daily training, guide students to deepen the understanding of track and field sports, and help students develop good track and field sports. In the process of daily training, they should work hard, improve themselves, work together, and persevere (Mukherjee and Misra 2018). Do a good job in training. In the process of training, teachers should always consider the psychological state of students, provide psychological consultation and psychological education, help students adapt to their emotions, train with an optimistic attitude, and improve the effect of sports training.

Table 4: Weight coefficient table

| Index                                           | Weight coefficient | Normalized weight |
|-------------------------------------------------|--------------------|-------------------|
| Height                                          | 0.283              | 0.03              |
| Body weight                                     | 0.503              | 0.05              |
| Bench press barbell                             | 0.699              | 0.07              |
| Weight squat                                    | 1.553              | 0.16              |
| 30mS run                                        | 0.889              | 0.09              |
| The difference between the vertical jump and the straight arm | 1.668              | 0.18              |
| Full-court variable-distance turnback run       | 0.84               | 0.09              |
| 10m round trip                                  | 0.322              | 0.03              |
| Standing forward bend                           | 0.354              | 0.04              |
| Harvard Step Test Index                         | 1.546              | 0.16              |

Carry out standardized training reforms

Physical education reform is very practical. If we only carry out theoretical reform and do not connect it with sports, they will not be able to better guide teaching and training. In sports training and education, some colleges and universities can be regarded as examples, but students in different regions and schools face different situations and problems, which is why the reform of universities and colleges is driven by national politics. According to the actual situation of different schools in different areas, record and check sports, improve the training methods should adapt to the local situation. For physical education teaching facilities, equipment and other facilities, it is necessary to ensure that special personnel are reviewed in a timely manner in order to provide university sports training services and responsibilities (Pan et al. 2013). Teacher training should also be evaluated. Through the evaluation, we can understand the current situation of College Physical Education and better improve the next step. In order to improve teachers’ interest, we need to pay more attention to scientific value and fairness in teaching evaluation. Most importantly, the evaluation standard of the evaluation system is fair, which can enable teachers to achieve the required evaluation level through teaching reform, and continue to encourage teachers. Their training skills, to ensure that college physical education can achieve the desired goal, so as to improve the effectiveness of physical education.

College physical education is an important task of physical education. Competent university administrators should be aware of the importance of sports, formulate corresponding sports reform measures according to the characteristics of universities in various industries, and increase the investment in sports (Pan et al. 2018). In the actual physical education teaching, we should supervise the team structure of trainers, carry out psychological training for students, plan scientific training methods, carry out standard training improvement measures, continue to explore and find problems in the process, and...
actively explore ways to increase the success rate of college sports training.

Conclusion

Through the collection of geological data, geological survey, remote sensing interpretation, internal experiments, and distributed calculation of environmental simulation, this paper discusses the distribution law and influencing factors of free landslides in Y Valley and geological environment. Taking hehe x landslide as an example, the tensile strength of loess at the back edge of landslide, the formation and development of fracture track, the migration law of water at loess pebble interface, and the withdrawal mechanism are analyzed. Then, through numerical simulation, a free memory monitoring and early warning system is established. Finally, he analyzed the influence of sports on students and their academic performance, which shows the importance of sports.

Declarations

Competing interests The authors declare no competing interests.

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