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Discussion on Teaching Reform of Sports Anatomy

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Abstract: *Sports anatomy is one of the important subjects in physical education and plays a key role in future physical education. Students who major in physical education must be proficient in basic anatomy knowledge and integrate theory with practice. With the continuous deepening of teaching reform in universities and the continuous innovation of teaching methods, the teaching reform of sports anatomy is facing huge opportunities and challenges. The current problems existing include too little teaching time, traditional teaching methods, mismatch between teaching content theory and practice, and unreasonable teaching evaluation system. Thus, this article proposes the teaching reform of sports anatomy, that is, the reform of class hours, teaching content characteristics, teaching methods, teachers' ability, practice items, and examination system, to provide a reference for the reform of sports anatomy course.*

Keywords: *Sports anatomy; Physical education; Practice; Teaching methods; Reform*

Introduction

Sports anatomy is a key component of the professional basic theoretical courses in physical education colleges and universities, and it is also the basis for students to learn sports technology and scientific training. However, the reform of sports anatomy teaching is facing huge opportunities and challenges with the continuous deepening of teaching reform in universities and the continuous innovation of teaching methods. Due to the changes in college physical education, most schools have reduced the total hours of sports anatomy teaching and laboratory practice. At the same time, however, the wealth of information to be learned is increasing exponentially. How to grasp the balance between teaching time and teaching content is worth exploring. In most colleges of physical education, sports anatomy knowledge is acquired through a so-called 'traditional' teacher-centered approach, namely lectures and anatomy classes. It is not a learner-centered teaching method to teach knowledge of physical anatomy. The traditional lecture teaching is conducive to memory retention instead of thinking, understanding, and problem solving (Singh & Kharb, 2013). Numerous studies reported that active, student-centered learning strategies are more effective than traditional lectures that encourage passive learning (Tanner, 2009). However, there is currently no workable solution to integrate the two approaches (teacher-centered/student-centered) to resolve the dispute on how to teach anatomy most effectively. In the course of teaching, sports anatomy is often taught to students via lectures with slides and models. Although slide images and models can show the relationships between muscles to a limited extent, neither can they show movement well nor be manipulated by students to isolate specific structure(s). Moreover, there are many memory parts in sports anatomy, and students can learn by rote but will easily lose interest in learning. In this context, the emergence of innovative teaching and learning strategies is triggered

to maximize students' learning of sports anatomy. Therefore, this article mainly discusses curriculum construction as well as teaching contents and methods of sports anatomy, which has important practical significance for improving teaching quality.

Course Description

Sports anatomy is a core professional basic theoretical course compulsory in the school of physical education. It is based on the normal human anatomy to study the influence of sports on the structure and development of human body and to explore the relationship between human mechanical movement and sports action (Chang & Jiang, 2018). Sports anatomy is correctly considered as the "basis of Exercise Science" and required for students majoring in Physical Education. This course is the learning foundation for follow-up courses in Biomechanics and Exercise Physiology, as well as a prerequisite for other courses. Ideally, Sports Anatomy is the first course in a physical education university. The textbook, Sports Anatomy (Li, 2015), is used as general teaching materials. Course topics include: (a) the structural basis of human body composition; (b) motor system; (c) digestive system; (d) respiratory system; (e) urinary system; (f) reproductive system; (g) cardiovascular system; (h) nervous system; (i) sense organs; (j) endocrine system. Sports anatomy mainly involves the impact of exercise on the human body's shape, structure and function (focusing on exercise, skeletal muscle, cardiovasology, neurology, etc.), the principle of skeletal muscle movement and physical training, the diagnosis and optimization of movement structure and sports technology, the anatomical mechanism and prevention of sports injuries and abnormal body postures, the research and application of the growth and development of contemporary children and adolescents, the theory and practice of sports to promote physical fitness, and the innovation of sports anatomy teaching methods. Therefore, students must learn not only the structure and function of sports anatomy but also the influence and regularity of sports on human body structure.

Sports anatomy is not simply a basic theory course, but an applied course where spatial visualization is of importance. Despite two-dimensional (2D) static anatomical drawings provided, anatomy textbooks and atlases have limited value in revealing three-dimensional (3D) dynamics of the anatomical structure. Moreover, the application in sports practice is even more lacking. Learners may find it difficult to understand certain dynamic aspects of functional anatomy by visualizing 2D images as 3D and deepen their understanding of physical exercise and sports technology. There are two main parts of the assessment: usual results, examination results. Students who score below 60% will be provided with a "make-up" attempt, otherwise, they retake this course.

