ECP Espiral. Cuadernos del Profesorado
Vol. 15, nº 30
Marzo 2022
Multidisciplinary Journal of Education

Learning and evaluation of human anatomy content in Sports Sciences through Surf videos

Aprendizaje y evaluación de contenidos de anatomía humana en Ciencias del Deporte mediante vídeos de Surf

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Abstract

The current pandemic due to Covid-19 and its consequent social distancing has accelerated the transformation of traditional education towards online education. However, this transformation has been adapted at a technological level, but not pedagogically. This study has aimed to analyze the acquisition of anatomical knowledge of CAFD students using videos and static images of surfing managed through a blog. A total of 106 students from the CAFD degree at the University of Murcia completed this work. In addition, an exam containing five questions on the anatomy applied to surfing was carried out to analyze the effect on learning after viewing the videos/images. After the statistical analysis, a percentage of correct answers of 66.0%, 51.9%, 62.3%, and 63.2% was observed for questions 1, 2, 4 and 5. This methodology, based essentially on an analysis of movement, allows a functional understanding of the anatomy of the locomotor system in the adventure sport of surfing. These results show a practical and novel methodology for the development of online teaching. Furthermore, they reveal the broad scope for improving the teaching of anatomy in CAFD through the combined use of new technologies.

Keywords: Anatomy; Functional anatomy; surf; Anatomy CAFD; extreme sport; e-learning.

Resumen

La pandemia actual por la Covid-19 y su consecuente distanciamiento social ha acelerado la transformación de la educación tradicional hacia la educación en línea. Sin embargo, esta transformación se ha adaptado a nivel tecnológico, pero no pedagógico. El objetivo de este estudio ha sido analizar la adquisición de conocimientos anatómicos de los estudiantes de CAFD mediante el uso de vídeos e imágenes estáticas de surf gestionadas a través de un blog. Un total de 106 estudiantes del grado de CAFD de la Universidad de Murcia participaron en el presente trabajo. Para el análisis del efecto en el aprendizaje se ha realizado un examen que contenía cinco preguntas sobre la anatomía aplicada al surf tras la visualización de los vídeos/imágenes. Tras el análisis estadístico, se observó un porcentaje de aciertos de 66.0%, 51.9%, 62.3% y 63.2%, para las preguntas 1, 2, 4 y 5 respectivamente. Esta metodología basada esencialmente en un análisis del movimiento permite una comprensión funcional de la anatomía del aparato locomotor en el deporte de aventura de surf. Estos resultados muestran una metodología útil y novedosa para el desarrollo de docencia online. Además, revelan el amplio margen con el que se cuenta para mejora de la enseñanza de la anatomía en CAFD mediante el uso combinado de las nuevas tecnologías.

Palabras clave: Anatomía; Anatomía funcional; surf; deporte extremo; e-learning.

Received: 07/05/2021
Accepted: 08/07/2021

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Introduction

For decades the scientific literature has identified the internet, with its multiple services as the "world wide web," or commonly known as the "web", the triggering factor of a new pedagogical paradigm, with great potential for the evolution of teaching models (Area, 2002). This process has been accelerated due to the current COVID-19 pandemic, which has led to the imminent closure of universities and colleges around the world. This health emergency has forced the evolution from traditional education to online teaching models (Bacow, 2020).

Social distancing is one of the main strategies that all countries have established to reduce community transmission of the virus (Weeden & Cornwell, 2020). Accordingly, "emergency e-learning" protocols have emerged as a rapid transition from face-to-face classes to online learning systems (Murphy, 2020). As a result, entire countries have been shut down. All public and private institutions have ceased their activities and higher education institutions have been forced to interrupt face-to-face teaching activities. Therefore, the widespread transmission of the virus between countries and even continents and the institutional closure has caused more than 80% of students worldwide not to attend their universities and colleges in person, according to the World Organization of the Health (2020). However, the required social distancing has highlighted the need to rapidly develop methodologies that allow a dynamic experience in the teaching-learning process for online teaching (Ferran, 2015; Baños, Toval, Morales-Delgado & Ferrán, 2021).

