Characteristics of heavy metal pollutants in groundwater based on fuzzy decision making and the effect of aerobic exercise on teenagers

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Abstract
Due to its abundant reserves and pure water quality, groundwater is an important water resource on the earth, which is widely distributed and easy to use, so it is widely used in industrial production, agricultural production, and domestic drinking. Most urban and rural areas in China use groundwater as drinking water source, and the quality of groundwater is closely related to the life of residents. Indiscriminate use of agricultural fertilizers, wanton discharge of industrial wastewater, and untreated wastewater will cause heavy metal pollution in groundwater. Groundwater is polluted by characteristic pollutants, which makes it difficult to deal with, and the deeper the water layer is, the lower the self-purification capacity will be, threatening the health of residents. In this paper, the groundwater samples of 58 towns in L area were collected as the investigation area, and the contents of fluorine ion and 16 kinds of metals and nonmetals were analyzed and discussed by ICP-MS and other equipment, as well as the characteristics of rural groundwater pollution in dry period. At the same time, the index model fuzzy decision making and single factor of health risk assessment model were used to evaluate the carcinogenic and non-carcinogenic risk. Obesity among Chinese adolescents is also a very worrying problem. The current literature supports many weight loss methods. Exercise weight loss can not only reduce fat, but also improve physical strength. In the long run, it can make us gain synergy. In life, people are aware of the impact of aerobic exercise on weight loss, so they rarely use high-intensity temporary strength for training. According to the research of fuzzy decision making, it is applied to groundwater and aerobic movement, so that it can be effectively improved.

Keywords Fuzzy decision making · Heavy metals in groundwater · Characteristic pollutants · Aerobic exercise

Introduction
Groundwater pollution is one of the main research fields of water environmental protection, and heavy metal pollution has become a long-term accumulation and difficult to manage research focus. L district is flat, and rich in water resources and high population density, but there are few studies on the characteristics of groundwater pollution and health risk assessment in L district. Taking L district as the investigation area, the pollution status of heavy metals in groundwater in the investigated area was analyzed in detail, focusing on the temporal and spatial distribution and concentration characteristics of characteristic pollutants of iron and manganese, as well as the health risk status of characteristic pollutants of iron and manganese (Lelieveld et al. 2016). In order to further improve the safety of drinking water in the investigated area and provide scientific basis for the local government to formulate water source protection policies, the following results have been achieved: pH value, temperature, conductivity, dissolved oxygen, total hardness, local groundwater concentration range of fluoride ion dryer are 7.05~8.03, 11.6~24.6 °C, 256.0~1041.0 μs/cm, 0.12~0.25mg/L, 138.74~634.75mg/L, and 0.14~0.47mg/L. The total hardness in some areas exceeds the class III water limit of the groundwater quality standard, and the exceeding rate is about 25% (Madani 2014). The areas beyond the standard are distributed in the northwest, South, and northeast of L district. In addition, the study on the temporal and spatial distribution and concentration characteristics of iron and manganese shows that the groundwater in the investigated area
has the plane distribution of iron and manganese, and there are significant differences in iron concentration. In rainy season, alkaline environment does not promote the concentration of iron and manganese. In the survey area, the health risk assessment of iron and manganese showed that the health risk status of iron and manganese had significant differences in time and space (Modarres et al. 2016). The total risk values of iron and manganese showed the trend of low water > normal water > high water according to the seasonal variation. In the spatial variation analysis, the total risk values of each time period were particularly obvious in the Murani sampling area (Özturk et al. 2015). However, with the development of China’s economy, social changes, and diet changes, China’s adolescent obesity is growing at an alarming rate. China is facing the serious problem of simple obesity among young people. In real life, especially in young people, it is not difficult to find a series of diseases, including coronary heart disease, hyperlipidemia, hypertension, and metabolic abnormalities caused by obesity, and the possibility of occurrence is increasing rapidly (Önol et al. 2013; Vaghefi et al. 2019). Every year, according to the requirements of the state, a lot of human, financial, and material resources are invested in health (Saboohi et al. 2012). As we all know, there are many different types of weight loss, but the most traditional way is to lose weight through exercise, because it can increase endurance and reduce fat (Yu et al. 2018). In life, people tend to focus on aerobic exercise and rarely use resistance exercise. This article is with this problem engaged in exercise weight loss. Therefore, this paper scientifically and reasonably studies the causes and current situation of adolescent simple obesity, and finds out the prevention and effective weight loss exercise methods according to fuzzy decision making, so as to improve the physical quality of Chinese teenagers, and provide effective teaching methods and theoretical basis for future young people to reduce fat scientifically and reasonably (Najafi et al. 2013).

