Analysis of the Effect of Martial Arts on Students’ Physical and Mental Health Based on Internet of Things Technology

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In order to explore the effect of martial arts on the improvement of students’ physical and mental health, this article combines the Internet of Things technology to construct a martial arts learning platform. Moreover, this study improves the IoT node technology and energy consumption algorithm to reduce the system energy consumption of the IoT system, improve the operating efficiency of the IoT technology, and improve the accuracy of martial arts movement recognition and the effect of data transmission. In addition, this study combines the skeleton model to construct the martial arts action 3D human body model. The platform can be used as an intelligent system to improve the physical and mental health of students. In order to study the effect of martial arts on the improvement of students’ physical and mental health, this study uses the system constructed as a test platform to allow college students to learn martial arts through this system platform and combines the questionnaire method to count the improvement of physical and mental health of students after learning martial arts. The experimental research results show that the martial arts learning platform based on the Internet of Things technology can play an important role in improving the physical and mental health of students.

1. Introduction

With the progress of society and the development of science and technology, people are facing more and more competition and pressure from life, study, and work; their psychological load is increasing, and their understanding of health has also undergone great changes [1]. The existing overall health concept holds that health primarily consists of social health (the ability to communicate effectively with others and the environment, as well as satisfying interpersonal relationships), intellectual health (learning ability, intellectual development), emotional health (self-control and the ability to appropriately express emotions, in a state of inner relative balance and satisfaction), and mental health (a strong belief in the integration of human power success) (the ability to complete work). It is not difficult to see that in order to achieve a high degree of health, individuals must maintain a regular dynamic balance in the five characteristics listed above [2]. Traditional Chinese martial arts training serves a variety of purposes in promoting people’s health and harmonious development. In our nation, college students’ mental health is an essential component of their education and their health education. The incorporation of mental health education into physical education is also an excellent method of obtaining college mental health education. The goal of this study is to look at the mechanisms and dimensions of martial arts instruction for enhancing college students’ mental health, as well as the many forms and techniques of improving college students’ mental health in martial arts instruction [3].

Martial arts is a treasure of Chinese culture. It is not only a physical fitness exercise but also regulates bad emotions and cultivates people’s unity and perseverance. College martial arts courses are the ultimate mode of martial arts in the educational structure, and college students shoulder the future of national development, and the level of their spiritual quality determines the vitality and cohesion of the nation. In martial arts teaching in colleges and universities, on the one hand, students use the combination of routines required by the learning curriculum to promote their
physical qualities, such as strength, agility, flexibility, and coordination; on the other hand, martial arts culture contains a way to face difficulties (the spirit of perseverance, a quality of not giving in, and not giving up). In today’s society, with the improvement of material life, people’s mental health has problems of varying degrees. No sport can replace the profound cultural and moral qualities of martial arts. This makes martial arts more and more popular. The school assumes the task of education. Based on this, many college teachers use martial arts teaching as a means to deal with the various psychological problems of college students at this stage. Through martial arts teaching, students can release their tensions and burdens in study and life and strengthen them (psychological endurance, sound personality, and perfect self-awareness).

A healthy psyche is essential for college students’ social growth. College is a critical moment for individuals to improve their mental health. On the other hand, college students face significant academic challenges as well as many external temptations. Students are subjected to a number of stresses and demands. They are prone to psychological issues and need assistance in adjusting. Martial arts have significant cultural and moral aspects, instructors promote the spirit of martial arts via martial arts lessons, and students learn about martial arts thinking and construct accurate views that are in line with the times. This demonstrates that martial arts instruction may help pupils regulate their emotions.

This article uses Internet of Things technology to examine the impact of martial arts in improving students’ physical and mental health, as well as offer a theoretical foundation for future improvements in students’ physical and mental health.

