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Article

Exploration on the application of dynamics principles in police physical education curriculum teaching

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Abstract: The police physical education curriculum focuses on the integration of physical training and police skills training, aiming to enhance students' physical fitness and police skill levels. By reasonably applying the principles of dynamics, teachers can develop more scientific and reasonable training plans, optimizing aspects such as strength training, speed training, endurance training, and skill instruction. The application of dynamics principles not only helps improve students' physical fitness but also assists teachers in better understanding the mechanical principles involved when students perform movements, thereby enabling more effective skill instruction. Therefore, in the teaching of police physical education, emphasis should be placed on the integration and practice of dynamics principles to improve teaching quality and effectiveness, providing strong support for cultivating high-quality police talents.

Keywords: physical education curriculum; principles of dynamics; teaching application

1. Introduction

The principles of dynamics have extensive application value in the teaching of police physical education courses. Police physical education is one of the important components in the comprehensive quality training of police at public security academies. The optimization and innovation of teaching modes not only concern the physical fitness and combat skills of "police cadets" but also relate to the quality and capabilities of the police force. At the National Conference of Directors of Public Security Bureaus held on 14 January 2024, it was emphasized that efforts should be made to "ensure security, promote development, advance reforms, and strengthen teams at a high standard, accelerate the formation and enhancement of new combat capabilities for public security, faithfully fulfill sacred duties, strive to advance the modernization of public security work, and contribute the strength of public security to solidly and steadily advancing Chinese-style modernization" [1]. The people's police are a crucial safeguard for maintaining social stability and promoting social development. Mastering police skills is a powerful support for enhancing the combat effectiveness of the new generation of public security forces and is the foundation for the law enforcement application of the people's police. A weak foundation can lead to instability, so it is important to emphasize the application of dynamic principles, lay a solid foundation, and truly make police physical education serve grassroots law enforcement work and practical police training. As an important part of physics, dynamic principles mainly study the laws governing changes in the motion state of objects and analyze the performance of human movement. These principles have extensive applications and far-reaching impacts in the teaching of police physical education courses. Human motion analysis is applied in various fields such as sports performance, medical diagnosis, surveillance, human-computer interfaces, or video

conferencing. Depending on the activity of interest, different sensor configurations are used to capture and digitize human movements [2]. In the digital and networked era, people have higher requirements for physical fitness. In the future, fitness will not only require good fitness equipment and environments, but also more convenient and intelligent refined fitness services such as health management, service guidance, social interaction, and entertainment [3]. By applying the principles of dynamics reasonably, teachers can develop more scientific and reasonable training plans to enhance students' physical fitness and police skills. Meanwhile, the principles of dynamics can also assist teachers in better understanding the mechanical principles involved when students perform actions, thereby conducting more effective skill teaching. Therefore, emphasis should be placed on the application of dynamics principles in police physical education teaching to improve teaching quality and effectiveness.

2. The importance of dynamics principles in police physical education curriculum teaching

Technological advancements in sports science have led to profound changes in the field, ushering in an era of enhanced, objective, and real-time performance analysis [4]. The exploratory research on the application of dynamics principles in police physical education curriculum teaching has brought tremendous changes to the advancement and application of sports science and technology. It enhances the scientific nature of police physical education curriculum teaching, strengthens the physical fitness and police skills of police officers, promotes innovation and development in police physical education curriculum teaching, improves the safety and efficiency of police officers when performing tasks, and provides theoretical support for the continuous optimization of police physical education curricula. The following is a detailed analysis:

2.1. Enhancing the scientific nature of police physical education curriculum teaching

As an important branch of physics, the principles of dynamics reveal the laws governing the change in the motion state of objects. The scientific contributions of kinesiology researchers will lead the trend, but science-based conceptual sports and complementary fitness education programs that align with sports content standards and fitness education benchmarks will play a crucial role [5]. The curriculum setting for police physical education is divided into: public security and justice, non-public security, and in-service police training (see **Table 1**). In police physical education curriculum teaching, by introducing the principles of dynamics, teachers can more scientifically analyze students' motion states, develop more reasonable training plans, and optimize training content and methods. This helps to enhance the scientificity and systematicness of police physical education curriculum teaching, ensuring the maximization of training effects.

Table 1. Statistics on the distribution of police physical education curriculum content at Fujian police college.

Name	Course Content
Public Security and Justice	"Specialized Physical Fitness for Policemen", "Unarmed Combat Techniques for Policemen", "Police Defense and Control", "Weapon Use", etc.
Non-public Security Category	General Physical Fitness, Martial Arts and Fitness, Sanshou (a form of Chinese martial art), Specialized Physical Fitness, etc.
On-duty policemen	Comprehensive Police Skills: Police Practical Training, etc.

2.2. Enhancing police officers' physical fitness and police skills

When police officers are on duty, they need to possess good physical fitness and police skills. Through the physical fitness assessment conducted for first-year students from the 2019 to 2024 intakes upon their enrollment at Fujian Police College, it was found that the increasing college entrance examination scores did not lead to a corresponding improvement in students' physical fitness. Instead, the failure rate has been rising (see **Table 2**). The application of dynamics principles can help students better understand the laws of body movement, improve physical qualities such as strength, speed, and endurance, and also enhance their police skills. For example, strength training guided by dynamics principles can enhance students' muscle strength and explosive power, improving their response capabilities when on duty.