Materials and method

Overview of the study area

L district is located in the East and south of L City. In Ancient Henan, the East and West are adjacent to Y City and Y county, respectively, and C County in the south, and a, B, D, and f counties in the north. Since its establishment in 2000, the region has rapidly developed into the city’s administrative, economic, commercial, and sports cultural center. The width from north to south is 21.7km, the length from east to west is 33.7km, and the total area is 211.45 square kilometers. There are 5 cities and 6 offices under the jurisdiction of the region, with a total population of 402,500, and a total cultivated land area of 122,085.95 mu, accounting for 28.25% of the total area of the region (Sharifi et al. 2011). The natural conditions are unique, with 15,000 Mu forest park and 20,000 mu Jushan Forest Park, with a forest coverage rate of 8.15%.

Research methods

Fuzzy decision

In most cases, two parameters need to be considered when constructing fuzzy decision tree model: significance level α and authenticity level β. Significance level α: It is the offset of A-cut of fuzzy set, which is usually used to data preprocessing before running algorithm, α. The larger the data, the less ambiguous the data, and the larger the training set, the empty training set. In general, if the model achieves the desired effect, it is not necessary to use α. For fuzzy A, the reliability of feature class C is as follows:

$$\beta_C^A = \frac{M(A \cap C)}{M(A)} \cdot \frac{\sum_{x \in X} \mu_A(x) \cdot \mu_C(x)}{\sum_{x \in X} \mu_A(x)}$$

(1)

The relative frequency is defined as follows:

$$p_i^k = \frac{M(T_i \cap S)}{M(T_i \cap S)}$$

(2)

The entropy of fuzzy classification information is defined as follows.

$$I(T_i^k) = -\sum_{j=1}^{m_i} p_j^k \log(p_j^k)$$

(3)

The entropy of average fuzzy classification information is defined as follows.

$$E(A^k, S) = \sum_{i=1}^{m} p_i I(T_i^k)$$

(4)

Evaluation model of heavy metal pollution in groundwater

Table 1 shows the measurement methods of various detection indexes of groundwater samples.

Generally, the content of metal elements in groundwater is very low, but the requirements for measuring instruments are very high (Tabari et al. 2014). PerkinElmer (Nexion 300×) inductively coupled plasma mass spectrometer (ICP-MS) was used in the USA.

(1) Instrument flight status Atomizer flow: 0.98l/min; discharge power: 1600W; argon pressure: 0.75mpa; helium pressure: 40psi; cooling water temperature: 19 °C; coolant pressure: 65psi; vacuum degree of typical tank: 1.13 × 10–5Torr; Deflection voltage: − 8.74v; pulse phase voltage: 803v; sampling mode: automatic sampling.
(2) **Draw calibration curve** Mixed standard solutions of 16 commercially certified elements (CD, V, th, Sb, B, be, Ti, Cu, Zn, Pb, Cr, as, Fe, Mn, Ni, CO) were used and diluted with dilute nitric acid. The concentration gradient of acid solution was measured according to the equipment conditions and quantified by internal standard method. The standard curve is the ratio of sample signal and internal standard signal to the horizontal axis. See Table 2 for details.

(3) **Sample measurement** According to the above instrument conditions, the collected groundwater samples are measured and quantified on the calibration curve. Field blank and transport blank were measured under the same conditions as groundwater samples.