2. Related Work

He et al. [4] believed that fog computing extends cloud computing services from the core of the network to the edge of the network. It is a highly virtualized platform that provides computing, storage, and network services between terminal devices and traditional cloud servers. Ray [5] described the features of fog computing and the application of fog computing in the Internet of Vehicles, smart grid, and wireless sensor networks. Qadri et al. [6] designed and implemented Cloudlet, but the design concept is very similar to fog computing. Cloudlet in this article refers to a computer or computer cluster adjacent to the terminal location, which is safe, resource-rich, and has a good connection to the Internet. This solution proposes for the first time to use fixed computing resources near the mobile terminal to enhance the performance of the mobile terminal. Dobkin [7] used dynamic virtual machine (VM) generation to instantaneously customize application services on Cloudlet. When there is no Cloudlet nearby or the resources of Cloudlet are insufficient, remote cloud resources are used. When the application service is migrated, the entire VM needs to be migrated. Yao and Ansari [8] used technical means such as deduplication, narrowing the semantic gap, and pipeline to optimize the synthesis time of VM. Currently, the problems existing in the migration of Cloudlet-based application services are as follows. (1) It lacks a unified Cloudlet deployment plan and strategy. (2) Most work only focuses on the optimization of Cloudlet performance and application performance and lacks research on Cloudlet security.

The usage of edge servers to enhance website speed has been discussed in the literature [9]. Users connect to the Internet using fog nodes, and fog nodes send out every HTTP request made by users. By implementing a range of optimizations, the fog node minimises the time it takes for visitors to wait for the requested site to load. Edge fog nodes will examine user behaviour and network circumstances to develop novel optimization methods in addition to conventional optimizations (such as caching HTML components, restructuring web page composition, and lowering the size of web objects). Edge fog nodes, for example, may offer users with low-resolution images to improve response time in the event of network congestion. In addition, the edge fog node may monitor the client machine’s performance and provide photographs of suitable resolution based on the browser rendering time. In addition, fog computing is used in the healthcare industry. A distributed system that leverages fog computing for auxiliary analysis to identify the fall movements of stroke patients was suggested in the literature [10]. The author created a fall detection algorithm based on accelerated measurement and time series analysis, then filtered the data before running the algorithm to make the process proceed more smoothly. Sheth et al. [11] proposed a fog computing-based real-time fall detection system. It separates the fall detection jobs, runs them on edge devices and cloud computing centres, and puts them to the test in a real-world setting. The system’s sensitivity is high, according to the findings of the tests, The response time and energy consumption are close to the most effective methods available. Fog computing is widely used, but there is no general fog computing platform construction plan, but the virtualization technology and the network communication problems of fog nodes have been mentioned many times. Container technology is a lightweight virtualization solution that is conducive to providing application services for devices with limited computing and storage resources [12]. Kshetri [13] proposed that the orchestration of applications and services can be realized through the container application boxing mechanism, through which the operation of multicontainer applications can be coordinated. In intelligent vehicle networking, a vehicle self-organizing network architecture called FSDN has been proposed. Siboni et al. [14] combined SDN and fog computing with vehicle self-organizing networks, and the SDN-based architecture can provide programmable and global resource views. At the same time, fog computing can meet the needs of real-time business in the Internet of Vehicles.

3. Improved Algorithm of the IoT Energy Consumption Model

Energy consumption is a key metric for determining how much processing power FN has, as well as one of the major determinants of which subtasks will be completed at this
node. The cost of conducting low-energy-consumption activities on the FN is low, whereas the cost of performing high-energy-consumption tasks on the FN is high. As a result, when task offloading, FSN prefers to run subtasks on FNs with low energy consumption as much as feasible in order to lower the system’s overall energy cost.

First, we introduce the three basic performance parameters of FN and FSN:

(1) The first basic parameter is the CPU processing frequency. Because each fog node has a different composition, the CPU frequency of each fog node is also different. The CPU frequency of FSN is higher than that of FN. The higher the CPU frequency, the stronger its computing power. In this article, the CPU frequency of the i-th fog node is denoted as $f_{i,g}$ [15].

(2) The second basic parameter is the number of cycles executed by the fog node’s CPU when processing 1 bit of data on the fog node. When FN and FSN process 1 bit data, the number of cycles executed by the fog node CPU is not much different. The number of CPU cycles for the i-th fog node to process 1 bit data is denoted as $\tau_{i,g}$.

(3) The third basic parameter is the energy consumption of the fog node’s CPU for one cycle. Because each fog node has different equipment, the energy consumption of its CPU for one cycle is also different. The smaller the parameter, the better the performance of the node. In this article, the energy consumption of the i-th fog node’s CPU for one cycle is recorded as $p_{i,g}$.