Table 2. Statistics of physical fitness assessment results for first-year public security majors at Fujian police college.

Grade/Year	Grade 2019 (50 students)	Grade 2020 (50 students)	Grade 2021 (50 students)	Grade 2022 (50 students)	Grade 2023 (50 students)	Grade 2024 (50 students)
Excellent (above 90 points)	3	2	2	3	3	2
Good (76–89 points)	19	21	23	15	20	23
Pass (60–75 points)	20	16	15	17	13	11
Fail (below 60 points)	8	11	10	15	14	14

2.3. Promoting innovation and development in police physical education curriculum teaching

With social progress and technological development, police physical education curriculum teaching also needs continuous innovation and development. The application of dynamics principles provides new ideas and methods for police physical education curriculum teaching, helping to drive reform and innovation in curriculum teaching. By introducing dynamics principles, teachers can explore more efficient and practical training methods, increase students' interest and participation in learning, and further improve teaching quality and effectiveness.

2.4. Improving police officers' safety and efficiency when on duty

Police officers face various complex and dangerous situations when on duty. Through the application of dynamics principles, teachers can help students better grasp

the laws of body movement, improving their safety and efficiency when on duty. For example, police skills training guided by dynamics principles can enable students to more proficiently master various police skills, enhancing their response capabilities and self-protection abilities when dealing with emergencies.

2.5. Providing theoretical support for the continuous optimization of police physical education curricula

The applied research on dynamics principles not only contributes to the improvement of current police physical education curriculum teaching but also provides theoretical support for the continuous optimization of future curricula. Through in-depth research on the application of dynamics principles in police physical education curriculum teaching, we can identify existing problems and deficiencies, propose improvement suggestions and opinions, and provide useful references for future curriculum design and teaching implementation.

3. Specific applications of dynamics principles in police physical education curriculum teaching

Education and research should support teachers in using digital tools in outdoor learning environments and integrating them into the curriculum [6]. The principle of dynamics is the fundamental carrier of digital technology, Physical education instructors should assess how users perceive the usefulness of technology in their sports environment [7]. The specific applications in police physical education curriculum teaching involve various aspects such as strength training, analysis and optimization of motor skills, prevention and rehabilitation of sports injuries, as well as simulation and evaluation of police practical skills. These applications not only enhance the scientificity and systematicity of police physical education curriculum teaching in a sports environment, but also contribute to improving students' physical fitness and police skill levels.

3.1. Scientific guidance for strength training

Newton's Second Law (F = ma) in the principles of dynamics provides a scientific basis for strength training. In police physical education curriculum teaching, teachers can precisely control the changes in students' acceleration (a) and mass (m) by adjusting training loads (i.e., force F) and training methods, thereby enhancing muscle strength and explosive power. For example: Dynamic Isotonic Contraction Training: Alternating muscle contraction and relaxation through changes in the position of limbs and equipment enhances muscle contraction speed and elasticity. This training method follows the relationship between force and acceleration in the principles of dynamics, improving students' muscle strength and explosive power by continuously increasing training loads. Static Isometric Contraction Training: Overcoming resistance by altering muscle tension while maintaining a fixed body position and posture. This training method also relies on the principles of dynamics, exercising muscles at constant length through the continuous application of stable loads.

3.2. Analysis and optimization of motor skills

The principles of dynamics can also be used to analyze and optimize the motor skills required by police officers when executing tasks. For example: Analysis of Rotational Movements: In sports like gymnastics and diving, athletes adjust the magnitude and direction of angular momentum by controlling the mass and radius of gyration of different body parts. Police officers can similarly apply this principle when executing rotational movements, achieving smoother and more efficient rotations by adjusting body posture and center of gravity. Training for Balancing Movements: Maintaining body balance is crucial when performing movements on equipment like the balance beam and horizontal bar. Police officers also require good balance ability when executing tasks to cope with various complex and dangerous situations. Guided by the principles of dynamics, teachers can design specific balance training to improve students' balance and stability.

3.3. Prevention and rehabilitation of sports injuries

The principles of dynamics can also be used to analyze the mechanical mechanisms in the process of sports, identifying risk factors that may lead to sports injuries. For example: Analysis of Impact Forces and Joint Loads: Joints experience significant impact forces during movements like running and jumping. By analyzing the principles of dynamics, teachers can understand the impact of different movements on joint loads, designing more reasonable training plans to reduce the risk of sports injuries. Guidance for Rehabilitation Training: For injured students, teachers can develop personalized rehabilitation training plans based on the principles of dynamics. By controlling training loads and movement patterns, they can gradually restore muscle strength and joint flexibility in the injured areas.

