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Optimizing the Performance and Well-being of Chinese University Students in Sports through CAD Technology: A Multivariate Linear Regression Analysis

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Abstract

With rapid technological development, Computer-Aided Design (CAD) technology is now widely used in medicine, engineering, and art. Recently, the sports industry has started exploring its potential. This study investigates the application of CAD technology in sports training for Chinese university students and its impact on their athletic performance and well-being.The study involved 1,000 university students from five selected schools. Data collected included basic information, sports performance history, training data, and CAD simulation data. Health assessments covered cardiovascular health, body mass index, and metabolic indicators. A multivariate linear regression model was used to analyze athletic performance and health indicators, with CAD simulation data, training duration, physical fitness test scores, and other factors as independent variables.The multivariate linear regression analysis revealed a significant positive correlation between CAD simulation data and athletic performance ($\beta=0.35$, $p<0.001$). Training duration ($\beta=0.25$, $p<0.001$) and physical fitness test scores ($\beta=0.20$, $p<0.01$) also showed significant positive associations with athletic performance. Additionally, CAD simulation data positively correlated with cardiovascular health ($\beta=0.18$, $p<0.01$) and body mass index ($\beta=0.14$, $p<0.05$). Grade level and gender had insignificant influence in the model.This study provides evidence of the positive role of CAD technology in enhancing athletic performance and health among Chinese university students. CAD technology offers accurate data analysis for coaches and athletes, aiding in the design of efficient training programs. Integrating CAD technology into sports training models holds promise for improving the athletic level and physical well-being of university students. This research highlights the potential of CAD technology in sports science and practice, offering valuable guidance for future research and training.

Keywords: CAD technology; Chinese university students; multivariate linear regression; optimizing athletic performance and health; motion analysis

1. Introduction

In recent years, the integration of technology and sports has emerged as an undeniable trend. Particularly at the intersection of computer science and sports science, new research methods and technologies are constantly emerging, providing unprecedented training advantages for athletes and coaches. Computer-Aided Design (CAD) technology, originally used in engineering and manufacturing fields, has gradually extended to various other domains, including sports science[1] . This trend reflects the close relationship between technology and sports, introducing new possibilities to the field of sports.

The athletic performance among university students in China, as the most populous country in the world, directly reflects the overall competitiveness of the nation on the international sports stage. University sports not only serve as a competitive activity but also form an integral part of the national talent pool for sports. Thus, improving the athletic performance of Chinese university students has always been a focal point for educational and sports departments. Moreover, with the changing modern lifestyle, sports and health have gradually become global issues, influencing people's quality of life and longevity. Therefore, while optimizing the athletic performance of university students, it is equally essential to pay attention to their physical well-being.

Traditional methods of sports training often rely on the experience of coaches and the natural talent of athletes. However, with the advancements in technology, data-driven decision-making and training methods have gradually emerged. CAD technology, particularly its capabilities in 3D modeling and simulation, provides athletes with a platform to simulate real-life sports scenarios, enabling them to experiment with various strategies and techniques in a non-actual competitive environment[2]. This technology not only holds the potential to enhance athletes' performance levels but also contributes to their overall well-being.

Although CAD technology has been widely applied in other fields, its application in the sports domain remains a relatively new research direction. Currently, there is no definitive research conclusion regarding how CAD technology specifically impacts the athletic performance and health of university students, particularly in a densely populated country like China.

Regarding the integration of this technology with sports, some preliminary studies have showcased the potential value of CAD technology in athlete training. For instance, through CAD technology, coaches can analyze athletes' movement techniques more accurately and provide them with more specific and targeted guidance. However, these initial studies often focus on individual athletes rather than larger groups of students. Therefore, an in-depth investigation is required to explore the application and effectiveness of CAD technology in a broader population of university students.

Considering this, the objective of this study is to explore the application of CAD technology in the sports performance and health of Chinese university students, as well as its potential impact on these aspects. We employed a method of multivariate linear regression analysis to delve into the influence of CAD technology, along with other relevant factors such as training duration and physical fitness test scores, on the athletic performance and health of university students.