Energy consumption is an important basis for measuring whether an FN can perform subtasks. Energy consumption is inseparable from the CPU performance of FN. This section mainly analyzes the energy consumption model based on the specific characteristics of the fog layer. The specific content is as follows:

The three basic performance parameters $f_{i,g}$, $\tau_{i,g}$, and $p_{i,g}$ of the fog node are analyzed above. From this, the time required for the i-th fog node to process 1 bit data can be obtained, as shown in [16]

$$t_i = \frac{\tau_{i,g}}{f_{i,g}}$$  

(1)

The service rate of the i-th fog node is shown in

$$R_{i,g} = \frac{f_{i,g}}{\tau_{i,g}}$$  

(2)

When processing l bit of data on the i-th fog node, the time required is $t_{i,g}$, as shown in

$$t_{i,g} = \frac{l\tau_{i,g}}{f_{i,g}}$$  

(3)

According to formula (3), when the i-th fog node processes l bit data, the total energy consumption is $p_{i,g}$, as shown in

$$p_{i,g} = p_{i,g}^* \frac{1}{f_{i,g}}$$  

(4)

From formula (4), the total energy consumption of the i-th fog node when processing l bit of data can be calculated, and $p_{i,g}$ is used as a major constraint for the task offloading decision. FSN selected nodes 2, 3, and 4 for task offloading. Because the three nodes are performing tasks at the same time, the total energy consumption of the system performing this task at this time is the sum of the energy consumption of nodes 2, 3, and 4.

When the FSN divides the task into n FNs for execution, each FN executes a subtask. At this time, the total energy consumption of the system is the cumulative sum of the energy consumption of each fog node, as shown in [17]

$$P = \sum_{i=1}^{n} P_{i,g}$$  

(5)

The job unloading constraint criteria addressed in this study are three, and these three constraint constraints reflect FN’s compute and storage capabilities. The work offloading is more dependable and efficient because of the common restrictions of these three constraints. The three limits are the length of the delay, the amount of storage available, and the amount of energy used. These three constraints work together to determine whether the FN can complete subtasks, which is the FN’s overall performance model.

The fundamental purpose of task offloading is to reduce delay. The job offloading procedure is shown in Figure 1. The subtasks are submitted to FN to be completed, and the results are returned to FSN. The time from FN to FSN, on the other hand, is usually overlooked in the analysis process since the result of returning FSN is usually extremely little and will have little influence on the outcomes of this article’s study.

When analyzing the delay of subtask j unloading on the i-th FN, the total time from the sending of task j from the FSN to the output of the i-th FN is studied, which is recorded as $\tilde{D}_{i,g}$. This process adopts DNC theory and adopts an end-to-end performance analysis method to quickly obtain the system’s end-to-end total delay. Using this method to calculate the delay size simplifies the analysis process of the delay under the conventional method and can accurately obtain the upper bound of the delay size [18].

As shown in Figure 1, FSN collects the data uploaded by the terminal and divides the overall task into several subtasks. For ease of understanding, this section takes two subtasks as an example. FSN passes the two subtasks to two nodes for execution. This section mainly analyzes the execution of subtasks, the processing delay of the task on the node, and the total delay of executing the task.

In this clustered fog cluster, the total service curve of FSN is $\beta_j$, and the arrival curve is $\alpha_j$. $\beta_{1_j}$ and $\beta_{2_j}$ represent the equivalent service curve provided by the FSN node for subtasks 1 and 2, respectively. $\alpha_{1_f}$ and $\alpha_{2_f}$ represent the arrival curves of subtasks 1 and 2, respectively. $\beta_{1_f}$ characterizes the service capability of the FSN, and $\alpha_j$ characterizes the characteristics of the task. $\beta_{1_g}$ and $\beta_{2_g}$ represent the service curves of node 1 and node 2, respectively, and both...
represent the service capabilities of nodes 1 and 2. \( \alpha_{1,g} \) and \( \alpha_{2,g} \) represent the arrival curves of subtask 1 and subtask 2 at FN, respectively, that is, the arrival curve of the output of subtasks 1 and 2 from the FSN, and it represents the characteristics of subtasks 1 and 2 reaching nodes 1 and 2 [19].

