Hindawi
Journal of Nanomaterials
Volume 2022, Article ID 4179693, 10 pages
https://doi.org/10.1155/2022/4179693

Research Article

Amorphous Alloys and Ferroelectric Nanomaterials and the Repair of Athletic Ligament Injuries in Soccer

Chao Ma

Physical Education College, Inner Mongolia Minzu University, Tongliao, 028000 Inner Mongolia, China

Correspondence should be addressed to Chao Ma; machao@imun.edu.cn

Received 19 March 2022; Revised 3 May 2022; Accepted 16 May 2022; Published 14 June 2022

Academic Editor: Awais Ahmed

Amorphous alloy refers to the orderly arrangement of the internal structure of various substances in nature. Amorphous solid materials include amorphous inorganic materials, amorphous polymers, and amorphous alloys. Amorphous alloys, also known as glassy alloys or metallic glasses, are atomically condensed, long-range disordered, and short-range ordered alloy materials that have the distinctive properties of both metals and glasses. Ligament injury is damage caused by different degrees of damage to the ligaments of a certain part of the body. The purpose of this paper is to investigate amorphous alloys and ferroelectric nanomaterials and the repair of athletic ligament injuries in the soccer game, using the excellent properties of amorphous alloys and ferroelectric nanomaterials to solve the problem of athletic injuries. Knee and ankle injuries and muscle strains account for a large percentage of soccer injuries. In this paper, researches and explorations have been conducted on the preparation of new composite magnetic nanomaterials, the construction of immunosensor interfaces, and the development of new signal amplification and renewable immunosensors. The rehabilitation effect of the medial collateral ligament of the athlete's knee joint is used as the research object, and various methods are used. In-depth investigation and research and statistical analysis of the data obtained one by one were carried out. The experimental results in this article show that from the age of ligament injury, the number of people between 18 and 20 is relatively small, and the number of people aged 20–40 is relatively large. The number of people who have been trained for three years and above is 5, and the proportion of ligament injuries is 0.8%; the number of training for two years is 33, and the proportion of ligament injuries is 13.7%, the number of training for one year is 98, and the proportion of ligament injuries is 40.7%, and the number of training for six months is 105, and the proportion of ligaments is 44.8%.

1. Introduction

1.1. Background. In line that scientific and artistic fields are constantly evolving, sports in China have also been flourishing. More and more sports, as well as sporting events, are getting more and more attention, especially soccer. It is a good thing for the whole society that soccer is being taken seriously, but along with the focus on performance, we should also be concerned about the physical injuries of the athletes. Soccer consists of many high-intensity and decisive action confrontations, and its fast and variable nature, high level of confrontation, and tight schedule contribute to the high incidence of sports injuries. Basically all athletes have different degrees of physical injuries, maybe a back injury or a leg injury, which are closely related to the sports injuries we are discussing. Sports injuries are not like the bumps and bruises of our lives, especially ligament strains, which take a long time to recover from and are difficult to resist medication. Random ligament injuries have a significant impact on the life of the operator. However, until now, there has been no direct and effective way to treat sports ligament injuries and only some degree of pain relief. This type of injury is mostly characterized by localized pain in the knee joint along with swelling, flexion, and extension difficulties, and often walking difficulties, which in the long run can cause fear in daily training and affect the performance of technical movements. Currently, widely used amorphous alloy materials can be deformed according to their magnetic characteristics and are highly sensitive to external stresses. Compared with the traditional is metal magnetic material, non-alloy material atomic arrangement disorder, high resistivity, has high permeability, low loss, can improve transformer efficiency, reduce mention, and reduce weight. In addition, nanomaterials are very small in size and can present acoustic, optical, electrical, magnetic, and thermal properties [1]. With the new characteristics, if nanomaterials can be combined with amorphous alloy materials, they may produce unexpected results when applied to the repair of ligament injuries.

1.2. Significance. The combination of nanomaterials and amorphous alloy materials in the repair of ligament injuries can fill the current lack of effective treatment of ligament injuries and promote the progress of medical care; curb the adverse effects of ligament injury on athletes, so that they can continue to struggle in their careers and improve China's sports performance; expand the use of nanomaterials and explore their functions; nanomaterials have the advantages of large specific surface area and conductivity, nanomaterials have the advantages of large specific surface area and conductivity, and their application in the construction of immunosensors can effectively improve the above shortcomings of immunosensors.