The current health situation has been characterized by constant innovation in existing technologies to facilitate communication and guarantee fast and dynamic access to information. In this way, the use of learning platforms such as Moodle, Blackboard, ZOOM and/or Skype, among others, has intensified as communication and teaching tools for students, where faculty teachers have faced the challenge of becoming familiar with the new teaching methods (Kataoka & Mertala, 2017). However, communication through the screen produces intense isolation, which make it difficult to establish proper frameworks for both interactive dialogue and constructive or elaborate comments between numerous individuals. In this way, it is challenging to establish paradigms of connection with emotional empathy that avoid dialogue with the "emptiness" (Brooks et al., 2020). Otherwise, the students' procrastination behaviors and feelings of worthlessness can easily escalate, exacerbating the levels of anxiety and depression (Farwaz & Samaha, 2021). All educational community members (students, teachers, computer technicians, administrators...) are making a titanic effort to adapt in the best possible way to this new educational context, but at a pedagogical level some interesting questions raises: Are sufficient the measures of face-to-face classes adopted to deliver course content through video lessons? Are we adapting methodologically to this pandemic situation? Have the teaching resources used to maintain the motivation and academic commitment of the students evolved?

In this new educational paradigm, some teachers have sought new teaching strategies through innovative technologies to promote active participation and constructivism among students. For example, technological didactic resources such as Mentimeter, Poll Everywhere, Slido, Kahoot, Quizizz (Azlan et al., 2020) have been used to increase the motivation and satisfaction of students in online teaching (Fuster-Guilló et al., 2019). However, the degree in Physical Activity and Sports Sciences (CAFD) has greater obstacles to adapt its online teaching due to two fundamental aspects: 1) the eminently practical nature of this area of knowledge; and 2) it is a multidisciplinary science in which different scientific branches interact with each other (Baños et al., 2021).

One of the scientific branches of CAFD is human anatomy, which also has had to rapidly adapt to virtual teaching (Evans et al., 2020; Ravi, 2020). The study of anatomy has different approaches such as, for example, the anatomy applied to movement that is taught in the CAFD degree. This degree studies a great diversity of contents related to a large variety of sports, which are the object of analysis, including traditional sports such as soccer, basketball, athletics, etc. However, the contents related to physical activities in the natural environment (climbing, rappelling, orientation, ...) have aroused considerable interest among students and continue to be a challenge to get a high degree of motivation in learning anatomy (Baena-Extremera & Granero-Gallegos, 2013; Granero-Gallegos & Baena-Extremera, 2011).

The current academic context and the growing development of technologies associated with virtual reality call for a profound change that adapts the teaching methodology of the Functional Anatomy content, more closely aligned with the interests of the new generations of CAFD students. These strategies should strive to promote an increase in the satisfaction, motivation and engagement of CAFD anatomy students. A reliable strategy that follows these guidelines is the creation and development of short videos. It allows the analysis of the anatomical movement of the human body in recreational and/or adventure sports, which can be performed outdoors and individually (Baños et al., 2021). These videos can be embedded, stored, and reproduced on a blog, which also has self-assessment tools for students to test the acquisition of their anatomical knowledge applied to sport.

Based on the above, we created a specific blog on the subject of Functional Anatomy at the University of Murcia. It was linked to their respective social media accounts: YouTube (https://www.youtube.com/channel/UCYUw3u_Hka7J7gkxTNOuoFg/videos), Twitter (https://twitter.com/anatomycafd?lang=es) and Facebook (https://es-es.facebook.com/pages/category/Community/Anatomia-Funcional-CAFD-681177941967218/). All of them were also used as digital teaching tools. Therefore, it is intended to facilitate online learning for CAFD students with tools that could play a prominent role in situations such as the current COVID-19 pandemic. Thus, the main objective of this study has been to analyze the acquisition of anatomical knowledge of CAFD students through videos and static images of surfing managed through the blog.

Method

Participants

The total number of students who participated in the study was 106, 78 men and 28 women, enrolled in the Functional Anatomy subject at the CAFD degree at the University of Murcia, between 19 and 49 years (21.6 ± 4.7 years).

Study Design

A non-experimental, descriptive, and cross-sectional study was designed. The subject was taught from September 2017 to January 2018 according to the contents established in the Functional Anatomy teaching guide, with a credit load of 6 ECTS credits. They were distributed in four weekly teaching hours, of which three hours were taught as theory and one hour for practical lessons. In theory classes, the teacher used the PowerPoint tool to teach. In contrast, in the practical sessions, students used atlases of human anatomy and bones to identify bone morphology and visualized various sports, employing videos to understand the anatomical movements of the human body.