According to DNC theory, the arrival curve \( \alpha_{1,g} \) of subtask 1 at node 1 can be obtained, as shown in

\[
\alpha_{1,g} = \alpha_{1,f} \odot \beta_{1,f}. \tag{6}
\]

At this time, the total delay of executing task 1 on node 1 is shown in

\[
D_{1,g} = \sup_{t \geq 0} \left\{ \inf_{u} \left\{ \alpha_{1,f} \leq \beta_{1}^{*} (t + u) \right\} \right\}. \tag{7}
\]

Among them, \( \beta_{1}^{*} = \beta_{1,f} \odot \beta_{1,g} \).

The delay at this time is the maximum value of the horizontal deviation between \( \alpha_{1,g} \) and \( \beta_{1,g}^{*} \), as shown in formula (8).

From the formula, the total time \( D_{1,g} \) from the FSN issue to the output from node \( i \) can be obtained, as shown in

\[
D_{1,g} = \begin{cases}
\frac{\tau_{1,g}}{f_{i,g}} = U, k \tau_{1,g} \leq f_{i,g}, \tau_{1,g} \leq f_{i,g} \\
\frac{\tau_{1,g} + \frac{(b - l)(k \tau_{1,g} - f_{i,g})}{(k - r)f_{i,g}}}{f_{i,g}} > f_{i,g}, \tau_{1,g} \leq f_{i,g}
\end{cases}
\tag{8}
\]

The size of \( D_{1,g} \), characterized as the computing power of FN, that is, \( D_{1,g} \) is the first constraint condition for task offloading in fog computing. Among them, \( f_{i,g} \) represents the frequency of the node’s CPU, and \( k \) represents the rate of the link.

In the same way, the time for node 2 to perform the subtask can be calculated. From the analysis, we can see the total delay of the task from FSN to FN, and the result from FN is shown in

\[
D_{\text{max}} = \{D_{1,g}, D_{2,g}, ..., D_{n,g}\}. \tag{9}
\]

This article hopes to achieve task offloading efficiently, while ensuring that the value of \( D_{\text{max}} \) is as small as possible.

FN has certain computing and storage capabilities. FN has higher capabilities than terminals, but its capabilities are not as good as cloud centers. Therefore, when the task is unloaded, a constraint condition related to the storage capacity of FN is required.

It can be concluded that the data backlog from FSN to FN is shown in

\[
\beta_{i,g} = \sup_{t \geq 0} \left\{ \alpha_{i,f} - \beta_{i}^{*} \right\}. \tag{10}
\]

That is, it is the maximum vertical distance between \( D_{\text{max}} \) and \( \beta_{i,g}^{*} \).

\[
\beta_{i,g} = u \left\{ \alpha_{i,f}, \beta_{i}^{*} \right\}. \tag{11}
\]

The maximum buffer size of node \( i \) may be computed using formula (11). The buffer size is a reserved portion of memory for temporarily keeping data that cannot be processed in this area of the memory. The performance of a clustered cluster of fog nodes varies based to the diverse technology that makes up the FN [20].

(1) The FN cannot be utilised if the available storage space is inadequate to sustain the data backlog created by the execution of the subtask.

(2) The FN may be utilised if the amount of the FN’s remaining storage space is larger than the data backlog created by the subtask’s execution.

(3) Due to variables such as data bursts, it is extremely simple to generate congestion and packet loss when the remaining storage space is not considerably different from the size of the buffer. As a result, the proportion of the buffer size to the node’s available storage capacity should be considered while choosing the FN for job offloading, as given in [21]

\[
T_{2,i} = \frac{B_{i,g}}{B_{i}}. \tag{12}
\]

Among them, \( B_{i} \) represents the remaining storage space of node \( i \), and the smaller the \( T_{2,i} \) of FN, the better the performance. In this article, \( T \) represents the equivalent storage capacity of node \( i \). It is the second constraint condition for FN to perform task offloading.

Energy consumption is an important indicator to measure the computing power of FN, and it is also a condition that must be considered when deploying FN in the offloading of fog layer tasks. This section mainly analyzes the energy consumption of FN execution tasks and standardizes the energy consumption, which is convenient to use energy...
consumption as a constraint condition in the following
MOTO algorithm and GOMOTO algorithm.

The energy consumption \( P_{i,g} \) of the i-th node is shown in
formula (4). \( p_{i,g} \) is the third constraint condition for task
offloading in fog computing.