1.3. Related Work. With the development of the national economy, sports continue to receive attention, and sports performance has become the focus of national attention. But in following sporting events, it is found that the physical ailments of athletes are otherwise ignored, especially ligament injuries have caused fatal injuries to athletes. We must find an effective way to contain it. Based on basic sciences, Pearce obtained the unanimous opinion of the members of the ESSKA-AFAS Ankle Instability Team to propose a best evidence method. Before the experiment, base scientific and proclinical data on bone cell recovery after ligament rebuilding, as well as the reconstruction of sensorimotor control, were reviewed, and then members of the ESSKA-AFAS ankle instability team obtained information about the ankle based on this evidence. Rehabilitation recommendations were proposed for the early postoperative period, early recovery phase, and goal-oriented late rehabilitation and recovery exercise phases, and practical and evidence-based guidelines were adopted for the rehabilitation and recovery activities after the surgery of the lateral ankle ligament [2]. In order to obtain amorphous alloys with high plasticity, Shan SF designed a series of 100xTMx alloys to investigate the effect of Nb and Y additions on plasticity. 100xTMx alloy means Ti_{40} Zr_{25} Cu_9 Ni_8 Be_{18}, where $x = 0$, 1, 2, 3, and 4 and TM = Nb. The plasticity of different bulk amorphous alloys was investigated by measuring the plastic deformation energy (PDE) during loading. The obtained results indicate that the inclusion of Nb decreases the PDE level, contributes to the creation of more than one fracture zone, and obviously increases the breaking force and complexity, but the inclusion of element Y decreases the breaking force and plastic strain of the alloy [3]. Kuji systematically prepared different microstructures by annealing B-rich Fe-Si-B-Cr amorphous plates to obtain the best mechanical and processing properties of the alloy. Annealing is a metal heat treatment process that involves slowly heating the metal to a certain temperature, holding it for a sufficient amount of time, and then cooling it at a suitable rate. The purpose is to reduce hardness and improve machinability, reduce residual stress, stabilize dimensions, and reduce deformation and cracking tendencies. Thermal, structural, and mechanical analyses show that the early reaction sequence of the amorphous alloy after annealing is characterized by structural relaxation, heterogeneous nucleation of the surface α-Fe (Si) phase, and homogeneous nucleation of the metastable Fe3B nuclei, which is influenced by the α-encircled Fe shell [4]. Danylyak analyzed the thermal stability and crystallization kinetic parameters of $Fe_{82}Nb_2B_{14}REM_2$ (REM = Y, Gd, Tb, or Dy) amorphous metal alloys by differential scanning calorimetry. Iron-based alloys were crystallized in two stages; we calculated the activation energy of the two stages of crystallization of amorphous alloys according to the Kissinger, Ozawa, and Augis-Bennett models. The process of doping $Fe_{84}Nb_2B_{14}$ alloy with rare earth metals leads to an increase in temperature, crystallization activation energy, and frequency factor. The doping of rare earth metals leads to a decrease in the crystallization rate constant of alloys revealing their resistance to temperature treatment [5]. Fangping conducts the experiment by preprocessing the Zr-based amorphous alloy with ultrasonic-assisted vibration microcompression at different amplitudes and frequencies and then compresses the sample until it breaks. The process is simulated by the finite element analysis software ABAQUS. By comparing the results of simulation and experiment, the reliability of the finite element model is verified. At 0, 19, 27, 36, and 43 μm ultrasonic amplitudes and 20, 25, 30 and 35 kHz frequencies, the effect of energy flux density on the room temperature deformation behavior of Zr-based amorphous alloys was studied. The results show that as the ultrasonic amplitude and frequency increase, the elastic modulus decreases, the equivalent stress distribution becomes more uniform, and the formability improves. This is due to the increase in temperature caused by ultrasonic vibration and the increase in the free volume concentration of the compressed sample. However, studies have found that when the ultrasonic energy flow density increases, the formability of amorphous alloys decreases [6]. Ding summarizes studies that provide information on releases of ENM in occupational settings, in different industrial activities, and during the use of various nanomaterials. It also assesses background information—like the amount of material processed, protective measures, and measurement strategies—to understand which release scenarios may lead to exposure. High-energy processes, such as synthesis, spraying, and processing, are associated with the release of large numbers of primarily small-sized particles. The current analysis suggests that process-based release potential can be ranked to help prioritize release assessments, which can be useful in stratifying exposure assessment methods and guiding the implementation of workplace safety strategies [7]. Huang suggested that nanomaterials could be used in the field of sports therapy. Nanoscale materials have been widely used as reagents for therapeutic and diagnostic (i.e., therapeutic diagnostics) purposes. He discusses some general design considerations for advanced therapeutic diagnostic materials from a diagnostic and therapeutic perspective, as well as the challenges of their use. Common classes of nanoscale biomaterials have been shown to have diagnostic and therapeutic potential, with size variations such as control and surface modifications that can modulate biocompatibility and interaction with target tissues [8]. These theories have discussed tropical damage, amorphous alloys, and ferroelectric nanomaterials to a certain extent. Because of the limitations in the research, the actual operation is not very rational and not practical.

1.4. Innovation. It is the first time that amorphous alloys and ferroelectric nanomaterials are used in the rehabilitation of ligament injuries. This is a new attempt for the entire medical field. If this method can be promoted, it will achieve a new breakthrough in sports ligament injuries. A porous nanogold film was modified on the surface of the glassy carbon electrode of the large specific surface area and strong adsorption capacity of nanogold.