The didactic material was designed and created by the Teaching Innovation Group in Human Anatomy of the University of Murcia (GINDAH) and shared through a blog as a didactic resource (https://functionalanatomysite.wordpress.com/). Initially, students became familiar with the blog tasks, highlighting the possibilities and benefits of learning. These resources were used in theoretical and practical classes as well as autonomously by the student at home. Using this blog, the students were able to assess their knowledge. For example, while watching the video, you can stop for a few seconds at some key moment of the technical-sports action, being able to ask a question related to the anatomical movements and joint complexes involved during the execution of the action by the surfer. Finally, the contents acquired by the students were evaluated through a multiple-choice theoretical exam.

Instruments

To evaluate whether participants have acquired new knowledge, five questions on analysis of movement during surfing were included in the final exam of the subject. It was made up of a total of 60 multiple choice questions with a single valid answer. The subject coordinator prepared the exam with a total duration of 90 minutes to answer the test. The surfing-related questions based on Figure 1 were:

1) Question 1 (**arrow 1**). Which of the following muscles does NOT allow flexion of the indicated joint? Possible answers*: A) Flexor digitorum profundus. B) Flexor carpi radialis. C) Brachioradialis. D) Round Pronator.*

2) Question 2 (**arrow 2**): Choose the CORRECT option on the position of the joint/muscle involved. Possible answers*: A) Anteversion/Teres major. B) Adduction/Anterior deltoid. C) Anteversion/Pectoralis major. D) Adduction/Supraspinatus muscle.*
3) Question 3 (**arrow 3**): Indicate which muscle is not involved in the observed position of the joint. Possible answers*: A) Internal obturator. B) Rectus femoris. C) Sartorius. D) Pectineus.*
4) Question 4 (**arrow 4**): Which of the following options is INCORRECT regarding the indicated joint. Possible answers*: A) The tibialis anterior produces dorsiflexion in the ankle. B) The extensor digitorum longus produces dorsiflexion at the ankle. C) The ankle or talocrural joint is a flat-faced diarthrosis. D) The soleus is a plantarflexion muscle.*
5) Question 5 (**arrow 5**): The muscle originating from the anterior inferior iliac spine corresponds to: Possible answers*: A) Rectus femoris. B) Sartorius. C) Tensor fasciae latae. D) Pectineus.*

Figure 1.

Surf image included in the Functional Anatomy final exam (Source: Extracted from blog https://functionalanatomysite.wordpress.com/).

Statistics Analysis

After coding and tabulating the data, a descriptive analysis of the frequencies was carried out, which has been selected for its orientation in the sociological field. Statistical analysis was performed with SPSS (Statistical Package for Social Sciences, v. 20.0, for Windows; SPSS Inc, Chicago).

Results

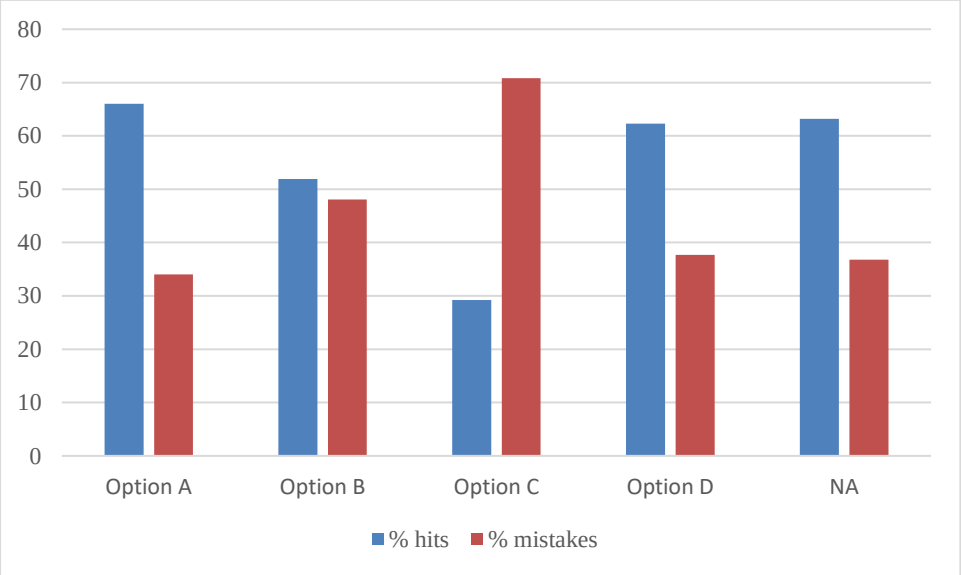
Percentage of correct and incorrect answers

Figure 2 describes the percentage of correct and incorrect answers in the final exam from questions related to the analysis of the anatomy in surfing. All questions, except Q3, had a percentage of correct

answers higher than 50% (Question 1 - 66.0%, Question 2 - 51.9%, Question 3 - 29.2%, Question 4 - 62.3% Question 5 - 63.2%).