According to the execution process of the subtasks in
Figure 1, the total energy consumption of task offloading can be obtained by formulas (4) and (5), as shown in [22]

\[
p = \sum_{i=1}^{n} \frac{l_{i,g}}{f_{i,g}} \tag{13}
\]

This article hopes to achieve task offloading efficiently in
the fog layer, while ensuring that the power value is as small as possible to meet the energy consumption requirements of FN.

The delay of FN’s execution of subtasks, the storage capacity, and energy consumption of nodes determine the overall performance of FN, which is an important basis for whether FN can execute subtasks. The comprehensive performance model of FN proposed in this article is based on
\( D_{i,g}, B_{i,g} \), and \( P_{i,g} \) of FN.

In order to make \( D_{i,g}, B_{i,g} \), and \( P_{i,g} \) constrain FN together, the three constraints \( D_{i,g}, B_{i,g} \), and \( P_{i,g} \) need to be transformed into one constraint. Because different constraint conditions have different dimensions, it is meaningless to compare the data directly at this time. In order to solve the above problems, it is necessary to standardize the three constraints of \( D_{i,g}, B_{i,g} \), and \( P_{i,g} \) before performing numerical comparisons.

This article uses the method of dispersion standardization to linearly transform the delay \( D_{i,g} \) and the energy consumption \( P_{i,g} \), so that the values of \( D_{i,g} \) and \( P_{i,g} \) are distributed between \([0, 1]\).

\( D_{g}^\text{max} \) represents the maximum value of the delay in the FN performing the task, and \( D_{g}^\text{min} \) represents the minimum value of the delay in the FN performing the task. In this article, \( T_{3,i} \) is used to represent the equivalent delay parameter of the i-th FN. At this time, the equivalent delay is between 0 and 1, and the smaller the equivalent delay, the better the performance of FN, as shown in [23]

\[
T_{3,i} = \frac{D_{i,g} - D_{g}^\text{min}}{D_{g}^\text{max} - D_{g}^\text{min}} \tag{14}
\]

\( P_{g}^\text{max} \) represents the maximum value of energy consumption in the FN performing the subtask, and \( P_{g}^\text{min} \) represents the minimum value of energy consumption in the FN performing the subtask. This article uses \( T \) to represent the equivalent energy consumption parameter of the i-th FN. At this time, the equivalent energy consumption is between 0 and 1, and the smaller the equivalent energy consumption, the better the performance of FN, as shown in

\[
T_{1,i} = \frac{P_{i,g} - P_{g}^\text{min}}{P_{g}^\text{max} - P_{g}^\text{min}} \tag{15}
\]

As shown in formula (13), the equivalent storage capacity is \( T_{2,i} = B_{i,g}/B \in [0, 1] \) and \( T_{2,i} \) is dimensionless, so \( T_{2,i} \) can be used directly.

In order to evaluate the comprehensive performance of FN, this article adopts a linear weighting method to set different weights \( W \) according to user requirements for equivalent energy \( T_{1,i} \), equivalent buffer \( T_{2,i} \), and equivalent delay \( T_{3,i} \). The three constraints of \( T_{1,i}, T_{2,i}, \) and \( T_{3,i} \) are simplified into one constraint, denoted by \( T_{i} \). The \( T_{i} \) characterizes the comprehensive performance of FN, as shown in

\[
T_{i} = W_{1}T_{1,i} + W_{2}T_{2,i} + W_{3}T_{3,i},
\]

\[
W_{1} + W_{2} + W_{3} = 1, 0 \leq W_{1}, W_{2}, W_{3} \leq 1. \tag{17}
\]

4. Martial Arts Learning Platform for College Students Based on IoT Technology

The topology’s hardware is the base, and cloud computing will be utilised for processing, with virtualization coming later. It ensures the data and information security of the security service platform utilised in the school’s internal network while also allowing access to users from outside the school. Figure 2 depicts the topological structure of the martial arts learning system for college students based on the Internet of Things that was developed in this article.

In order to realize the feature recognition of martial arts actions, this article introduces a human skeleton model and converts the recognized human model into a skeleton model. The human skeleton model constructed in this article is shown in Figure 3.

After constructing the human skeleton model in this article, the data can be transmitted through the Internet of Things node and transmitted to the data processing center. In the data processing center, the skeleton model is converted into a skinned 3D human body model through 3D digital processing, as shown in Figure 4.