2. Amorphous Alloys and Ferroelectric Nanomaterials and Repair Methods for Sports Ligament Injuries

2.1. Ferroelectric Nanomaterials. Nanomaterials are materials in which at least one dimension in three-dimensional space is at the nanometer size (1-100 nm) or consists of them as the basic unit, which is approximately equivalent to the scale of 10 to 1000 atoms closely aligned together [9, 10]. At the beginning of the twentieth century, related researchers discovered the dielectric properties of substances, combining organic matter with ferroelectric phenomena for the first time. Because of its low density, easy processing, and low price, it has been widely used. After research, it has been found that there are four kinds of crystals in ferroelectric nanomaterials, and the four kinds of substrates can be converted to each other [11]. The specific conversion is shown in Figure 1:

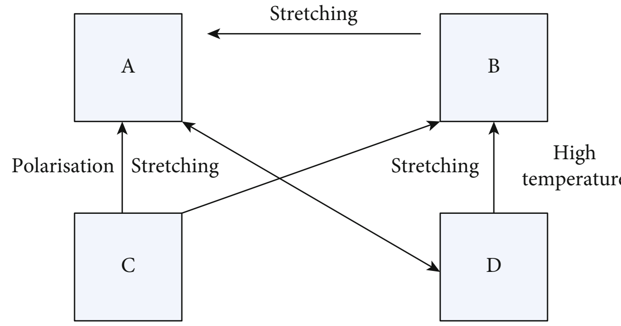

Figure 1: Four crystalline transformation relationships.

In the middle of the last century, the emergence of new materials is the rapid development of nanomaterials. In the subsequent gradual development, as researchers continue to explore theories, the scope of application of nanomaterials has become wider and wider. Nanoceramics have small grain size, and the grains can easily move on other grains; therefore, nanoceramic materials have very high strength and high toughness as well as good ductility; these characteristics make nanoceramic materials can be cold processed at room temperature or sub-high temperature, making them ductile and high-performance ceramics [12]. In recent years, the continuous improvement of science and technology has forced the upgrading of traditional materials. Due to the limitations of various functions, traditional scientific and technological materials can no longer meet the requirements of modern technology. New nanomaterials have a lot of room for development. From the offline situation, the entire nanomaterials are still in their infancy, and the subsequent development is still very violent. At this stage, although researchers choose different nanomaterials for experiments, but so far there have been no more satisfactory results. In short, nanomaterials are very important functional materials, and the research and application of their characteristics still need continuous research and exploration [13, 14]. The ratio of the number of surface atoms to the total number of atoms in a nanocrystal particle increases dramatically as the particle diameter becomes smaller. For example, at a particle diameter of 10 nm, the particle contains 4000 atoms, and the surface atoms account for 40%; at a particle diameter of 1 nm, the particle contains 30 atoms, and the surface atoms account for 99%.

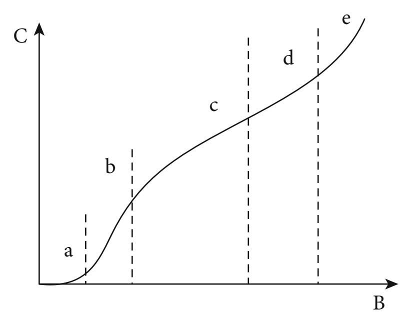

Figure 2: Magnetization of amorphous alloy materials.

2.2. Amorphous Alloy. Amorphous alloys refer to alloyed materials that are condensed by atoms and have an orderly structure [15]. According to the form of amorphous alloys, they can be divided into ribbons, fibers, filaments, and powders. Amorphous alloys have low elasticity, high toughness, high resistivity, high chemical activity, resistance to radiation damage, and high corrosion resistance. Amorphous alloys have their own microstructures, so it causes the lack of many functions of amorphous alloys, but amorphous alloys also have unique properties [16]. In terms of chemical functionality, compared with ordinary alloy materials, the corrosion resistance of amorphous alloys is very good. This unique advantage provides convenience for its wide application in various fields. After research by researchers, the quality of corrosion resistance is determined by the structure and composition of the substance, and the structure and formation of amorphous alloys are relatively uniform, so it has good corrosion resistance. Structural uniformity refers to a substance without structural defects such as grain boundaries and lattice defects. Composition uniformity refers to