Figure 2.

Percentage of correct and incorrect answers of the multiple-choice test.

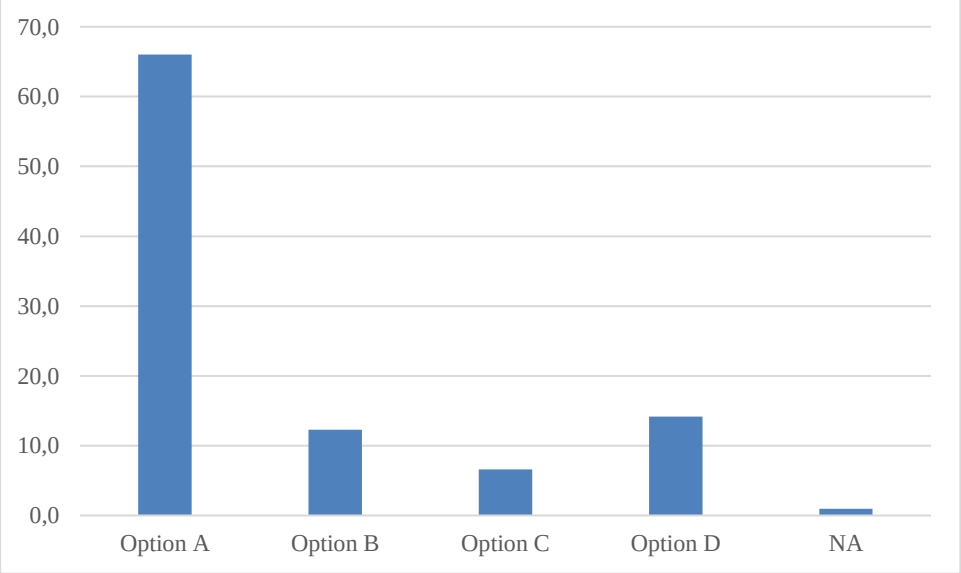


Answers to Question 1

As can be seen in Figure 3, 66% of the students chose the correct answer, option A: "*Flexor digitorum profundus*", followed by options D, B and C " *Round Pronator*", " *Flexor carpi radialis*" and "*Brachioradialis*", respectively.

Figure 3.

Selected answers to question 1.



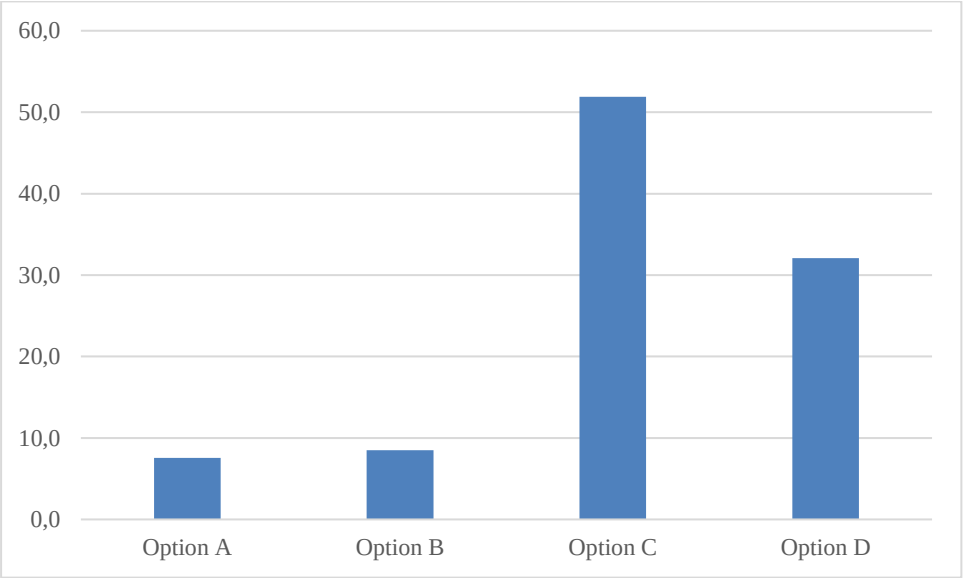
Answers to Question 2

In question 2, most of the students (51.9%) selected the correct option C "*Anteversion/Pectoralis major*", followed by option D "*Adduction/Supraspinatus muscle*" with 32.1%, while a few of students

chose option B " *Adduction/Anterior deltoid* " with 8.5%, and 7.5% option A " *Anteversion/Teres major* " (Figure 4).