The human body model in skeletal animation technology, unlike the human body in physiology, just contains “skeleton” and “skin,” with no muscle acting as a volume between them. As a result, the vertical distance between each vertex and the longitudinal section of the skeleton is given at the first stage of the production of this mesh point set in order to make the model seem realistic. This distance varies as the skeleton moves, causing the skeleton figure to move “lively.” During movement, each vertex is influenced by one or more skeletons in order for the character model to behave more realistically. This article uses Internet of Things image and video processing technologies to recognise martial arts action elements and compare them with a standard database. Figure 5 depicts the martial arts action feature extraction.

Because the internal structure of the human body is too complicated, it is difficult to construct a human skeleton model, and it is basically difficult to establish an extremely accurate three-dimensional human body model. In the process of constructing the human skeleton model, this article will use the principle of human movement and use several important joint points and skeletons to construct the three-dimensional skeleton model of the human body, as shown in Figure 6.
This system is a network-based application that connects to the campus network through the Internet. Network hardware platforms, network operating systems, Internet server software, client software, and other network platforms must all be considered. Figure 7 depicts the structural diagram.
5. Analysis of the Effect of Martial Arts on Improving Students’ Physical and Mental Health Based on IoT Technology

This article uses Internet of Things technology to create a martial arts instruction system for college students. This approach allows college students to study martial arts at a distance. The platform may be utilised as a smart system to help students improve their physical and mental health. The text system is being utilised as an experimental platform for college students to learn martial arts using the text system platform in order to research the influence of martial arts on the improvement of students’ physical and mental health.
Furthermore, this article employs a questionnaire approach to assess the improvement in students’ physical and mental health as a result of their martial arts training. This article teaches college students the fundamental three-way Changquan using a martial arts learning platform based on the Internet of Things. The experimental group is made up of these students. A control group is also put up with a typical physical education programme. Before and after the test, the physical and mental health of the experimental and control groups are assessed. Tables 1 and 2 illustrate the findings obtained.

From the above research, we can see that the martial arts learning platform based on the Internet of Things technology constructed in this article can help students improve their physical and mental health. Compared with students studying general physical education courses, students studying martial arts have a higher degree of improvement.

**Table 1: Statistical results of physical health evaluation.**

| No. | Control group | Test group | No. | Control group | Test group | No. | Control group | Test group |
|-----|---------------|------------|-----|---------------|------------|-----|---------------|------------|
| 1   | 97.4          | 97.3       | 80.5| 89.3          | 47         | 60.5| 78.2          |
| 2   | 95.3          | 97.2       | 78.9| 88.7          | 48         | 59.6| 77.9          |
| 3   | 95.2          | 97.1       | 77.6| 87.8          | 49         | 59.0| 77.8          |
| 4   | 95.1          | 97.0       | 76.9| 87.5          | 50         | 58.4| 76.7          |
| 5   | 94.9          | 94.7       | 76.8| 87.1          | 51         | 58.2| 76.6          |
| 6   | 94.8          | 94.7       | 75.1| 86.9          | 52         | 58.1| 76.1          |
| 7   | 94.5          | 94.6       | 74.7| 86.9          | 53         | 55.1| 76.1          |
| 8   | 94.3          | 94.6       | 74.5| 86.4          | 54         | 53.5| 74.2          |
| 9   | 91.4          | 94.1       | 70.1| 86.1          | 55         | 53.0| 73.8          |
| 10  | 90.7          | 93.2       | 69.7| 86.1          | 56         | 52.7| 73.8          |
| 11  | 90.6          | 93.1       | 68.1| 85.6          | 57         | 51.7| 73.4          |
| 12  | 89.8          | 92.8       | 67.6| 85.6          | 58         | 51.6| 72.9          |
| 13  | 89.1          | 92.7       | 67.4| 84.4          | 59         | 51.3| 72.1          |
| 14  | 88.8          | 92.4       | 66.4| 84.1          | 60         | 51.2| 71.6          |
| 15  | 88.4          | 92.3       | 66.3| 83.7          | 61         | 51.0| 71.2          |
| 16  | 87.2          | 92.2       | 66.3| 83.4          | 62         | 50.9| 71.0          |
| 17  | 85.7          | 90.3       | 66.2| 82.7          | 63         | 50.5| 70.9          |
| 18  | 85.2          | 90.3       | 65.8| 81.5          | 64         | 50.2| 70.3          |
| 19  | 84.3          | 89.9       | 64.2| 81.2          | 65         | 49.2| 70.1          |
| 20  | 83.1          | 89.9       | 62.0| 80.7          | 66         | 49.0| 69.9          |
| 21  | 82.5          | 89.7       | 61.3| 80.4          | 67         | 48.8| 69.4          |
| 22  | 82.0          | 89.4       | 60.8| 80.2          | 68         | 47.6| 69.3          |
| 23  | 81.0          | 89.4       | 60.6| 78.6          | 69         | 46.5| 68.8          |