Current Problems

Teaching Content Lacking Focus

With the continuous deepening of sports anatomy teaching reform and the rapid development of science and technology, the teaching content has changed and the teaching time has also been reduced. At present, the theory of sports anatomy is the main part, but the practicality and maneuverability account for a small proportion. Also, theoretical courses are rich in content, including eight major systems and sense organs.

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In China, sports anatomy in many physical education colleges has fully adopted the teaching content of medical majors. The teaching content has not been adjusted reasonably according to the professional training objectives of the sports major. At the same time, due to the shortage of class hours and the complexity of teaching content, it is very hard to explain course content comprehensively and systematically and to guarantee the breadth and depth of knowledge. Experimental courses account for one-sixth of the theoretical courses. Therefore, it is difficult to strengthen the knowledge system of students in limited teaching time.

Teachers' Professional Knowledge Reserve and Teaching Ability

At present, teachers who teach sports anatomy have different backgrounds, such as medicine, sports human science, and physical education. As a result, there will be some weaknesses. For example, medical professionals may lack sports experience and sports-related knowledge. In addition to explaining the basic knowledge of anatomy, sports anatomy also needs to be combined with physical exercise in order to add sports interpretation. However, some teachers still stay on books to explain and pay less attention to the dynamics of sports science research. With the development of sports research, the teachers' knowledge system also needs to be constantly updated.

Single Teaching Mode

In the traditional teaching of sports anatomy, teachers often adopt a teaching mode that combines textbooks, atlases, specimens and models. However, students worry about difficulties due to the complexity of anatomical terms, the shortage of human specimens and the lack of imagery in two-dimensional image teaching, resulting in poor teaching effects. Traditional experimental items and contents are demonstrated by teachers and observed by students, which leads to the poor practical ability of students. The experimental course focuses on introducing the structure of the human body but pays little attention to the combination of theory and practice. Experimental projects lack subjective initiative and the ability to encourage students to think creatively and design experiments. Therefore, in the face of limited learning time, students under a single teaching model are prone to get bored and gradually lose interest in learning, coupled with heavy tasks, difficult to understand.

Teaching Evaluation System

The current teaching evaluation is mainly based on usual scores and test paper scores that account for a large proportion. Test papers of sports anatomy are mainly adapted from textbook content into noun explanations, multiple-choice questions, judgment questions, short answer questions and directional questions. In this way, students can easily learn by rote.

Practice Innovation and Reform

Optimization of Teaching Content

In sports anatomy teaching, for sports majors, the teaching content should be selected according to the

goals of professional training, such as movement organs, cardiovascular system and nervous system, etc. That is to introduce the most basic morphological structure and location of the human body concisely, with an emphasis on its commonality, regularity and application points. In addition, teachers can provide topic selection, and students can analyze and discuss according to their interests and time. In sports anatomy and physical education teaching, attention can be paid to cultivating students' ability to analyze and solve problems by combining theory with practice. When explaining muscles, the teacher can give topics such as winged scapula, kypholordosis and applied scratch test. Students choose to analyze and discuss according to their interests. When discussing ways to increase muscle strength, students are required to first consider describing in a self-weight way which muscle strength will be developed in the action. When students have a preliminary grasp of muscle knowledge, they can study sports technology for movement analysis. This not only retains the basic theoretical backbone but also has systematicness and completeness, enabling students to establish the knowledge framework of sports anatomy. In addition, highlighting the content related to the major and combining it with practical application help to stimulate students' interest in learning and apply what they have learned. Therefore, according to the characteristics of sports major, there is a need to highlight the key content of sports anatomy and strengthen the combination of theory and practice.