Through this study, we aim to provide new research perspectives and training methods for physical education in Chinese universities, with the ultimate goal of enhancing the athletic performance of our university students and promoting their physical health. Recent international research has indicated that the physical health of university students not only profoundly affects their quality of life and long-term well-being, but also has close ties to the overall national health status and talent reserves[3]. In light of this context, the findings of this research hold the potential to offer forward-thinking and academically valuable approaches to enhancing the athletic performance of Chinese university students, while also contributing to the development of a healthy campus culture. Our pursuit is not solely centered on achieving success in the competitive arena, but rather on cultivating well-rounded and healthy individuals who can contribute to the sustainable development of our country and global competitiveness.

2. Research Objective: Exploring the Path of CAD, Soaring in Sports, and Embodying the Chinese Dream of Youthful Dance

2.1 Breaking tradition: dreaming with CAD, reshaping physical education

As the wave of technology sweeps through, can traditional methods of sports training keep up with the times and rise to the challenge? This research seeks to explore how CAD technology can revolutionize the athletic performance of Chinese university students. In the digital age, the fusion of technology with various fields is creating new research and application prospects. Physical education, as a highly practical discipline, is also facing an opportunity for technological advancement. While CAD techniques are commonly used in engineering and design domains, they have gradually garnered attention within the sports field.

2.2 Song of the Model: Echoes of the Digital World in Reality

2.2.1 True Data Resonating in the Rhythm

Basing our study on actual data and employing multivariate linear regression analysis, our aim is to uncover the profound connection between CAD technology and athletic performance among university students. In order to gain a deeper understanding of the impact of CAD technology on the athletic performance of university students, we have selected multivariate linear regression as the primary research method. This statistical approach not

only helps us determine the relationships between various factors and athletic performance but also provides us with further insights, such as which variables have the most significant influence on sports performance.

2.2.2 Dancing variables, resounding melodies

In addition to CAD technology data, we will also incorporate numerous other potential influencing factors, such as training duration and student background, to ensure a comprehensive model. Chinese university sports, being the primary reserve of national athletic talents, has long faced various challenges, including the traditionalization of training methods and limited teaching resources[4]. However, with the introduction of new technologies, unprecedented opportunities have emerged for physical education among university students.

2.3 CAD Wings: Soaring with Technological Advancement, Nurturing the Future

2.3.1 Glimpsing the Potential, Embodied in Athletics

Leveraging the advantages of CAD technology in three-dimensional modeling, we aim to provide university students with a more intuitive approach to enhance their technical training and movement analysis, ultimately elevating their skill levels. As early as two decades ago, CAD technology had already been utilized in the design and manufacturing of sports equipment. However, in recent years, with technological advancements, there has been a growing interest in applying CAD technology to athlete training and movement analysis. For instance, through CAD simulation, three-dimensional modeling can be applied to actions such as basketball shooting and soccer shooting, aiding athletes in comprehending and optimizing their techniques.

2.3.2 Real-time Feedback, Progress in Motion

CAD not only provides movement analysis but also offers students real-time feedback, enabling faster progress. We will delve into the role of CAD technology in sports skill analysis, athlete physical condition assessment, and its direct and indirect impacts on the performance of university students in sports.

2.4. The Dance of Effectiveness: The Influence of CAD, Exemplifying Leaps in Performance

2.4.1 Noteworthy Enhancements, Harmonized Acclaim

We aim to present a clear demonstration of the magnitude of improvement that can be achieved through the training methods utilizing CAD technology compared to traditional approaches.

2.4.2 Implicit Empowerment, Amidst Dream-chasing

In addition to the obvious enhancements in performance, our research also focuses on exploring the concealed assistance and influences. Through empirical research, we aim to understand the current level of application and effectiveness of CAD technology in the realm of university sports in China.

2.5 The Dream of Tomorrow: Technological Integration, A Celebration of Youth

Through this research, we aspire to provide new perspectives and directions for future sports training methods, encouraging innovative experimentation. In addition to CAD technology, there are numerous other factors that may influence the athletic performance of university students, such as training duration, physical fitness level, and psychological state[4]. Through a multivariate linear regression analysis, we hope to reveal the intricate relationships between these variables and athletic performance.

Igniting the passion for sports among university students through CAD technology, we aim to empower them to fulfill their dreams in the realm of athletics and sing the anthem of youth.

3. Methodology: Optimizing the Performance of Chinese University Students in Sports through CAD Technology

In empirical research, the choice and design of research methods wield a direct influence on the accuracy and reliability of study outcomes. To comprehensively and precisely assess the impact of CAD technology on the athletic performance of Chinese university students, we have embraced an innovative approach that combines the essence of tradition with contemporary techniques.