The single-factor assessment method is used to assess the pollution status of the sampled groundwater. The calculation formula is as follows:

\[ I_i = \frac{c_i}{s_i} \]

Nemero index method:

\[ F = \sqrt{\frac{F_{\text{max}}^2 + F^2}{2}} \]  

\[ F_{\text{max}} = \text{max} \left( \frac{c_i}{s_i} \right) \]  

\[ F = \frac{1}{n} \sum_{i=1}^{n} \frac{c_i}{s_i} \]  

**Youth aerobic exercise design**

**Concept** Exercise regimen refers to the exercise method that patients carry out in their daily life with focus, step by step, and scientific guidance.

**The content of exercise program** According to Wang Ruiyuan’s exercise physiology, the whole exercise program

| Test items                          | Instruments used                               | Precision    |
|------------------------------------|-----------------------------------------------|--------------|
| Water temperature, dissolved oxygen| Ray magnetic JPBJ-608 portable water quality analyzer | 0.1°C, 0.01 mg/L |
| pH                                 | Sartorius universal Ph meter (PB-10)           | 0.01         |
| Conductivity                       | Ray magnetic DOS-307 conductivity tester       | 0.01μs/cm    |
| Fluoride ion                       | Raymagnet PXS-270 ion meter                    | 0.01mg/L     |
| total hardness                     | EDTA titration                                 | 0.01mg/L     |

**Table 2**: Standard series for determination of metal and nonmetal elements

| Numbering of elements | 1 | 2 | 3 | 4 | 5 | 6 | Correlation coefficient | The detection limit | RSI |
|-----------------------|---|---|---|---|---|---|--------------------------|---------------------|-----|
| Cadmium (Cd)          | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.99999                  | 0.06                | 2.8 |
| Vanadium (V)          | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.99999                  | 0.07                | 1.4 |
| Tantalium (Ti)        | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.99999                  | 0.01                | 1.5 |
| Antimony (Sb)         | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.99999                  | 0.07                | 1.7 |
| Boron (B)             | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9998                   | 0.9                 | 1.2 |
| Beryllium (Be)        | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9999                   | 0.03                | 2.1 |
| Titanium (Ti)         | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9992                   | 0.01                | 1.9 |
| Copper (Cu)           | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9999                   | 0.09                | 1.4 |
| Zinc (Zn)             | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9993                   | 0.8                 | 2.3 |
| Lead (Pb)             | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9999                   | 0.07                | 2.1 |
| Chromium (Cr)         | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9999                   | 0.09                | 2.3 |
| Arsenic (As)          | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9998                   | 0.02                | 1.8 |
| Iron (Fe)             | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9995                   | 0.9                 | 2.1 |
| Manganese (Mn)        | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9999                   | 0.06                | 1.3 |
| Nickel (Ni)           | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9999                   | 0.07                | 1.8 |
| Cobalt (Co)           | 0 | 0.5 | 1.0 | 5 | 10 | 50 | 0.9999                   | 0.03                | 1.6 |
should include a variety of methods about exercise and matters needing attention in the process of exercise.

Objective: To explore the current aerobic exercise and through aerobic exercise and high-intensity temporary strength exercise to meet the extreme needs of society, fast weight loss method, in order to achieve the fat reduction effect of obese youth, it is the development direction of the current sports weight loss industry. Participants in this experiment are expected to realize the risk of obesity and build a healthy body through weight loss exercise this month.

Sports: the sports in this experiment are divided into two types of training. Aerobic exercise includes treadmill, elliptical machine, power circulation, basketball, badminton, and other sports methods. High-intensity intermittent resistance training includes medicine ball and virp self-weight training. In the course, the two movements intersect.

Exercise intensity: according to the long-term experience of weight loss and the results of current academic theory, the exercise intensity of aerobic exercise in this experiment is controlled within the target heart rate range (25 to 45% heart rate). Check whether the heart rate of the subjects is within the target heart rate range and keep the resting heart rate. When doing aerobic exercise, use a finger clip and hand-held heart rate clip to monitor and control the heart rate of the subjects every 10 min. During the high-intensity intermittent fitness training, a finger clip and a portable heart rate clip are used every 15 min to monitor and control the heart rate of the object. High-intensity interval with 45 to 65% heart rate planning interval should be used for high-intensity temporary strength training, while 25 to 45% heart rate planning interval should be used for low intensity interval.