The Innovation of Teaching Methods

Today, modern technologies are booming, with revolutionary learning potential in many fields. Augmented reality (AR) is a system that adds virtual objects created by computer to generate a real landscape, in which users can see the virtual objects just like the real things (Kurniawan & Witjaksono, 2018). In reality, AR can be used to build students' interest in learning imaginative and incomprehensible concepts, especially in anatomy. It thus becomes complementary to traditional learning, which has been regarded as an effective learning method (Weeks, Pakpoor, Park, Robinson, Rubinstein, Prouty & Nachiappan, 2020; Al Hamidy Hazidar, 2014). Moreover, interactive online teaching and multimedia technology have been also accepted as supplementary support to positively influence students' learning outcomes, which are therefore applied to the teaching of anatomy and physiology (Gopal, Herron, Mohn, Hartsell, Jawor & Blickenstaff, 2010; Has, 2001; Woodrow, Mayer-Smith & Pedretti, 2000; Preim & Saalfeld, 2018). At present, there is a growing increase in anatomy software that builds an interactive educational application using a virtual reality environment, such as complete anatomy, human anatomy atlas, visible body, sports anatomy, etc. These programs can basically meet many important needs, that is, to clearly present the structure of human body according to different systems; to freely manipulate the 3D model of human body; to freely explore the systems selected; to turn on and off the systems selected at any time; to display text description, dynamical intersection and transparent views (Hamrol, Górski, Grajewski & Zawadzki, 2013). In the sports anatomy teaching environment, teachers can integrate technology into the classroom and teach students how to use technology more effectively. VR technology is helpful to supplement teaching and enhance the teaching ability of teachers. The 3D complete anatomy application can be utilized by students to study muscle movements, determine proximal and distal attachment points, understand spatial relationships between structures, take self-assessments, and more, at their convenience (Nair & Lindsey, 2020). At the same time, students can use sports anatomy to understand the functional anatomy of human movement, related training of various body muscles, human joint muscle movement, 3D human body images and AR functions. It has been always complicated to teach human anatomy and movement by using only 2D images. All the 3D anatomy structures and movements can be clarified through advanced technologies that directly use 3D models for interaction. This is even

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more useful when students can use VR systems to see what the teacher explains in class. A study found that student performance on classroom testing could be enhanced by using an application-based web as a skeletal system learning tool (Bice, Carey, Brown, Adkins & Ball, 2016). Therefore, adding virtual reality to teaching classroom will help students understand the human anatomy and strengthen the training of sports movements.

Student-Centered Teaching

The traditional teaching mode is explained from the perspective of how teachers teach and ignores the problem of how students learn. However, it is clear that teaching is student-centered, and the responsibility of learning lies with students, not teachers. If students just sit in class and watch, listen and take notes, they will not learn much from it. In the teaching of sports anatomy, the traditional teacher-centered approach should be transformed into the learner-centered approach. As an instructor or learning partner, the teacher guides students to take the initiative to learn knowledge, relate it to previous experience and apply it to daily life. That is to say, students must turn what they have learned into a part of themselves. In the teaching process, teachers should pay attention to what and how students are learning, the conditions for students to learn, whether students are retaining and applying the knowledge they have learned, and how current learning positions students for future learning (Saulnier, 2008). In sports anatomy teaching, it is necessary to make full use of information technology and network platform. Knowledge points can be made into text, video, micro-class and other forms for resource sharing before and after class to cultivate students' autonomous learning ability. In addition to sharing information, frequent feedback is provided to students in other ways. New strategies for assigning a range of tasks to students in tutorials each week help reduce students' expectations of tutorials that provide a mini-lecture or in which they answer questions mechanically (Gerstman, Salehi & Lobo, 2012). Teachers can arrange discussions in the form of topics and involve students in a discussion of creating an atmosphere that promotes learning.

Increase Teachers' Professional Knowledge Reserve and Teaching Ability

With the development of sports science research and the change of society, people realize the importance of scientific sports. This puts forward higher requirements on sports anatomy, like comprehensive fitness, exercise medicine, Healthy China 2030, etc. Therefore, teachers need to pay timely attention to national policies and research trends and update their knowledge reserves for better teaching. The development of information technology also puts forward requirements for the ability of teachers. In this era of the rapid development of science and technology information, teachers should actively seek technological applications and programs to increase learning. Although VR allows unique teaching and learning experience, it requires a teacher's design and proficiency to make its implementation interesting in existing multimodal paths. Teachers should combine the focus of teaching with sports practice, such as explaining muscles through the demonstration and interpretation of movements. This requires teachers to have certain sports experience.