3.4. Simulation and evaluation of police combat skills

In police physical education teaching, the principles of dynamics are used to simulate and evaluate police combat skills. For example: Simulated Confrontation Training: By simulating confrontation scenarios in actual combat, teachers can use the principles of dynamics to analyze parameters such as force, speed, and acceleration during students' confrontations, thereby assessing their police combat skill levels. Testing and Evaluation of Technical Movements: Using dynamics simulation and modeling technology, teachers can test and evaluate new technical movements without interfering with students' training. This helps teachers identify problems and deficiencies in technical movements and provide targeted guidance and advice to students.

4. Case study on the application of kinetic principles in police physical education curriculum teaching

The practical case analysis of kinetic principles in police physical education curriculum teaching holds significant importance. It not only aids students in deeply understanding movement laws and improving technical skills but also facilitates the formulation of scientific training plans, optimization of technical movements, prevention of sports injuries, enhancement of police operational capabilities, and

promotes interdisciplinary research development. Therefore, emphasis should be placed on the practical case analysis of kinetic principles in police physical education curriculum teaching, with continuous exploration of its application methods and approaches in teaching and training.

4.1. Grappling and combat training

The principle of dynamics, a branch of physics, studies the causes and laws governing changes in the motion state of objects. It has important applications in sports, especially in grappling and combat training. Grappling techniques are the main content of the "Police Defense and Control" course in police physical education programs. They are techniques used to control an opponent's body and restrict their movements. The basic principle involves optimizing the coupling of one's own force with the opponent's force through the rational application of human body structure and mechanical principles, as well as knowledge of kinematics and biomechanics, thereby achieving control over the opponent. The maturity of digital transformation in sports leads to enhanced digital capabilities, creating digital advantages, increasing flexibility, innovation, and broader participation, and establishing personalized products and services to improve the sports experience [8]. The principles of dynamics can provide foundational support for the digitization of sports, involving a deep understanding and application of knowledge about human body structure, mechanical principles, kinematics, and biomechanics. Here are the details: Firstly, force application and Newton's laws of motion. In grappling and combat, athletes need to fully utilize Newton's laws of motion. For example, Newton's second law ($F = ma$) states that the acceleration of an object is directly proportional to the force acting on it and inversely proportional to its mass. In grappling and combat, police trainees need to overcome the inertia generated by the opponent's mass and increase the force to improve acceleration, thereby gaining an advantage. They apply force through rapid and accurate movements to disbalance the opponent. Secondly, reaction force and conservation of momentum. Newton's third law (action-reaction law) states that for every action, there is an equal and opposite reaction. In grappling and combat, police trainees can use this principle to apply force to the opponent with reasonable technical movements while reducing the reaction force on themselves. Additionally, the principle of conservation of momentum also plays an important role in grappling and combat. Trainees can predict and judge the opponent's movement trajectory and speed changes by controlling the change in their body's momentum and make corresponding technical movements. Thirdly, friction and stability. Friction is also crucial in grappling and combat. Police trainees need to make full use of the principle of friction to generate control effects using the friction between their bodies and the opponent's body or other objects. For example, during grappling, trainees can increase friction by increasing the contact area and pressure with the opponent to control them more effectively. At the same time, trainees need to maintain their own stability, utilizing the vertical and horizontal stability of their bodies to transfer and support force to critical points on the opponent. Fourthly, joint mechanics and grappling techniques. Grappling also relies on a deep understanding of the mobility of human joints and their mechanical properties. Police trainees must learn how to reasonably control and

restrain the opponent by applying force to the joints during training. This requires a deep understanding of human anatomy, joint kinematics, and biomechanics. For example, trainees need to know which joints are vulnerable to attack and how to apply force to cause pain and disable the opponent's resistance.

4.2. Armed swimming training

Practical case analysis of the application of dynamic principles in police physical education curriculum teaching, specifically in armed swimming training, is mainly reflected in the following aspects: Firstly, balance and distribution of forces. In armed swimming training, police officers need to maintain balance in the water and overcome water resistance to move forward. This involves the principles of force balance and distribution. One aspect is buoyancy and gravity: officers need to utilize the balance between their own buoyancy and gravity to maintain a stable posture in the water. By adjusting their body posture and breathing, officers can control the magnitude of buoyancy to maintain balance in the water. Another aspect is propulsive force and resistance: during armed swimming, officers need to use the propulsive force of their arms and legs to overcome water resistance and move forward. Through reasonable arm strokes and leg kicks, officers can generate sufficient propulsive force while reducing resistance, thereby increasing swimming speed. Secondly, conservation of momentum and angular momentum. Conservation of momentum in armed swimming refers to the need for officers to maintain a certain speed while swimming. According to the principle of conservation of momentum, officers can control their speed by adjusting the frequency and intensity of their arm strokes and leg kicks, thereby maintaining a stable swimming state. Conservation of angular momentum refers to the need for officers to maintain a stable posture during swimming, especially the position of their heads. By controlling their body's moment of inertia and angular velocity, officers can maintain conservation of angular momentum, thereby keeping their heads in a stable position and reducing swaying and shaking in the water. Thirdly, energy conversion and consumption. Armed swimming is a high-intensity sport that requires a significant amount of energy. During training, officers need to allocate their physical strength reasonably to ensure successful completion of the swimming task. One aspect is muscle contraction and energy release: during swimming, officers need to use muscle contraction to generate propulsive force. Through reasonable muscle contraction and relaxation, officers can convert chemical energy into mechanical energy to propel their bodies forward. Another aspect is energy consumption and recovery: during long-duration swimming training, officers need to arrange rest times reasonably to ensure energy recovery and replenishment. Through reasonable training plans and nutritional supplements, officers can maintain a high level of physical fitness and successfully complete swimming tasks.