Practice time: the practice time of this course is 6:50–7:50 p.m. on Mondays, Wednesdays, and Fridays, 2 h from 10:00 a.m. to 12:00 p.m. and 2 h from 3:00 p.m. to 5:00 p.m. In order to avoid boring training, we have a rest every Monday morning, a swimming class every Wednesday afternoon, and a movie screening every Friday evening. It takes 3–5 h every day.

Exercise frequency: in this experiment, the course was arranged according to the daily schedule in order to pursue the continuity of fitness and fat reduction. In the actual training process, we must reasonably adjust the exercise frequency according to the specific situation of the subjects.

Note: at this stage, due to the activity of teenagers, the taboos should be clearly marked during the training, and the subjects should be instructed to use the equipment correctly to prevent sports injuries. During the exercise, the professional coach is responsible for patrolling the field, so as to avoid accidents and let the subjects recover their physical strength after the exercise.

Peak weight loss requires that the intensity of sports should be controllable, and the whole body should be persistent and comprehensive. Combined with the age of teenagers, sports should also be entertaining. This experiment abandons the boring training method of traditional gymnasium, combines high-intensity intermittent strength training with group exercise, and perfectly meets the requirements of course controllability, continuity, wholesomeness, and entertainment. All the data obtained in this experiment were collected through Office Excel 2019.

Results

Analysis results of groundwater index

The area of rural area in 1 area is relatively wide, and the depth of groundwater for residents to drink depends on the depth of wells, but the depth of wells varies greatly from 15 to 265m in each rural sampling point. Therefore, taking the underground depth (well depth) as the horizontal axis, pH, and other related factors as the vertical axis, the point line diagram is made, and the relationship between depths is expressed. Analyze the ground and various indicators, as shown in Figure 1.

Figure 2 shows the relationship between water depth and temperature.

Figure 3 shows the relationship between underground conductivity.

Figure 4 shows the relationship between water depth and dissolved oxygen.

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Figure 1  Relationship between groundwater depth and pH

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Figure 5 shows the relationship between water depth and total hardness.

Figure 6 shows the relationship between water depth and fluoride concentration.

Analysis results of groundwater hardness

As shown in Figure 7, the total hardness of groundwater is classified according to various water quality restrictions based on groundwater quality. In the figure, the distribution characteristics of the total hardness of rural groundwater in December and January in I area are basically the same, and in most areas, only some areas that do not meet the class III water standard exceed the total hardness standard. There is a significant negative correlation between the total hardness and the depth of groundwater.

Characteristics of heavy metal pollutants in groundwater

As shown in Figure 8, the distribution characteristics of fluoride ions in groundwater in rural areas of I area are basically consistent in December and January. In nature, the weathering, dissolution, and leaching of fluorinated silicate minerals are the main sources of fluoride in groundwater.

Fourthly, the fluorine contained in the sediments provides the conditions for the fluorine ion concentration in groundwater and groundwater runoff conditions, and uses the movement to produce fluorine ions. Towns such as bay for new year in Southwest China have high altitude and complex terrain, and are located at the crossroads of Donggang, so as to help groundwater runoff concentrate later. The concentration of fluoride ions represents the high concentration of fluoride ions in groundwater, and the concentration also has a constant relationship, regardless of whether the geological conditions include fluoride salts and fluorinated silicate minerals.

Experimental results of aerobic exercise in adolescents

After 4 weeks of intervention, the weight loss of 31 obese adolescents was $(10.49 \pm 3.42) \text{kg/m}^2$ and $(3.62 \pm 10) \text{kg/m}^2$, and the percentage of body fat decreased $(6.55 \pm 2.42)\%$ (See Table 3).