Figure 4.

Selected answers to question 2.

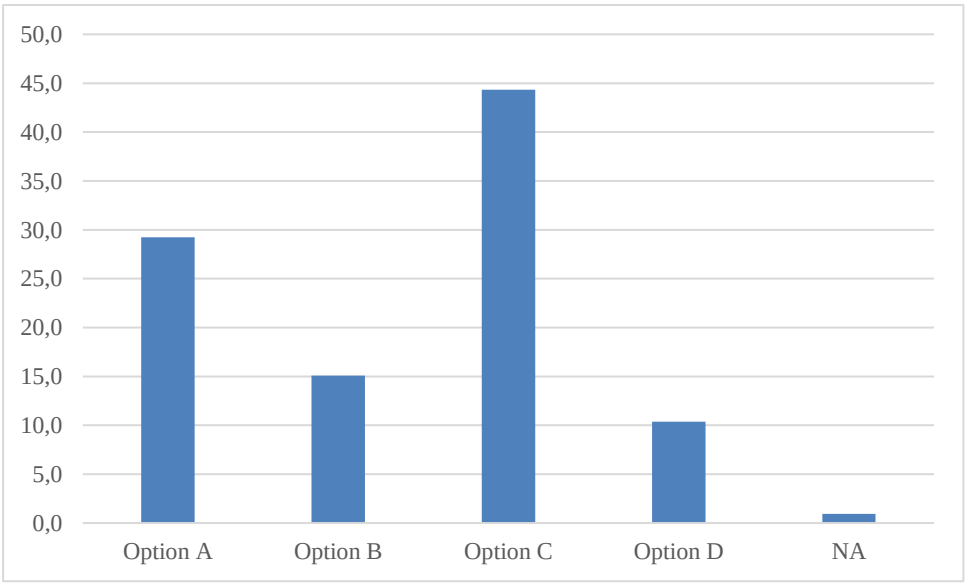


Answers to Question 3

In question 3, only 29.2% of the students chose the correct option A "*Internal obturator*". 44.3% wrongly chose C "*Sartorius*". Furthermore, 15.1% chose option B "*Rectus femoris*" and 10.4%, answered D "*Pectineus*" (Figure 5).

Figure 5.

Selected answers to question 3.



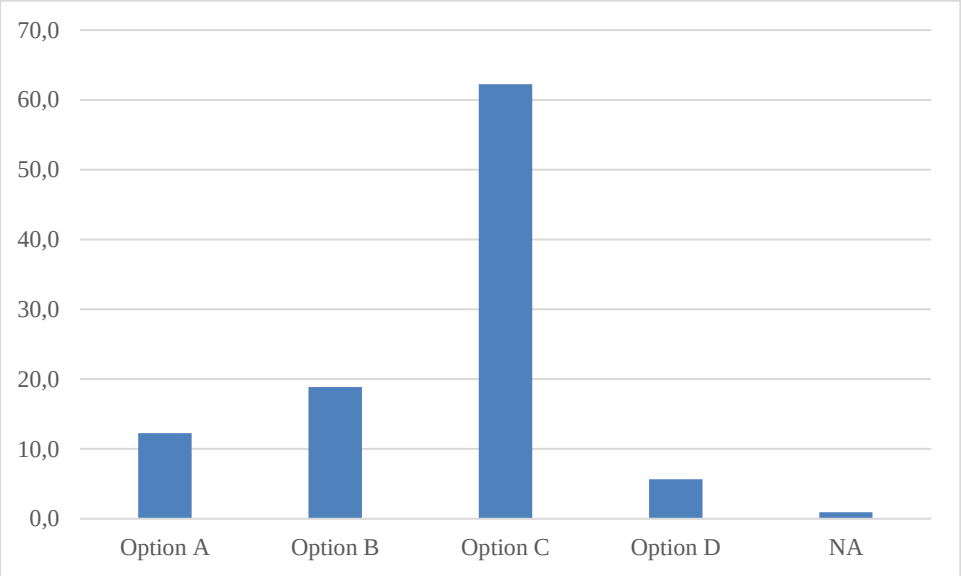
Answers to Question 4

In question 4, most of the students (62.3%) selected the correct option C " *The ankle or talocrural joint is a flat-faced diarthrosis* ", followed by option B "*The extensor digitorum longus produces dorsiflexion at the ankle*" with 18.9%, while a small percentage of students chose option A "*The tibialis*

anterior produces dorsiflexion at the ankle" with 12.3%, and 5.7% option D "*The soleus is a plantarflexion muscle*" (Figure 6).