4.3. Physical fitness training

Physical fitness training in police physical education curriculum aims to enhance police officers' physical qualities such as strength, speed, endurance, flexibility, and coordination to better cope with various challenges during law enforcement. Dynamic principles, as fundamental theories in physics, provide scientific guidance and basis

for physical fitness training. Firstly, dynamic principles in strength training. Dynamic principles, specifically Newton's second law of motion (F = ma), play an important role in strength training. This law states that an object's acceleration is directly proportional to the force acting on it and inversely proportional to its mass. Therefore, during strength training, by increasing training load (i.e., mass m) or training intensity (i.e., force F), officers can stimulate their muscles to produce greater force. Squat thrust training: officers can gradually increase the weight of the barbell during squat thrust training to increase the training load, thereby stimulating the leg and hip muscles to produce greater force. Bench press training: by increasing the weight of the bench press, officers can exercise the strength of their upper limbs and chest, improving their ability to confront and restrain criminal suspects during law enforcement. Secondly, dynamic principles in speed training. Speed training focuses on improving officers' movement speed and reaction speed. The law of conservation of momentum in dynamic principles (i.e., an object's momentum remains constant in the absence of external forces) provides theoretical support for speed training. By optimizing movement techniques and increasing muscle contraction speed, officers can increase their momentum and thus improve speed. Sprint training: officers can improve speed through optimizing starting posture, increasing step frequency and stride length, and other technical movements during sprint training. At the same time, by strengthening the strength training of the legs and core muscle groups, officers can increase muscle contraction speed, further increasing momentum and speed. Reaction speed training: through reaction speed training, such as using signal lights or sounds to stimulate officers to respond quickly, officers can exercise their reaction speed and agility. Thirdly, dynamic principles in endurance training. Endurance training focuses on improving officers' continuous exercise capacity and fatigue resistance. The law of conservation of energy in dynamic principles (i.e., energy cannot be created or destroyed; it can only be converted from one form to another) provides theoretical support for endurance training. By reasonably allocating physical strength and optimizing energy metabolism pathways, officers can improve their endurance levels. Long-distance running training: through long-distance running training, officers can improve their cardiopulmonary function and muscle endurance. During training, officers need to learn to allocate physical strength reasonably to avoid premature exhaustion leading to fatigue. Interval training: through interval training, which involves performing high-intensity exercise for a short period, followed by a rest period before performing the next high-intensity exercise, officers can exercise their fatigue resistance and recovery abilities. Fourth, practical training programs and precautions. Firstly, the training programs are as follows: Example 1: Squat thrust training to improve muscle strength. Athlete information: mass m =80 kg, maximum force for squat thrust F_max = 2400 N (assumed to be obtained through testing). Training objective: Enhance muscle strength. Training movement: Squat thrust. Calculation of required resultant force: Assuming the acceleration for squatting and standing up a = 0.5 m/s^2 (this value can be adjusted based on actual conditions), the required resultant force F = ma = 80 × 0.5= 40 N (this is just an example, and the acceleration changes throughout the movement should be considered in actual calculations). However, since squat thrust involves the coordinated action of multiple

muscle groups, and athletes utilize their body weight and inertia during the movement, the required resultant force is much greater than this value. In this case, the athlete's maximum force F_max can be used as a reference, and an appropriate training weight (such as 70%–80% of F_max) can be selected for training. Determination of training weight and repetitions: Choose a training weight that is 75% of F_max, which is 1800N (equivalent to a weight of about 180kg, with adjustments possible for the weight of equipment and barbells). Perform 4 sets of training, with 8–12 repetitions per set. Example 2: Plyometric squat training to improve explosive power. Athlete information: Same as above. Training objective: Enhance explosive power. Training movement: Plyometric squat. Calculation of required resultant force: In plyometric squats, athletes need to generate large accelerations in a short period of time to complete the jumping movement. Therefore, lighter weights (relative to maximum force) should be selected and movements should be performed quickly. Assuming the acceleration for the jumping movement $a = 2\ m/s^2$ (this value can be adjusted based on actual conditions), the required resultant force $F = ma = 80 \times 2 = 160$ N. However, it should also be noted that plyometric squats involve rapid contraction and energy release by multiple muscle groups, so the required resultant force is much greater than this static calculation. In this case, appropriate training weights and speeds can be selected based on the athlete's actual ability and training objectives. Determination of training weight and repetitions: Choose lighter weights (such as 30%–40% of F_max) and perform movements quickly. Perform 3 sets of training, with 10–15 repetitions per set. Secondly, the precautions are as follows: Personalized training: Everyone's body weight, strength level, and training objectives are different, so personalized training plans need to be developed based on individual circumstances. Gradually increase difficulty: To avoid overtraining and injury, the difficulty of training should be gradually increased (such as by increasing weight, improving speed, etc.). Pay attention to movement quality: During training, maintain correct posture and movement trajectories to ensure training effectiveness and reduce the risk of injury. Monitoring and evaluation: Regularly monitor athletes' training progress and physical condition, and adjust training plans in a timely manner to accommodate athletes' changing needs.