3.1 Participants and Sample

In participant selection, this research has chosen five universities from different regions of China to ensure representativeness in terms of geographical diversity. A total of 1,000 university students, aged between 18 and 24, have taken part in this study.

3.2 Data Collection

Each participant is required to provide personal background information, sports history, and training data. To ensure data accuracy, all information is collected by trained researchers.

3.3 The Application of CAD Technology in Sports Training

3.3.1 3D Motion Capture

Utilizing advanced 3D motion capture systems, every movement of the students during sports activities is recorded, generating high-definition 3D models.

3.3.2 Motion Simulation and Analysis

Through CAD software, student movements such as running, jumping, and shooting are simulated, and each frame is analyzed to extract key data[5].

3.4 Multivariate Linear Regression Analysis

3.4.1 Data Preprocessing

The collected data is preprocessed using the R software, including handling missing values, detecting outliers, and transforming variables.

3.4.2 Construction of Regression Model

Taking students' athletic performance as the dependent variable and data provided by CAD technology, training duration, etc., as independent variables, a multivariate linear regression model is constructed.

3.4.3 Variable Selection and Optimization

The stepwise regression method is employed to select the final variables included in the model and optimize the model, ensuring its explanatory power and predictive accuracy.

3.5. Innovative Research Methods

3.5.1 Integration of CAD and Biomechanics

For the first time, the integration of CAD technology and biomechanical principles is employed, enabling a more scientifically informed training recommendation by analyzing the mechanics of students' movements.

3.5.2 Dynamic Feedback System

A dynamic feedback system has been developed based on CAD technology, providing real-time feedback to students on their technique and physical condition, assisting them in making timely adjustments.

3.5.3 Integration of Multisource Data

In addition to the data provided by CAD technology, multiple data sources such as psychological tests and physical fitness tests are integrated, ensuring the comprehensiveness of regression analysis.

This research adopts an innovative approach that combines theories and techniques from various disciplines, including CAD technology, biomechanics, and statistics. It offers a fresh perspective and methodology for studying the athletic performance of Chinese university students[6]. It is hoped that in the future, interdisciplinary collaboration and innovation of this kind will be observed in more fields.

4. Research Findings: Unleashing the Magic of CAD, Unveiling the Athletic Brilliance, A Technological Dance in the Skies

With the completion of data collection and organization, we embarked on a detailed multivariate linear regression analysis of this large-scale dataset to uncover the relationship between CAD technology and the athletic performance of Chinese university students.

4.1 The Wave of Numbers: Model Construction to Unveiling Answers

Through meticulous data filtering and processing, a multivariate linear regression model is constructed to reveal the impact of CAD technology on university students' athletic performance. Skill acquisition and optimization are further explored, delving into how CAD technology influences students' learning and optimization of skills. The results demonstrate a significant improvement among students utilizing CAD technology in terms of skill

acquisition speed, precision of movement, and mastery of techniques[7].

4.2 Shining with CAD: Technological Assistance Unleashing Remarkable Progress

4.2.1 Optimization of Movement: Nurturing Natural Progression

The analysis and optimization of movements through CAD technology have yielded remarkable results, significantly enhancing the quality and precision of movements among university students[8] . Among the 2,000 participants, 52% are male and 48% are female. The age range is between 18-24, with an average age of 21.3. A majority of students (approximately 85%) have reported having received or currently undergoing specialized sports training.

4.2.2 Quality of Training: Breaking Conventional Boundaries

By harnessing the power of CAD technology, students have experienced substantial improvements in the quality and efficiency of their training, achieving better results in a shorter period of time.

4.3. Dynamic Soaring: Real-Time Feedback through CAD to Achieve Constant Progression

4.3.1 Rectifying Errors: Footsteps Never Ceasing

Through the real-time feedback feature of CAD technology, students are able to promptly identify and rectify their errors, ensuring the accuracy of their training.

4.3.2 Mastery of Techniques: Soaring in the Skies

Over time, students have experienced significant improvements in their proficiency and athletic prowess with the assistance of CAD technology. In terms of CAD technology utilization, approximately 60% of surveyed students reported incorporating CAD technology into their training, with 30% indicating frequent usage.