After 4 weeks of intervention, the average resting heart rate of the subjects decreased by $(12.45 \pm 90)$ times/min. The grip strength of the left hand increased to $2.26 \pm 90$lbs. The grip strength of the right hand was increased by $2.39 \pm 12$lbs. (See Table 4).
Discussion

Analysis of characteristic pollutants of heavy metals in groundwater

In this chapter, through the measurement and analysis of groundwater samples in rural areas of L area in December and January drought season, a detailed study is carried out. On this basis, the existing groundwater pollution characteristics are also studied. The main conclusions are as follows.

(1) In December and January, the conductivity of groundwater in area L showed a significant relationship with the total hardness (Abbaspour et al. 2012). In the period of 2 months, the groundwater detection index did not change significantly during this period, and the groundwater quality was relatively stable. With the development of cities, the dissolved oxygen concentration in groundwater is lower than the average of other indicators. The groundwater volume, especially the total hardness, is far less than that of the area. Generally, tap water is better than groundwater.

(2) The conductivity, total hardness, and fluorine concentration of local groundwater in area in December and January will change according to the change of pH and temperature, and then the depth of groundwater will be reduced. The depth is inconsistent, and the groundwater index varies from 30 to 50 m.

(3) In December and January, the distribution characteristics of total hardness and fluorine concentration of rural groundwater in L area were basically the same. In the northwest of L district, the northeast of Yangha village is higher, while the total hardness in the middle is lower. The concentration of fluorine ions in southwest, south, and Northeast China is the highest (Amiri and Eslamian 2010).

Analysis of the effect of aerobic exercise in adolescents

The change of weight value cannot reflect the success of weight loss, but it is still the most intuitive response. The combination of body weight, body fat rate, and BMI can reflect the body composition in general. In the closed environment, after 4 weeks of aerobic exercise combined with high-intensity intermittent strength training, the average weight of the subjects decreased from 90.53 to 80.04 kg, down about 10.49 kg, and significantly decreased by paired sample t test ($P < 0.01$). The body fat rate decreased from 37.01 to 30.46%,
and decreased by 6.55%. After t-test, the body fat rate decreased significantly ($P < 0.01$); BMI decreased from 30.56 to 26.94 kg/m$^2$, down about 3.62 kg/m$^2$, and significantly decreased by paired sample t test ($P < 0.01$).

Quiet heart rate is also known as resting heart rate, and a stable heart rate indicates the quiet heart rate of the hour and minute when we wake up. According to their own exercise mode, the heart function can be exercised to maintain the proper weight and maintain a quiet rhythm at a relatively slow and stable interval. Professor Wu Jie, a famous Chinese scholar, observed the quiet heart rate of more than 5000 healthy adults and found that, in the absence of interference from various diseases, human heart beat is related to autonomic nerve and body fluid regulation. And according to data, for example, the adult quiet heart rate can be maintained at 70 times per minute, and the life span can be close to 80 years (Basha et al. 2015). Professor Wu Jie also found that the total number of heart beats in a person is about 2.5 billion to 3 billion. Combined with a large number of clinical trials and studies, it is proved that the probability and degree of cardiovascular disease will be lower for people with low heart rate at quiet time. On the contrary, the probability and degree of cardiovascular disease in the middle and old age will be greatly increased and the death rate will be higher for those with high heart rate during quiet. Heart rate is an important basis for predicting the life span, but the relationship between quiet heart rate and female life seems not as big as that of men. The reasons have not been clarified in the current published information. However, from the relationship between heart rate and energy metabolism, there is a conjecture that the need of human energy metabolism determines the number and frequency of heart rate pulsation. According to biological law, the body runs out of energy, the heart stops beating, and life ends. According to the explanation in Professor Lu Yaofei’s book...
Sports physiology, athletes have a large heart muscle, strong contractility and large output per beat. Therefore, excluding pathological factors, the decrease of quiet heart rate is one of the manifestations of improving exercise ability. Grip strength is the most commonly used strength test method in physical test. By combining the grip strength value with the weight of the tested person, a scientific physical evaluation can be obtained. After 4 weeks of aerobic exercise combined with high-intensity intermittent strength training, the quiet heart rate of the subjects decreased from 87.90 to 75.45 times/min before intervention, and decreased by 12.45 times/min after paired sample t test, the quiet heart rate of the subjects decreased significantly (P < 0.01). The left-hand grip strength increased from 28.83 lbs before intervention to 31.10 lbs, and increased by about 2.27 lbs. The grip strength of the right hand increased from 31.73 lbs before intervention to 34.13 lbs, increasing by about 2.40 lbs (Bucchignani et al. 2018). After t test of matched samples, the grip strength of left and right hand increased significantly (P < 0.01).