5. Promoting pathways of kinetic principles in police physical education curriculum teaching

Physical education is regarded as an important discipline for cultivating healthy habits and well-being. Moreover, the impact of technology on all aspects of life is now an undeniable reality [9]. The principles of dynamics, which study the relationship between the motion state of an object and the external forces acting on it, hold significant application value in physical education and training. Especially in police physical education curriculum teaching, the promotion pathways of dynamic principles can help students better understand the laws of motion and enhance their police skills and physical fitness levels. By deeply studying and applying these principles, police cadets' athletic skills and physical fitness levels can be more effectively improved, cultivating more high-quality talents for public security work.

5.1. Strengthening theoretical teaching

Strengthening the theoretical teaching of dynamic principles in police physical education requires multiple approaches. Implementing measures such as introducing dynamic principles, analyzing with practical examples, highlighting the characteristics of the police profession, and updating teaching content will help improve the teaching level of dynamic principles in police physical education and the learning outcomes of students. The following are specific strategies aimed at enhancing the theoretical teaching level of dynamic principles in police physical education: Firstly, introduce dynamic principles. Dynamic principles are the foundation for understanding the motion state and force relationships of objects. Introducing dynamic principles into police physical education courses will help students deeply understand the laws of motion and improve their athletic skills. Clearly introduce the basic concepts, laws, and formulas of dynamic principles in the theoretical teaching of police physical education courses, such as Newton's laws of motion, the theorem of momentum, and the theorem of kinetic energy. By explaining these principles, students can understand the relationship between the motion state of an object and the forces acting on it. Secondly, analyze with practical examples. When police officers perform their duties, they need to quickly and accurately assess situations and respond. The application of dynamic principles can help students better control body movements and forces, enhancing their combat capabilities. Combine dynamic principles with practical cases in police physical education courses, such as obstacle training, climbing training, and grappling and wrestling. By analyzing the motion states and force conditions in these cases, students can more intuitively understand the application of dynamic principles. Thirdly, highlight the characteristics of the police profession. In theoretical teaching, it is necessary to closely combine the characteristics of the police profession and emphasize the comprehensive application of physical fitness, skills, and tactics, so that dynamic principles permeate police skills teaching, making training methods more targeted and practical. Fourthly, update teaching content. With the advancement of science and technology and the continuous development of police work, it is necessary to constantly update theoretical teaching content, introduce the latest research results and practical cases, and improve the timeliness and forward-looking nature of teaching content.

5.2. Optimizing course settings

In the promotion pathways of dynamic principles in police physical education curriculum teaching, optimizing course settings is a key link to improving teaching quality and effectiveness. The following are suggestions aimed at optimizing course settings in police physical education courses to better integrate dynamic principles: Firstly, clarify course goal orientation. Combining the characteristics of the police profession, clarify the goal orientation of the course, tightly combine dynamic principles with practical skills, and ensure that the course settings have both theoretical depth and practical application value. Secondly, introduce ideological and political education goals: Incorporate ideological and political education elements into the course settings to cultivate students' professional ethics, sense of responsibility, and team spirit, complementing the teaching of dynamic principles. Thirdly, scientifically

set course content. Firstly, integrate dynamic principles and police physical education courses, use dynamic principles as the theoretical foundation of police physical education courses, and design systematic course content, including training methods for physical qualities such as strength, speed, endurance, flexibility, and agility, as well as the application of these qualities in police activities. Secondly, increase scenario-based teaching and case-based teaching. By introducing real-life scenarios, let students learn and apply dynamic principles in practice, improving their ability to solve practical problems. At the same time, introduce typical cases to analyze the specific application of dynamic principles in police actions. By introducing real cases, let students analyze the application of dynamic principles in the cases to enhance their understanding and application ability of theoretical knowledge. For example, analyze how police officers use dynamic principles to increase speed and agility during pursuits. Thirdly, strengthen combat simulations: In police physical education courses, increase combat simulation sessions, simulate real police scenarios, and let students use dynamic principles for combat drills in simulated environments. Through combat simulations, students can better understand the application of dynamic principles in police combat. Meanwhile, the latest technological products are utilized to assist in teaching. Implementation Steps - Technology Product Evaluation: Regularly evaluate the latest technological products on the market, such as wearable devices, Virtual Reality (VR) technology, Augmented Reality (AR) technology, etc., to determine which products can effectively aid in teaching. Before introducing new technological products, provide technical training for teachers to ensure they are proficient in the usage and teaching applications of these products. Integrate suitable technological products into the curriculum, such as using wearable devices to monitor students' motion data and utilizing VR technology for simulated combat training. Fourthly, establish a phased training framework and precautions. The first part is the phased training framework. (1) Initial Exposure and Understanding Stage: In the early stages of the course, through theoretical explanations and simple practices, students are provided with a preliminary understanding of the basic concepts and application scope of dynamics principles. Arrange theory classes once a week or every two weeks, combined with specific cases, to give students an intuitive understanding of dynamics principles; (2) In-depth Learning and Practice Stage: As the course progresses, gradually increase the application of dynamics principles in police physical skills training. Through practical activities such as simulated combat, strength training, and speed training, students can deepen their understanding and mastery of dynamics principles through practice. Arrange a comprehensive practical training session once a month to test students' ability to apply dynamics principles; (3) Consolidation and Enhancement Stage: In the later stages of the course, further enhance students' ability to apply dynamics principles by increasing the difficulty and complexity of training. Arrange regular assessments and competitions to stimulate students' interest in learning and sense of competition, promoting skill improvement. Conduct a comprehensive summary and evaluation at the end of each semester to comprehensively evaluate students' learning outcomes. Continuous Update and Optimization: Based on feedback and evaluation results during the course implementation process, continuously update and optimize the course content, teaching methods, and evaluation system. Invite industry experts or scholars to give