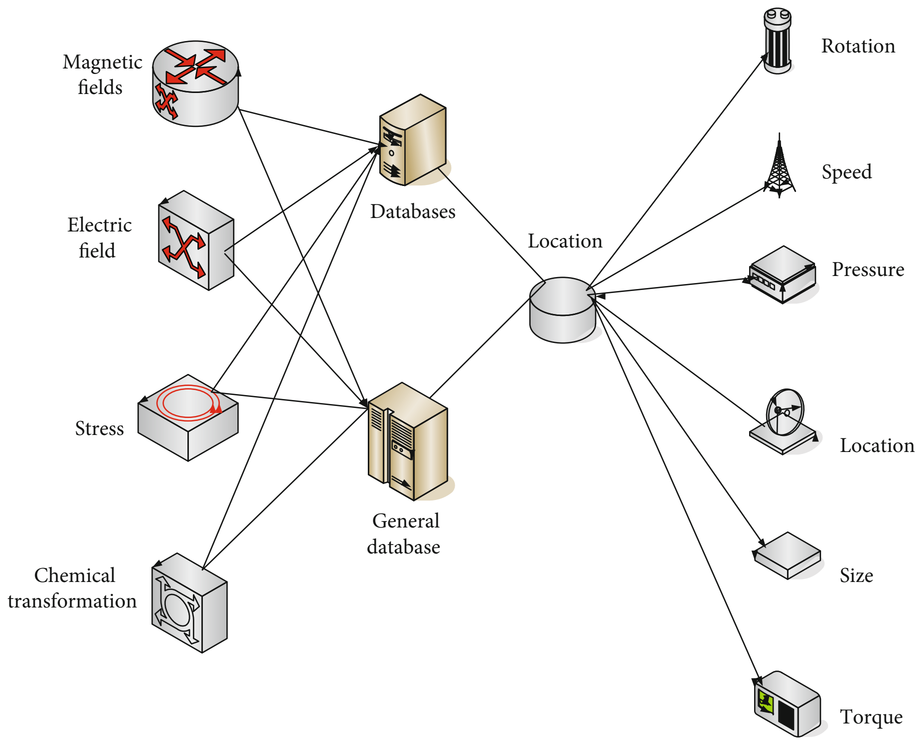

Figure 3: Magnetic sensor and magnetic relationship diagram.

the absence of static inclusions and heterogeneous components in the substance. The homogeneity of the composition is due to the fact that it is a fast-hardening material and the various atoms are "localized" before they can diffuse, so there are no fluctuations in composition like segregation, inclusions, and heterogeneity in the crystalline state. Since amorphous alloy materials are satisfied, the corrosion resistance is high [17].

Amorphous alloy itself has magnetic characteristics, but because the level of development is not enough, it is difficult to directly obtain its specific quantity; usually we use the saturation magnetic induction to reflect; function expression is as follows:

$$S = \phi_0 (G + K) * (G + K). \tag{1}$$

Among them, S represents the magnetic induction intensity, K represents the magnetization intensity, and ϕ_0 represents the constant.

In the technical magnetization diagram, the amorphous alloy material is basically the same as the ordinary alloy material, as shown in Figure 2:

According to Figure 2, the main influencing factor in the magnetization process is the reversible domain wall displacement or reversible domain rotation in zone a. The magnetization degree is weak in zone b, the initial magnetization rate is large in zone c, the domain rotation plays a major role in zone d, and the wall movement and domain rotation of the internal domains in zone e are all completed.

When the magnetization of amorphous alloy materials is relatively weak, the function expression is as follows:

$$\begin{aligned} Q &= \alpha_1 T + \beta T^2, \\ W &= \varphi_1 T + 4\pi \beta T^2. \end{aligned} \tag{2}$$

Among them, Q represents the magnetization intensity, α_1 represents the magnetic susceptibility, T represents the magnetic field intensity, β represents the constant, W represents the magnetic induction intensity, and φ_1 represents the initial permeability. Figure 3 is a schematic diagram of the relationship between magnetic sensors and magnetism:

When it comes to the magnetism of amorphous alloy materials, the stretching effect is involved, which essentially refers to the energy exchange of the material. The specific function expression is as follows:

$$\begin{gathered} \begin{cases} \iota = \iota(T, \chi), \\ W = W(T, \chi), \end{cases} \\ \begin{cases} \chi = \chi(W, \iota), \\ T = T(W, \iota), \end{cases} \end{gathered} \tag{3}$$

where W represents the magnetic induction intensity, T represents the magnetic field intensity, ι represents the stress, and χ represents the strain.

The electromechanical coupling coefficient has a certain relationship with the permeability and elastic modulus

Figure 4: Common ligament injuries.

of amorphous alloy materials, which can be expressed as follows:

$$d^2 = \frac{\lambda_a - \lambda_b}{\lambda_z} = \frac{S_Q - S_K}{S_O}, \quad (4)$$

where $\lambda_{1,}\lambda_2$ represents the reversible permeability of the amorphous alloy material under steady stress and constant strain and S_Q, S_K represents the elastic modulus of the amorphous alloy material under steady magnetic induction and steady magnetic field strength, where

$$d^2 = \omega\left(\frac{\varphi\delta}{\varphi N}\right)^2 + \frac{\lambda_1 - \lambda_2}{\lambda_Z}, \quad S = \frac{9}{4}\frac{S\gamma_c{}^2}{\pi N_c^2}\nu_i\left(\frac{N}{N_c}\right)^2, \quad (5)$$

where ω represents the magnetic susceptibility, δ represents the expansion ratio, δ_c represents the saturation magnetostriction coefficient, N represents the magnetization, N_c represents the saturation magnetization, ν_i represents the reversible permeability, and S represents the elastic modulus.