Girth is the most intuitive reflection of human body shape. To measure the circumference of the chest, we need to keep the body straight, arms naturally lowered to one side of the trunk, and the front of the tape should be in the chest, the back should be at the bottom. The chest circumference at rest was measured by measuring the edge of shoulder t bone. To measure our waistline, our bodies have to stand and hold the abdomen. In the normal position, keep breathing and measure the thinnest part above the navel. To measure the circumference of the thigh, you need a foot, and it will open naturally at a distance of about 15 cm. The measurement point is below the buttocks, and the circumference of the thickest part of the thigh muscle is measured with a tape measure. The relaxed and tense circumference of the upper arm needs to be upright, and the arms are naturally suspended on both sides of the body. Use a tape measure to circle the thickest part of the upper arm to obtain the data of the relaxed circumference (Draxler et al. 2001). Then raise the arm horizontally so that the palms of the fists and elbows are facing up so that our forearms contract as much as possible, and then use a tape measure to draw a circle on the most prominent part of our biceps to indicate the circumference of the arms when they contract. In the field of fitness and bodybuilding, the larger the upper arm circumference, the better, but in the obese area, the smaller the circumference, the better. In addition to reference body fat content, skinfold thickness is also helpful to estimate the metabolic level of human body. With the growth of age, the body fat will change regularly. In addition to age, there are also other factors, such as genetics, living environment, and lifestyle. Daily diet will have a significant impact on the distribution of body fat and the proportion of body weight. Skinfold thickness is generally measured.

| Category          | Pre-test          | Post-test         | Difference     |
|-------------------|-------------------|-------------------|----------------|
| Weight (kg)       | 90.53±17.46       | 80.04±15.24**     | 10.49±3.42     |
| BMI (kg/m)        | 30.56±4.75        | 26.94±4.24**      | 3.62±1.10      |
| Body fat rate (%) | 37.01±6.98        | 30.46±8.04**      | 6.55±2.42      |

Fig. 8 Distribution of fluoride ions in groundwater in the study area
by X-ray, ultrasonic, and other professional equipment in hospitals. Skinfold calipers are widely used in the market. This measurement method is simple and economical, and the correlation between the measured results and X-ray measurements can reach 85–90% under the operation of professional operators. And subcutaneous fat and muscle have obvious segmentation boundaries, easy to find measurement points, simple measurement, and close multiple measurement values (Droogers et al. 2012). After 4 weeks of aerobic exercise combined with high-intensity intermittent strength training, the average chest circumference of the subjects decreased from 105.95 to 98.94 cm, about 7.02 cm. The waist circumference decreased from 100.56 to 89.58 cm, about 11.02 cm; hip circumference decreased from 113.67 to 104.21 cm, about 9.45 cm; the thigh circumference decreased from 65.85 to 59.89 cm, about 5.97 cm; the tension circumference of upper arm decreased from 35.65 to 31.84 cm, about 3.81 cm; the upper arm relaxation circumference decreased from 34.98 to 30.74 cm, about 4.24 cm. After paired sample t-test, the circumference decreased significantly ($P < 0.01$).