lectures or provide guidance to provide students with a broader perspective and deeper understanding. The second part is precautions. (1) Emphasize the Integration of Theory and Practice: In the teaching process, emphasize the integration of theory and practice to avoid pure theoretical indoctrination or blind practical operation; (2) Pay Attention to Individual Differences: There are differences in students' physical fitness and skill levels, so individual differences should be considered and teaching should be tailored to each student's needs; (3) Strengthen Safety Awareness: When conducting practical training, strengthen safety awareness to ensure students' personal safety; (4) Establish a Feedback Mechanism: Establish an effective feedback mechanism to timely collect students' opinions and suggestions for continuous improvement of the course.

5.3. Optimizing teaching methods and means

Optimizing teaching methods and tools is the key to enhancing the effectiveness of dynamics principles in police physical education curriculum teaching. By adopting diversified teaching methods, heuristic teaching, utilizing modern teaching tools, and strengthening the integration of theory and practice, we can more effectively integrate dynamics principles into police physical education teaching, thereby improving students' learning outcomes and practical combat abilities. Here are some specific optimization strategies: First, adopt diversified teaching methods: Combine various teaching methods such as lectures, discussions, experiments, and practical training to stimulate students' interest and initiative in learning. Utilize multimedia teaching tools, such as animations and videos, to visually demonstrate the motion processes of dynamics principles. Second, heuristic teaching: In police physical education curriculum teaching, adopt heuristic teaching methods to guide students to actively think and explore. Through methods such as questioning and discussion, stimulate students' interest in learning and curiosity, enabling them to gain a deeper understanding of dynamics principles. Third, utilize modern teaching tools. Leverage multimedia technology, virtual reality technology, and other modern teaching tools to present dynamics principles in a more intuitive and vivid manner. These teaching tools can assist students in better understanding and mastering dynamics principles, thereby enhancing teaching effectiveness. One aspect is multimedia-assisted teaching: Utilize multimedia resources such as videos and animations to visually demonstrate the application of dynamics principles in policing practices. This helps students better comprehend abstract theoretical knowledge and improves learning outcomes. The second is virtual reality (VR) technology: Use VR technology for simulation training by selecting high-quality VR headsets and controllers that match students' movement needs and provide sufficient immersion and interactivity. Design and set up virtual training scenarios according to the requirements of the police physical education curriculum. These scenarios can include various policing activities such as chasing, apprehending, and combat. Ensure the authenticity and realism of the scenarios so that students can better adapt to and immerse themselves in them. Students wear VR headsets and controllers to enter the virtual training scenarios and conduct simulation training for various policing activities based on the prompts and requirements in the scenarios. Meanwhile, record the students' training processes and use video analysis

software or built-in analysis tools of the VR system to quantitatively evaluate their training effects. Based on the evaluation results, adjust the training plans and methods to improve students' practical combat abilities. Teachers can monitor students' training in real-time and provide timely guidance and feedback. Thirdly, an intelligent teaching platform: Develop an intelligent teaching platform that provides personalized learning resources and assessment feedback. Students can select suitable learning content and difficulty levels based on their own learning progress and needs, enabling autonomous learning and personalized development. Fourthly, strengthen the integration of theory and practice. Firstly, design experimental activities: Combine principles of dynamics to design experimental activities such as measuring the trajectory of moving objects, analyzing the synthesis and resolution of forces, etc., allowing students to experience the application of principles firsthand. Secondly, arrange practical training: Apply principles of dynamics in practical training, such as obstacle courses, climbing training, grappling and combat training, etc., to enhance students' athletic skills and practical combat abilities through practical training. Fourthly, establish a feedback mechanism. Firstly, establish a formal student feedback mechanism: Design and implement regular student satisfaction surveys, which can be in the form of online questionnaires, paper questionnaires, or group discussions, ensuring coverage of all classes and student groups. Set up anonymous feedback channels such as email and suggestion boxes to eliminate students' concerns and encourage them to express their opinions more candidly. Regular teacher-student exchange meetings should be held to directly listen to students' voices, increasing interactivity and immediacy. Secondly, encourage immediate and continuous feedback: After each class or at the end of a teaching unit, invite students to quickly fill out a brief feedback form to collect their immediate feelings about the day's teaching content, methods, and pace. Utilize classroom interaction software or platforms to set up functions such as "like", "ask questions", and "suggestions", allowing students to provide feedback at any time during the lecture. Thirdly, refine feedback content and clarify improvement directions: Feedback questionnaires or forms should be designed to be specific and targeted, such as asking students about their understanding of a certain knowledge point, their feelings about participation in teaching activities, and their evaluation of the clarity of the teacher's explanations. Encourage students to propose specific improvement suggestions, such as which examples they would like to see added, which explanation methods adjusted, and which interactive sessions increased. Fourthly, actively respond to and process feedback: Promptly organize and analyze the collected feedback to identify common issues and individual needs. Publicly disclose the results of feedback processing so that students can see that their opinions are valued and receive practical responses, enhancing their sense of participation and belonging. Adjust teaching plans, content, and methods based on feedback, and invite students to participate in discussions on course design when necessary to jointly optimize the learning process.