In operation, stress sensitivity can be used to evaluate the magnetostrictive effect and inverse magnetostrictive effect of amorphous alloy materials. The specific function expression is as follows:

$$T = \frac{3\gamma_c N_C}{2L_i}\sin^2\rho_0 \cos\rho_0, \quad (6)$$

where γ_c represents the saturation magnetostriction coefficient, N_c represents the saturation magnetization, L_i represents the uniaxial magnetic anisotropy, and ρ_0 represents the angle between the magnetization vector and the magnetic field.

The electromagnetic induction effect refers to the mutual induction phenomenon of electricity and magnetism. For a closed loop coil with a magnetic core, the function expression can be as follows:

$$L_j = -F\frac{d\mu}{di} = -FS\frac{dU}{di} = -FS\frac{d(\iota G)}{di}, \quad (7)$$

where L_j represents the induced voltage, μ represents the magnetic flux, F represents the number of coils, S represents the cross-sectional area of the magnetic core, U represents the magnetic induction intensity of the magnetic core, ι represents the magnetic permeability of the magnetic core, and G represents the magnetic field intensity.

Table 1: Patient status table.

Group	Male	Female	18-20	20-30	30-40
1	15	7	2	7	5
2	13	5	3	9	12
3	10	9	4	8	8
4	12	3	1	11	13

Table 2: Clinical efficacy comparison experiment.

Group	Excellent	Good	Generally	Difference
1				
Forward	0	0	3	15
Rear	0	5	8	6
2				
Forward	0	0	5	10
Rear	7	12	13	3
3				
Forward	0	7	3	13
Rear	0	10	11	2
4				
Forward	0	3	6	12
Rear	3	7	9	5

Table 3: Validation of validity.

Group	Total people	Percentage (%)	Effective number of people in the structure	Percentage (%)	Number of people valid for content	Percentage (%)
Invalid	0	0	0	0	0	0
Poor results	1	9	3	27	1	9
General	0	0	2	18	0	0
Good	2	18	3	27	3	27
Excellent	5	45	4	36	1	9

If the permeability does not change with time, it means that it can be used to detect the change of the magnetic field. The specific detection is as follows:

$$L_j = -\iota FS\frac{dG}{di}. \tag{8}$$

It has been demonstrated by experimental studies that the Hall effect of ferromagnetic materials can be expressed as

$$\kappa_g = H_0Q + \phi_0 N(H_1 - SH_0) = H_0Q + \phi_0 H_c N, \tag{9}$$

where B represents the magnetic induction intensity of the applied magnetic field, N represents the intrinsic magnetization strength, S represents the demagnetization factor, H_0 represents the normal hall coefficient, H_1 represents the abnormal hall coefficient, and H_c represents the spontaneous hall coefficient.

In a low field, the induction intensity of amorphous alloy materials is very small, dominated by anomalous effects, which can be expressed as follows:

$$\begin{aligned} P_f &= \left|\frac{\beta\mu_f}{\beta_W}\right|_{W\longrightarrow 0} = P_c, \\ P_{df} &= \left|\frac{\beta\mu_f}{\beta_W}\right|_{W\geq N_c} = P_0. \end{aligned} \tag{10}$$

When the external field changes the magnetic field, the amorphous alloy material will have an induced voltage phenomenon, and its function expression is as follows:

$$u_N = -\chi_a J_a \frac{dQ_a}{di} \infty - \frac{{N_c}^2 J_a}{g_a}\frac{dQ_a}{di}, \tag{11}$$

where χ_a represents the circumferential differential permeability, J_a represents the cross-sectional area of the axial magnetic circuit, Q_a represents the circumferential magnetic field strength, N_c represents the saturation magnetization, and g_a represents the circumferential magnetic anisotropy.

2.3. Sports Ligament Injury. With the continuous development of economy, people pay more and more attention to the all-round development of people [18]. The country is also advocating the all-round development of people's "ethics, intelligence, physique, beauty, and labor." Therefore, China's sports industry has also taken off. However, injury in sports training is an inevitable problem. Once an injury occurs, it will not only cause great harm to the body, but also affect the performance of the game and reduce the performance of the game [19]. According to statistics, in addition to common abrasions in sports, the most common injury is ligament. Ligaments are the most critical and complex joints of the human body. Ligaments connect bone to bone and are distinct fibrous tissues that either attach to the surface of the bone or fuse with the outer layer of the joint capsule to enhance the stability of the joint and prevent injury. Injury occurs when the ligament is stretched beyond its tolerance by violence that produces nonphysiological activity. No matter what training is being performed, the flexible cooperation of ligaments is required. Because of excessive use, the probability of injury is also greatly increased. Usually we divide ligaments into medial collateral ligament, lateral collateral ligament, anterior cruciate ligament, and posterior cruciate ligament. Both sides of the medial collateral ligament, including longitudinal and oblique fibers, are used to prevent knee rotation instability. The medial side is the main structure that maintains the stability of the medial knee joint. It is related to all parts of the body. The main function is to prevent outward movement; when the knee joint is flexed, the calf is suddenly adducted and internally rotated, and the lateral collateral ligament may be injured [20, 21]. The posterior cruciate ligament starts after the spine of the embryonic bone. The posterior cruciate ligament is also an important structure to maintain the knee joint. Its injury can cause the instability of the knee joint and damage other structures in the joint. Figure 4 is a picture of common ligament injuries:

Table 4: Length of ligament injury training survey.