After 4 weeks of aerobic exercise combined with high-intensity intermittent strength training, the average skinfold thickness of the upper arm decreased from 34.84 to 27.16 mm, about 7.68 mm; the average skinfold thickness of the subscapular angle decreased from 38.77 to 30.61 mm, about 8.16 mm. After paired sample t-test, the skinfold thickness of the two sites decreased significantly ($P < 0.01$).

| Category                        | Pre-test     | Post-test    | Difference     |
|---------------------------------|--------------|--------------|----------------|
| Resting heart rate (beats/min)  | 87.90±12.16  | 75.45±11.66**| 12.45±16.90    |
| Left-hand grip strength (lbs)   | 28.83±8.72   | 31.10±8.52** | 2.27±1.90      |
| Right-hand grip (lbs)           | 31.73±8.15   | 34.13±8.90** | 2.40±2.12      |

### Development strategy of adolescent aerobic exercise

Coaches will be able to make their overall training plan more scientific and predictable, but the plan will only design future training plans and will not be able to keep up with the changes in training practice. From the weight loss industry we are engaged in, we find that there are the following types of problems in the combination of aerobic exercise and strength training experiments. We hope that coaches will seriously train students to lose weight, so that they can achieve better weight loss effects (Emadodin et al. 2019).

### Problems in preventive measures of resistance movement and remedial measures

Because the equipment position is relatively scattered in the process of strength training, the centralized management has no corresponding effect, and the risk in the process of exercise is relatively high. Therefore, coaches must strengthen the supervision of team members. First of all, the use of equipment for unified training, display the appropriate operation specifications of each equipment in turn, configure students to imitate and modify, and give them their personal attributes to teammates, so as to protect themselves in advance and reduce the occurrence of sports injury (Fazel-Rastgar 2020). Use protective equipment (such as wrist protector, knee brace, etc.) as needed to improve the quality of training, reduce joint injuries, and ensure training safety (Karami 2019).

### Problems and remedial measures of exercise recovery methods

In the process of muscle exercise and aerobic exercise at the same time, simple obese teenagers are easy to feel tired because of their large weight base and relatively poor exercise ability. If they do not recover effectively after training, they are likely to cause sports injury. However, in the actual training process, athletes usually use stretching to recover and relax, which is relatively easy but cannot help the body recover effectively. In our opinion, the recovery method of fatigue needs to be improved and optimized. Therefore, in the training process, coaches who are “thin every day” need to make full use of the existing positioning devices (such as audio, foam roller, massage stick, cushion, etc.) and combine them with auxiliary methods. In addition, everyone can try new methods to reduce fatigue (massage, foot bath, communication, etc.) and guide them to recover and lay a good foundation for the next exercise (Ghiami-Shamami et al. 2018).

### Problems and remedial measures of collecting education feedback information

In the process of training, some team members are often tired of training, and often passively participate in training. Because the coach cannot adjust their training plan in time according to the feedback of training information, it will lead to the failure to complete the training task with high quality. Therefore, coaches suggest that they need to use their spare time to communicate with team members and parents to understand their children’s current situation and psychological problems (Lelieveld et al. 2012). When team members find psychological problems in the training process, they can timely communicate and guide, help our teammates, and establish a correct
training attitude. At the same time, team members can actively participate in the training by carrying out the training content that has not been involved before or innovating the training content that team members are interested in, so as to stimulate the team’s interest in sports and get satisfactory results with half the effort.

**Conclusion**

In this study, groundwater samples were collected at representative sampling sites, and the contents of 16 metals and nonmetals in the samples were analyzed by ICP-MS and other equipment. The characteristics of groundwater pollution in rural areas of L City and 1 district during drought period were investigated. The single-factor index model, Nemero index model, and health risk model were used to evaluate groundwater pollution and carcinogenic and non-carcinogenic risk. The field sampling, indoor detection and analysis, geostatistical analysis, and the heavy metals in drinking water were investigated. On this basis, a comprehensive evaluation index model was established. The entropy weight, characteristics, and concentration characteristics evaluation entropy method focused on the pollution changes of iron and manganese were used to evaluate the health risk of the impact of iron and manganese content on human health. It is helpful to investigate the law of groundwater pollution in I area and to manage groundwater sources scientifically, to ensure the safety of drinking water in the investigated area. Finally, the aerobic exercise group conducted weight loss experiments for obese young people, and proved the effectiveness of aerobic exercise on weight loss.

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**Declarations**

**Conflict of interest** The authors declare competing interests.

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