5.4. Strengthening the construction of the teaching staff

"Education plans are teacher-centered." Taking Fujian Police College as an example, it is evident that issues such as an uneven age distribution, an unreasonable

educational background structure, and an imbalance in the gender ratio of male and female teachers exist in the teaching of police physical education courses (see **Table 3**). To advance police physical education, not only is innovation in course content and teaching methods required, but also an emphasis on enhancing the professional quality and abilities of the teaching staff. To strengthen the construction of the teaching staff and better promote the application of dynamic principles in police physical education courses, the following aspects can be considered: Firstly, improve teachers' professional quality: Strengthen the training and education of teachers in police physical education courses to enhance their professional quality and teaching abilities. Through training and education, teachers can gain a deeper understanding of dynamic principles and their application in police physical education courses. Teachers are encouraged to self-study relevant textbooks to continuously update their knowledge structure. Teaching seminars can be held to share practical experiences of applying dynamic principles in police physical education teaching. Secondly, strengthen teachers' practical teaching abilities. Through simulated combat training, teachers can personally experience the application of dynamic principles in practical operations. Teachers can be organized to exchange and learn from public security combat departments to understand frontline needs and improve the pertinence and effectiveness of teaching. Teachers are encouraged to participate in the reform and innovation of police physical education courses to explore the deep integration of dynamic principles and police physical education teaching. Thirdly, optimize the structure of the teaching staff. By introducing high-level teachers and cultivating academic leaders, the structure of teachers in police physical education disciplines can be optimized to improve the overall teaching level. Talented individuals with rich practical experience and theoretical knowledge of dynamics can be introduced to enrich the teaching staff. A reasonable teacher echelon should be established to ensure the sustainable development of the teaching staff. "The introduction of talents can inject new vitality into the existing teaching staff. Highly educated and qualified composite talents can effectively change the current professional title structure and educational background structure of teachers, and enhance the teaching and research level of the entire sports teaching staff." [10]. Fourth, strengthen the construction of teachers' ethics and style. Emphasize teachers' professional ethics and sense of responsibility, establish good teachers' ethics and style, and improve teachers' professional quality and moral standards by carrying out teachers' ethics education activities. Fifth, improve the teacher incentive mechanism. Firstly, establish an incentive mechanism: stimulate teachers' enthusiasm for teaching and innovative spirit by setting up teaching awards, scientific research achievement awards, and other methods. Secondly, provide career development opportunities: provide teachers with career development plans and promotion opportunities, and encourage them to continuously improve their professional quality and teaching abilities.

Table 3. Statistics on age, degree, and professional title structure of police physical education teachers at Fujian police college in 2023.

		Total number of teachers	**Aged 26–35 (number of people)**	**Aged 36–45 (number of people)**	**Aged 46–60(number of people)**	**Average age (years)**
Category	Fujian Police College	22	5	4	13	45
Professional Title	Teaching Assistant (number of people)	1	1	0	0	——
	Lecturer (number of people)	8	4	3	1	
	Associate Professor (number of people)	10	0	1	9	
	Professor (number of people)	3	0	0	3	
Degree	Bachelor's Degree (number of people)	13	2	0	11	
	Master's Degree (number of people)	8	3	3	2	
	PhD (number of people)	1	0	1	0	
Gender	Male (number of people)	18	——			
	Female (number of people)	4	——			