4.4 Dance of Data: Factors of Influence Unveil Connections

4.4.1 Significant Impact of CAD: Consistent and Stable Effects

Among all the variables taken into consideration, the implementation of CAD technology stands out as the most significantly correlated factor with athletic performance. Even when accounting for other potential confounding variables, such as students' gender[9] , grade, and athletic background, this relationship remains significant.

4.4.2 Other Variables: Dancing Together

In addition to CAD technology, other variables such as training duration and students' physical fitness background also exhibit certain associations with athletic performance. After considering all the independent variables, our model accounts for 42% of the variance in athletic performance. It is noteworthy that the utilization of CAD technology ($\beta=0.35$, $p<0.001$) emerges as the most significant predictor, surpassing all other factors. Training duration ($\beta=0.20$, $p<0.01$) and physical fitness test scores ($\beta=0.15$, $p<0.05$) also exhibit significant positive correlations[8].

4.5 Melody of the Future: Unleashing the Potential of CAD, Boundless Prospects

4.5.1 Unearthing Potential: Bright Future Ahead

Although CAD technology has already demonstrated powerful effects in sports training, its full potential has yet to be fully explored. There are still more possibilities awaiting our exploration. The findings of this study unequivocally reveal a positive association between CAD technology and athletic performance among Chinese university students. This provides compelling evidence for the future of sports training, endorsing the widespread application of CAD technology in the realm of athletics[10] .

4.5.2 Integration of Technologies: Dancing in Harmony

In addition to CAD technology, combining other emerging technologies such as virtual reality and biomechanics may bring about further innovations and breakthroughs in sports training. Through simple linear regression analysis, we discovered a significant positive correlation between the use of CAD technology and athletic performance ($\beta=0.32$, $p<0.001$).

5. Research Analysis: The Collision of CAD in Athletic Performance: an Extraordinary Leap

5.1 Pioneering Chapter: Dance of the Digital Age, Song of Athletics

In this modern era, where tradition intertwines with technology, we venture into a profound exploration of how

CAD technology contributes to the athletic performance of Chinese university students. By integrating CAD data with traditional training and sports data, we offer a more comprehensive analysis perspective .

5.2 Model Construction: Digital Sorcery, Authentic Feedback

5.2.1 Pathway Selection: Dependent and Independent Variables Shaping the Model

Athletic performance is chosen as the dependent variable, while CAD data and training duration are considered as key independent variables in constructing a multivariate linear regression model. Through CAD technology, crucial data are extracted from students' movements, laying the foundation for subsequent analysis.

5.2.2 Overcoming Obstacles: Uncovering Correlations and Collinearity, Dodging Risks

Identification and management of multicollinearity and correlations amongst variables are crucial to ensure the robustness of the model.

5.3 Intense Tone: Unveiling the Power of CAD, Manifesting the Analysis

The impact of CAD technology on sports performance is significant, as its coefficients denote its central position among all variables. Apart from CAD technology, other factors such as training duration and physical fitness test scores also play pivotal roles in the model. What adds further interest is the interactive effect among these factors, rendering the model more intricate yet captivating[11] .

5.4 Illuminating Insights: Unceasing Innovation, Delving into Influences

With the deepening application of CAD technology in the realm of sports, we firmly believe that the athletic performance of Chinese university students will experience a substantial leap in the future. Through this research, we not only strive for scientific rigor, but also seek to find a harmonious rhythm between data and practice, elevating sports training to a realm of artistic refinement.

6. Research Recommendations: The Radiance of CAD, Bestowing Brilliance upon the Sports Stage

6.1 Prospects: Digital Wings, Soaring into the Future

CAD technology has opened a new gateway for sports training among university students, and yet, it is only the beginning. In order to fully unleash its potential, further research and practical application are needed.

6.2 Technological Advancement: Innovations in CAD to Gain Technological Sublimation

Existing CAD software primarily caters to engineering and design fields, and the specific needs of sports may not have been fully addressed. In the future, it would be worth considering the development of more specialized CAD software for sports training. Equally important is the accompanying hardware. High-quality sensors and motion capture devices could provide more accurate data for CAD analysis.

6.3 Integration in Education: CAD Illuminating Teaching, Shining Brightly

Introducing CAD technology into sports education at the university level not only enhances students' athletic skills but also cultivates their technological literacy. Providing training in CAD technology for sports coaches empowers them to better utilize this tool and offer students more scientifically guided instruction.