Group	Number of people	Proportion (%)
More than three years	5	0.8
Two years	33	13.7
One year	98	40.7
Half a year	105	44.8%

3. Amorphous Alloy and Ferroelectric Nanomaterials and the Repair Experiment of Sports Ligament Injury

3.1. Case Selection and Grouping. The experimental subjects were all patients with ligament injury, aged between 18 and

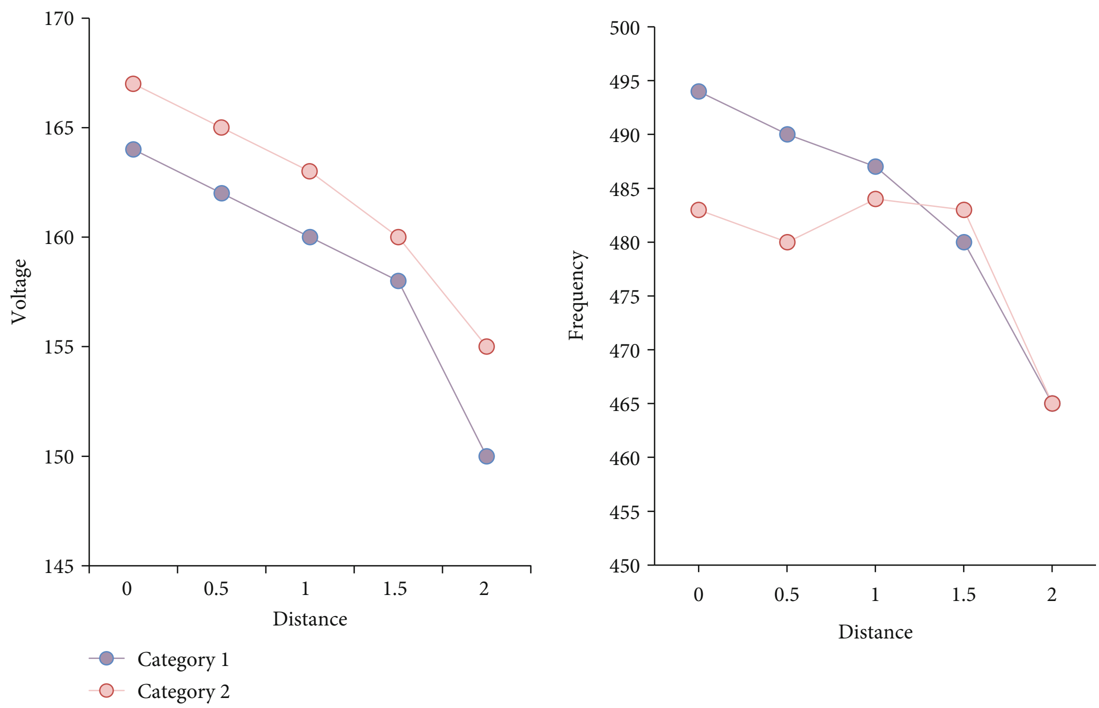

Figure 5: Schematic diagram of the forces applied.

40 years old, and were divided into 4 groups for separate experiments, and statistics were made according to the characteristics of the patients' age, symptoms, and gender [22]. The specific data is as follows:

According to the data in Table 1, in the four groups, the probability of male ligament injury is greater than that of females. Although there may be population base reasons, this situation is not obvious from the experimental data. From the perspective of the age of ligament injury, the number of people between 18 and 20 is relatively small, and the number of people with ligament injuries between 20 and 40 years old is relatively large. This reflects the flexibility of the ligament to a certain extent. Once injured, the possibility of a complete cure is very small [23].

3.2. Comparison before and after Treatment. There is no difference between the four groups of patients with ligament injury before treatment, and they are not comparable. Once different treatments are passed, we can explore the differences in treatments from the treatment results [24].

According to the data in Table 2, it can be seen that the results of treatments arranged by different groups are not the same. In the first group, the good before treatment is 0, the good after treatment is 0, the good before treatment is 0, the good after treatment is 5, the normal before treatment is 3, and the normal after treatment is 8, and the difference before treatment is 15, and the difference after treatment is 6. In the second group, the good before treatment is 0, the good after treatment is 7, the good before treatment is 0, and the good after treatment is 12. Before treatment is generally 5, after treatment is generally 13, the difference before treatment is 10, and the difference after treatment is 3; in the third group, the good before treatment is 0, and the good after treatment is 0. It is 7 for good before treatment, 10 for good after treatment, 3 for normal before treatment, 11 for normal after treatment, 13 for poor before treatment, and 3 for poor after treatment; in the fourth group, the good is 0 before treatment, the good is 3 after the treatment, the good is 3 before the treatment, the good is 7 after the treatment, the general is 6 before the treatment, the general is 9 after the treatment, the difference before treatment was 12, and the difference after treatment was 5. According to the overall treatment effect, the treatment effect of the second group is better, and the treatment effect of the third group is relatively poor [25].