5.5. Establishing an evaluation and feedback mechanism

In the process of advancing police physical education curriculum teaching with principles of dynamics, establishing an effective evaluation and feedback mechanism is crucial. It not only helps to identify problems in a timely manner and adjust teaching strategies but also promotes the mutual progress of both teachers and students. Here are the detailed steps to establish such a mechanism: Firstly, clarify the evaluation objectives. Initially, it is necessary to clarify what to evaluate and why. In police physical education curriculum teaching, evaluation objectives should cover students' understanding and application of principles of dynamics, physical fitness levels, practical skills, and other aspects. At the same time, the teaching quality, the effectiveness of teaching methods, and the adaptability of course content should also be evaluated. Secondly, design evaluation indicators. Based on the evaluation objectives, specific and quantifiable evaluation indicators should be designed. For example, the following indicators can be designed: 1) Mastery of theoretical knowledge: Assess students' understanding of principles of dynamics through exams, quizzes, and other methods; 2) Application ability: Evaluate students' ability to apply principles of dynamics to police physical education practice through case analysis, simulated combat, and other methods; 3) Physical fitness level: Assess students' physical fitness and endurance through physical fitness tests; 4) Practical skills: Evaluate students' practical skills and response abilities by setting scenarios and simulating confrontations; 5) Teaching quality and methods: Evaluate the effectiveness of teachers' teaching quality and methods through student evaluations, peer reviews, and other methods. Thirdly, implement the evaluation. Conduct evaluations regularly or irregularly according to the designed evaluation indicators.

Evaluations can include various forms such as classroom observations, analysis of student assignments, exams and quizzes, and practical drills. At the same time, it is essential to ensure the fairness, objectivity, and accuracy of the evaluation process. Fourth, optimize the evaluation mechanism. By utilizing various methods such as questionnaires, interviews, and observations, we can more comprehensively evaluate the teaching effectiveness of police physical education courses, focusing not only on students' physical fitness and skill enhancement but also delving into their psychological factors. Such an evaluation approach helps us gain a more accurate understanding of students' learning states and needs, thereby adopting more targeted teaching measures to improve teaching quality and effectiveness. In police physical education teaching, beyond the traditional evaluation dimension of focusing on students' physical fitness and skill enhancement, we should also deeply investigate their psychological factors, such as satisfaction, learning motivation, and self-efficacy. Here are specific suggestions and methods for evaluating these psychological factors: (1) Satisfaction, evaluation methods, questionnaires: Design questionnaires with multiple questions to inquire about students' satisfaction with course content, teachers' teaching methods, the comfort of the training environment, and other aspects. Interviews: Select some students for in-depth interviews to understand their overall impression of the course and whether they have specific suggestions for improvement. Implementation Steps: Conduct questionnaires and interviews before the end of the course or at the end of the semester to ensure students have enough time to reflect on and evaluate the course. Analyze the questionnaire and interview results, summarize students' satisfaction levels with the course, and identify areas needing improvement; (2) Learning motivation, evaluation methods, classroom participation: Observe students' performance in class, such as their active participation in discussions, exercises, and team activities. Learning progress tracking: Record students' learning progress in the course, including skill mastery and physical fitness improvement rates. Self-Reflection Reports: Require students to write self-reflection reports describing their feelings during the learning process, difficulties encountered, and methods used to overcome them.- Implementation Steps: Regularly collect and analyze students' classroom participation, learning progress tracking data, and self-reflection reports during the course. Based on the analysis results, identify students with insufficient learning motivation and take measures to stimulate their interest and motivation in learning; (3) Self-efficacy, evaluation methods, skill demonstration: Provide opportunities for students to demonstrate the skills they have learned, such as through simulated combat exercises and skill tests. Peer evaluation: Encourage students to evaluate each other's skill mastery and performance. Teacher feedback: Give positive feedback and suggestions based on students' performance to help them build self-confidence. Implementation steps: Organize skill demonstration activities before the end of the course or at specific stages to give students the opportunity to showcase their achievements. Collect peer evaluations and teacher feedback and share them with students to help them recognize their progress and accomplishments. Encourage students to convert their sense of self-efficacy into motivation for continuous learning and improvement. Fifth, continuous improvement. Based on the evaluation results and feedback, continuous improvements should be made to police physical education teaching. For example, adjustments can be made to course content, teaching methods

can be optimized, and practical training can be enhanced. Meanwhile, the evaluation and feedback mechanism should be regularly reviewed and improved to ensure it remains aligned with teaching objectives. Sixth, establish an incentive mechanism. To encourage teachers and students to actively participate in the evaluation and feedback process, a corresponding incentive mechanism can be established. For instance, outstanding students and teachers can be recognized and rewarded, and evaluation results can be used as an important basis for teachers' promotions and students' evaluations for excellence.

6. Conclusion

Through an in-depth analysis of the application of kinetic principles in police physical education curriculum teaching, it is not difficult to find that kinetic principles play a pivotal role in improving police cadets' physical fitness, skill levels, and practical abilities. Kinetic principles not only provide a solid theoretical foundation for police physical education courses but also provide strong support for the innovation of teaching methods and the optimization of practical operations. In police physical education teaching, the application of kinetic principles is not only reflected in the scientific training of physical qualities such as strength, speed, and endurance but also in the precise analysis and optimization of skill movements. Under the guidance of kinetic principles, police cadets can train more scientifically, improve their skill levels more effectively, and demonstrate stronger adaptability and combat effectiveness in actual combat. In the future, with technological advancements and updates in teaching concepts, we have reason to believe that the application of kinetic principles in police physical education curriculum teaching will become more extensive and in-depth. Through continuous exploration and practice, we will provide police cadets with more scientific, efficient, and practical physical education courses, contributing more wisdom and strength to the cultivation of high-quality, highly skilled police talent.

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