Establish a Acientific Sports Anatomy Evaluation System

At present, the assessment method of sports anatomy in our school is 30% of the usual grade and 70% of the final closed grade. In terms of evaluation, the practical part of sports anatomy teaching should be highlighted

as far as possible. Thus, it is possible to appropriately increase the ratio of usual scores and add the practice assessment. For example, the organization of the examination should consider the understanding and application of knowledge, such as adding open-book discussion questions, setting aside a week for literature review and discussion among students, and finally reporting in groups. This can help students connect theory with practice and improve their application ability. In addition, in the final closed-book exam, it is suggested to cancel or reduce the types of questions that are easy to find answers in books or online, and increase the number of comprehensive questions such as case studies.

Conclusion

With the development of teaching reform and information technology, in order to better train students majoring in physical education, the reform and innovation of sports anatomy are necessarily required in many aspects, such as teaching content, teaching methods, teaching models and teaching evaluation. Teachers can introduce and teach sports anatomy knowledge by employing modern technologies and student-centered pedagogic methods. This will help improve the teaching quality of sports anatomy, strengthen the theoretical foundation of students, and cultivate their practical ability. Besides, more research is needed to evaluate these resources before introducing them into undergraduate medical courses. Finally, the reform of sports anatomy experimental courses can not be accomplished overnight and needs to be continuously developed and perfected.

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References

Singh, V., & Kharb, P. (2013). A paradigm shift from teaching to learning gross anatomy: meta-analysis of implications for instructional methods. *Journal of the Anatomical Society of India*, 62(1), 84-9.

Tanner, K. D. (2009). Talking to Learn: Why Biology Students Should Be Talking in Classrooms and How to Make It Happen. *Cbe Life ences Education*, 8(2), 89.

Chang, Z., & Jiang, Y. (2018). Discussion on Practice Innovation Reform of Sports Anatomy. *2018 8th International Conference on Social science and Education Research* (SSER 2018).

Kurniawan, M. H., & Witjaksono, G. (2018). Human anatomy learning systems using augmented reality on mobile application. *Procedia Computer Science*, 135, 80-88.

Weeks, J. K., Pakpoor, J., Park, B. J., Robinson, N. J., Rubinstein, N. A., Prouty, S. M., & Nachiappan, A. C. (2020). Harnessing Augmented Reality and CT to Teach First-Year Medical Students Head and Neck Anatomy. *Academic Radiology*.

Al Hamidy Hazidar, R. S. (2014). Visualization Cardiac Human Anatomy using Augmented Reality Mobile Application, 5(3), 487-501.

Gopal, T., Herron, S. S., Mohn, R. S., Hartsell, T., Jawor, J. M., & Blickenstaff, J. C. (2010). Effect of an interactive web-based instruction in the performance of undergraduate anatomy and physiology lab students. *Computers & Education*, 55(2), 500-512.

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https://doi.org/10.37420/j.cer.2020.107

Has, M. C. (2001). The Impact of Education Technology on Student Achievement. *The Journal*. 28(2), 40-3.

Woodrow, J. E., Mayer-Smith, J. A., & Pedretti, E. G. (2000). Assessing technology enhanced instruction: A case study in secondary science. *Journal of Educational Computing Research*, 23(1), 15-39.

Preim, B., & Saalfeld, P. (2018). A survey of virtual human anatomy education systems. *Computers & Graphics*, 71, 132-153.

Hamrol, A., Górski, F., Grajewski, D., & Zawadzki, P. (2013). Virtual 3D atlas of a human body–development of an educational medical software application. *Procedia Computer Science*, 25, 302-314.

Nair, R. R., & Lindsey, A. (2020). Student Perception on Integration of 3D Complete Anatomy Software Application in Medical Curriculum. *The FASEB Journal*, 34(S1), 1-1.

Bice, M. R., Carey, J., Brown, G. A., Adkins, M., & Ball, J. W. (2016). The use of mobile application to enhance learning of the skeletal system in introductory anatomy & physiology students. *International J. Kinesiology in Higher Education*, 27(1), 16-22.

Saulnier, B. M. (2008). From "Sage on the Stage" to "Guide on the Side" Revisited: (Un)Covering the Content in the Learner-Centered Information Systems Course. In *The Proceedings of the Information Systems Education Conference*, 25, 1-9.

Gerstman, J., Salehi, K., & Lobo, A. (2012). Developing a Model of Student-Centred Teaching which Enhances Active Engagement. *International Journal of Learning*, 18(7), 13-30.