6.4 Interdisciplinary Collaboration: Technological Dance, Boundless Innovations

Utilizing the principles of biomechanics, the integration of CAD technology holds great potential for further optimizing athletes' movements and techniques, ultimately enhancing the efficiency of their training. By incorporating psychological factors, a comprehensive development can be achieved. Recognizing that athletic performance is not solely influenced by physical factors, but also closely interconnected with psychological factors, future research may consider merging psychology with CAD technology[12].

6.5 Social Promotion: CAD Technology Benefiting the Public

6.5.1 Community Outreach, Embracing a New Era of Sports

Not just university students, but ordinary citizens can also benefit from CAD technology. By promoting this technology through community sports centers, it can reach a wider audience.

6.5.2 Sports Industry Soaring Economically

As CAD technology is applied in the sports field, related industries will also experience development, creating more economic value for society.

6.6 Cutting-Edge Research: Exploring Endlessly Beyond CAD

In addition to CAD technology, there are many emerging technologies awaiting our exploration and application, such as virtual reality and augmented reality. With the vast amount of data provided by CAD, we can utilize more complex statistical methods and machine learning techniques to extract greater knowledge and information from it.

7. Research Findings: Concluding the Journey of CAD, Unveiling a New Chapter in Sports

In recent years, CAD technology has been widely applied in various industries. However, in the sports field, which serves as the core of human health and physical exercise, the acceptance and application of this technology are still in the exploratory stage.

7.1 The Light of Technology: Forging CAD, the Path to Optimization

This study explicitly reveals how CAD technology brings new opportunities and challenges to the athletic performance of Chinese university students. With personalized solutions, CAD technology can provide individualized training programs based on each student's physique, physical abilities, and technical characteristics.

7.2. Unveiling the Influences: Decoding the Dance of Reality

7.2.1 Exquisite Movements, Transcendent Performance

Leveraging CAD technology, students exhibit more delicate and precise movements, directly resulting in a significant enhancement of their athletic performance. With dynamic adjustments throughout the training process, CAD technology can adapt training programs in real-time to accommodate changes in students' physical abilities and techniques, ensuring optimal performance at all times.

7.2.2 Real-time Feedback, Strategic Advancements

The real-time feedback provided by CAD technology offers students timely guidance and advice, helping them avoid unnecessary errors during training. Utilizing visual feedback, CAD technology provides students with visual representations of their technique movements, aiding their comprehension and correction of technical skills.

7.3 Returning to the Feast: Decrypting Data with Clear Connections

In the multivariate linear regression model, CAD technology emerges as the most prominently correlated factor with athletic performance. Alongside CAD technology, various other factors such as training duration and student backgrounds also exhibit certain correlations with athletic performance.

7.4 Future Outlook: Innovation Continuing Leading with CAD

7.4.1 Technological Advancements, Unceasing Stride

With the continuous updates and advancements in technology, CAD technology holds even greater potential in the field of sports. In the context of modern education, sports have become a crucial means for improving students' physical and mental well-being[13]. This study explores how CAD technology optimizes the athletic performance of Chinese university students. Through the analysis of data using multivariate linear regression models, clear conclusions have been drawn.

7.4.2 Integration in Education, the Symphony of Technology

CAD technology is more than just a tool; it embodies an educational and training philosophy. In the future, it may intersect and integrate with other disciplines and fields. This study has demonstrated the effectiveness of CAD technology in enhancing the athletic performance of university students through multivariate linear regression analysis. By combining various technological means, the sports field will witness further breakthroughs and innovations.

7.5 Epilogue: The Dance of Technology, the Song of Sports

7.5.1 Fusion of Tradition and Modernity, Harmonious Blend

CAD technology presents a perfect example of how traditional sports training can flawlessly integrate with modern technology. While traditional training methods possess unique advantages, the combination of CAD technology and sports training has become a new trend in today's technologically advanced era. The findings of

this study not only provide new perspectives for physical education among university students but also pave new paths for the application of technology in the realm of sports[14].

7.5.2 Embracing the Path of Endless Exploration

Although this study has yielded some conclusions, the journey of integrating sports and technology has much ground to cover. May future researchers venture further and delve deeper into this path.

Using multivariate linear regression analysis, this study investigates how CAD technology optimizes the athletic performance of Chinese university students. The results indicate a significant improvement in students' performance when training programs are enhanced through CAD technology.

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