3.3. Treatment Effect Test. In order to explore the effectiveness of the treatment effect, it is not only necessary to look at the operation, but also the probability of recurrence. In order to ensure the validity of the data and scientifically and reasonably reflect the content of the research and discussion, we have analyzed the collected data in various ways. In order to increase the authority of the conclusions, we have invited relevant researchers to conduct research based on the survey questions rationality assessment. The details are as follows:

According to the data in Table 3, in the total number of questionnaires, 0% of people think it is invalid, 9% think that the effect is not good, 0% think that the average person thinks the effect is good, and 18% think that the effect is very good. In the structural effectiveness survey, 0% of people think that the effect is invalid, 27% think that the effect is not good, 18% think that the average person thinks the effect is good, 27% think that the effect is good, and the proportion thinks that the effect is very good 36%; in the content validity survey, 0% of people think it is invalid, 9% think the effect

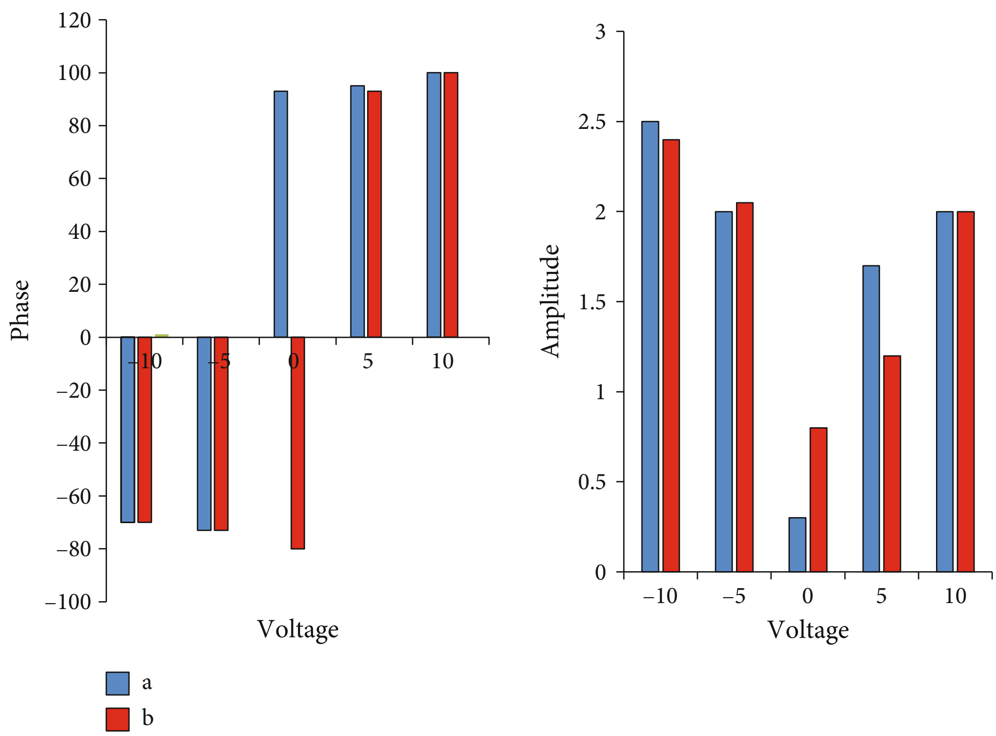

Figure 6: Nanoferroelectric material properties.

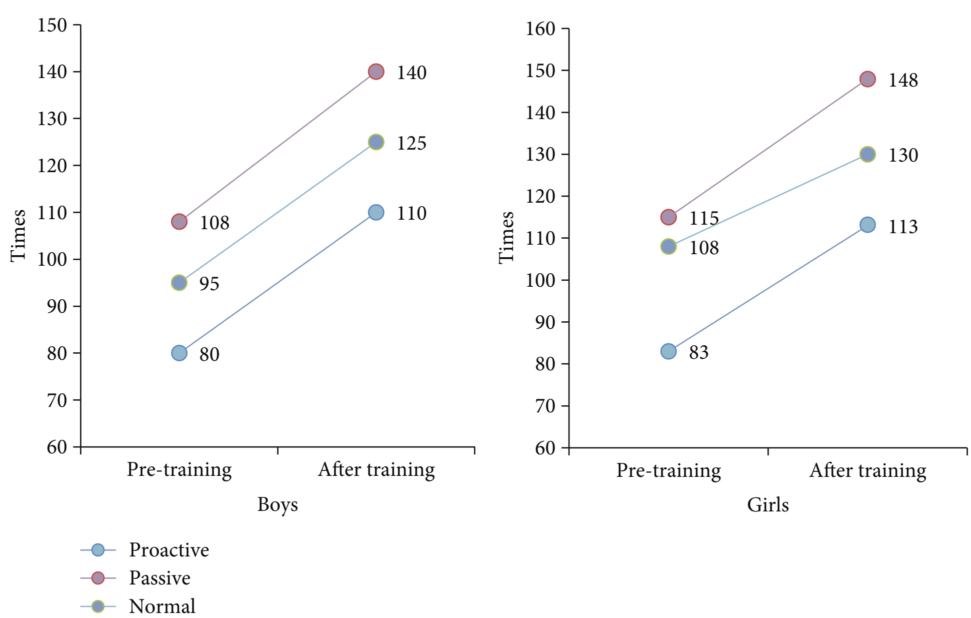

Figure 7: Ligament rehabilitation training values.