**Table 2: Statistical results of mental health evaluation.**

| No. | Control group | Test group | No. | Control group | Test group | No. | Control group | Test group |
|-----|---------------|------------|-----|---------------|------------|-----|---------------|------------|
| 1   | 94.0          | 95.5       | 77.6| 86.7          | 47         | 62.8| 72.9          |
| 2   | 93.3          | 95.4       | 77.2| 86.7          | 48         | 61.6| 72.7          |
| 3   | 92.7          | 95.0       | 77.0| 85.4          | 49         | 61.5| 71.6          |
| 4   | 90.8          | 94.6       | 76.4| 84.4          | 50         | 61.3| 70.2          |
| 5   | 89.4          | 94.5       | 75.3| 84.2          | 51         | 61.0| 69.2          |
| 6   | 88.6          | 94.2       | 74.1| 83.6          | 52         | 60.5| 68.4          |
| 7   | 87.9          | 94.1       | 74.1| 83.3          | 53         | 60.5| 66.8          |
| 8   | 86.8          | 93.9       | 73.5| 82.7          | 54         | 60.4| 66.1          |
| 9   | 86.4          | 93.9       | 72.9| 82.5          | 55         | 58.7| 65.2          |
| 10  | 86.2          | 93.2       | 72.7| 82.3          | 56         | 55.7| 65.1          |
| 11  | 84.6          | 92.8       | 72.6| 81.8          | 57         | 53.4| 64.9          |
| 12  | 84.4          | 92.2       | 72.3| 81.1          | 58         | 52.4| 64.8          |
| 13  | 83.6          | 91.8       | 72.0| 80.9          | 59         | 51.2| 64.8          |
| 14  | 83.6          | 90.5       | 71.2| 80.4          | 60         | 49.7| 64.7          |
| 15  | 83.3          | 89.4       | 70.0| 79.9          | 61         | 48.9| 64.5          |
| 16  | 82.1          | 89.2       | 69.6| 79.5          | 62         | 47.3| 64.0          |
| 17  | 81.4          | 89.0       | 69.2| 78.8          | 63         | 46.7| 63.2          |
| 18  | 80.9          | 88.0       | 68.9| 75.1          | 64         | 45.6| 62.3          |
| 19  | 80.2          | 87.7       | 66.3| 74.9          | 65         | 45.0| 62.2          |
| 20  | 79.2          | 87.6       | 66.3| 74.7          | 66         | 42.9| 62.0          |
| 21  | 78.6          | 87.5       | 65.8| 73.1          | 67         | 40.8| 59.8          |
| 22  | 78.0          | 87.2       | 64.1| 73.1          | 68         | 40.6| 59.3          |
| 23  | 77.8          | 86.9       | 63.9| 73.0          | 69         | 40.4| 59.0          |
in physical and mental health. It can be seen that the martial arts learning platform based on IoT technology can play an important role in improving the physical and mental health of students.

6. Conclusion

This article mainly proposes a human martial arts gesture recognition method based on the Internet of Things and bone data, using the bone data obtained by Kinect to extract the characteristics of human gestures. After a series of processing and calculations, the purpose of human body gesture recognition is achieved. On this basis, the martial arts learning platform is constructed, and the martial arts learning system based on the Internet of Things technology is explored through experiments to analyze the effect of the martial arts learning system on students' physical and mental health.

The survey found that the martial arts elective course affects mental health to a certain extent. For martial arts learning, only long-term martial arts exercise can have a great effect on people's mental health. The students selected in this study have relatively short learning time for martial arts. This survey can find that martial arts can bring joy to most college students. Moreover, it can be seen that the martial arts elective course still affects the mental health of college students to a certain extent.

Data Availability

The experimental data used to support the findings of this study are available from the author upon request.

Conflicts of Interest

The author declares no conflicts of interest regarding this work.

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