is not good, 0% think the effect is good, 27% think the effect is very good, and 9% think the effect is very good. According to the survey results, although the overall treatment effect is not good, the data obtained is still valid. The side proves that the validity survey method is correct and can continue to be implemented.

According to the data in Table 4, it can be seen that ligament injury training is prone to occur. In the survey data, the number of people who trained for three years or more was 5, the percentage of ligament injuries was 0.8%, the number of people who trained for two years was 33, the percentage of ligament injuries was 13.7%, and the number of people who trained for one year was 98. The proportion was 40.7%, the number of training for half a year was 105, and the proportion of ligament injuries was 44.8%. According to ten sentences, ligament injuries often occur at the beginning of training, which is closely related to the training method and self-protection consciousness. The more training time, the less chance of ligament injury, so to a certain extent the protection of ligaments. In addition to medical treatment, it is more important to increase the awareness of self-protection, find the correct training method, and reduce the probability of injury. In this way, the ligaments can be maintained in a good state without frequent injuries.

4. Amorphous Alloys and Ferroelectric Nanomaterials and the Repair Analysis of Sports Ligament Injuries

4.1. Amorphous Alloy Material Design. According to Figure 5, the distance change during the whole experiment is within 2 mm, but the voltage change is within 20 V. Although there is a linear downward trend in the performance of the entire image, the actual value is very small and difficult to measure; this phenomenon also occurs in the frequency; the distance change is only 2 mm, and the frequency is only 30 kHz floating, which will cause great difficulty to the subsequent data capture.

4.2. Ferroelectric Properties of Nanomaterials. According to the data in Figure 6, the performance of the amorphous alloy material changes greatly by changing the voltage during the experiment. When the voltage is negative, the value obtained is also negative. When the voltage is positive, the obtained value is also a positive value. When the voltage is zero, one of the obtained values is a positive value, and the other is a negative value, which indicates that the material has strong ferroelectricity. When the voltage is -10 V, the amplitude difference between the two is very small. When the voltage is -5 V, the two substances are almost the same. When the voltage is 0 V, the two substances begin to have a gap. When the voltage is 5 V, the difference between the two substances in the gap began to narrow. When the voltage was 10 V, the two substances were almost the same.

4.3. Ligament Rehabilitation Training. According to the data in Figure 7, before rehabilitation training, the gap between male and female active knee flexion angles is very small. Passive knee flexion angle is 95 degrees for boys and 115 degrees for girls. From this data, it can be shown that girls' ligaments are more flexible and injured during training. The probability is lower. After a period of training, the active knee bending angle of boys is 125 degrees, the active knee bending angle of girls is 130 degrees, and the knee bending angle of women is still greater than that of men. This proves the previous point of view. In passive knee bending training, the angle of boys after training has reached 140 degrees, and the angle of girls has reached 148 degrees. Although the overall situation has not changed, it has changed significantly from before training, indicating that this training is effective.

5. Conclusions

With the continuous advancement of science and technology, sports and sports performance have received unprecedented attention, but we must pay attention to the physical condition of the athletes while focusing on honor. The topic of this paper is the repair of amorphous alloys and ferroelectric nanomaterials and the repair of sports ligament injuries in soccer. It is expected that the excellent properties of amorphous alloys and ferroelectric nanomaterials will play a role in the treatment of ligaments. In the experiment, this paper mainly completed the following tasks: (1) Research and exploration were carried out from the preparation of new composite magnetic nanomaterials, the construction of immunosensor interface, and the development of new signal amplification and renewable immunosensors. (2) Various methods have been used to conduct in-depth investigations and studies and statistical analysis of the data obtained one by one, to formulate the corresponding rehabilitation training plan. (3) The excellent characteristics and sensitivity of amorphous alloys and ferroelectric nanomaterials are higher than those of conventional methods, with a wide linear range, and are expected to be applied in the field of clinical testing. However, there are still many shortcomings in the experimental work: (1) The experimental subjects are not large enough, and they are only searched in a limited range, which cannot represent the ligament training situation of various sports, so the data obtained is not universally representative. (2) The strength and flexibility of vulnerable parts should be strengthened during the training process. Due to the complexity of sports and different characteristics, it is impossible to provide accurate training methods.

Data Availability

No data were used to support this study.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this article.

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