Figure 6.

Selected answers to question 4.

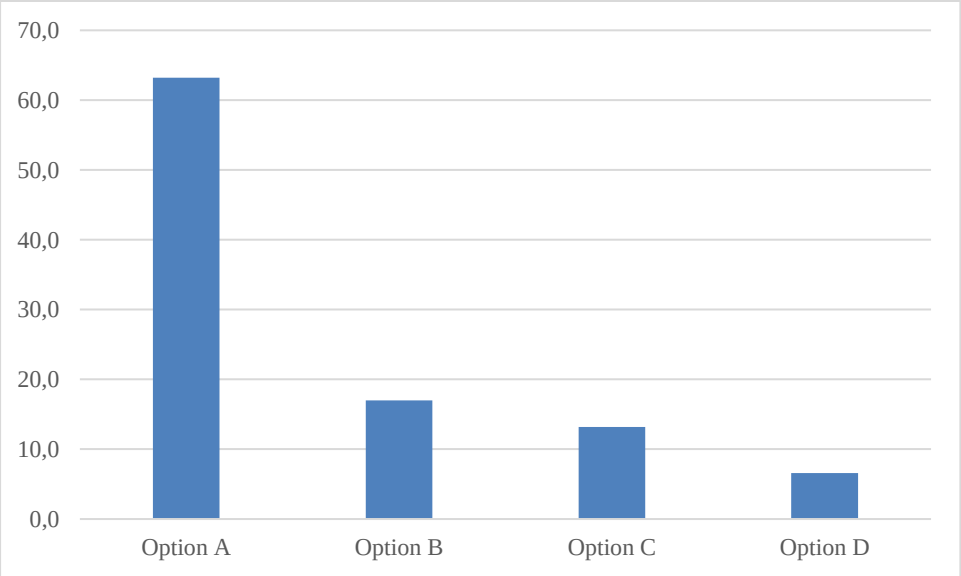


Answers to Question 5

In question 5, most of the students (63.2%) selected the correct option A "*Rectus femoris*", followed by option B "*Sartorius*" with 17%, while a small proportion of students chose the option C "*Tensor fasciae latae*" with 13.2%, and 6.6% for option D "*Pectineus*" (Figure 7).

Figure 7.

Selected answers to question 5.



Discussion

The objective of this study was to analyze the acquisition of anatomical knowledge of CAFD students using videos and static images of surfing through the blog. This methodology could be relevant in situations that require exclusively online teaching, such as the COVID-19 pandemic. Worldwide, the

adaptations that most universities have made in teaching during the pandemic can be summarized in the implementation of simple technological resources to support online teaching, referring to the use of platforms such as Skype, Google Classroom, Moodle, and Facebook (Crawford et al., 2020). Thus, most of the efforts have been focused on the transition to online learning, which should also be focused on online pedagogy (Crawford et al., 2020). However, there have been few online learning pedagogical proposals designed in the field of Functional Anatomy in CAFD (Baños et al., 2021).

It is worth mentioning that the proposal presented in this article is not only focused on the visualization of surfing videos and images, but that the free access blog has been designed and created to offer students access to all teaching material of the subject from the beginning of the academic course. This blog compiles the audiovisual material of surfing and the individual self-assessment questionnaires to check the level of knowledge acquired. These pedagogical strategies presented in this work attempt to provide solutions to the problems derived from learning anatomy online (Evans et al., 2020).

After implementing this pedagogical proposal for e-learning, an exam was carried out to evaluate the level of knowledge acquired. As a result, regarding questions 1, 2, 4 and 5, a high percentage of correct answers was obtained (66.0%, 51.9%, 62.3% and 63.2%, respectively), compared to the rate total error. Similar projects have been carried out around the world. On the one hand, a project developed in the subject of Anatomy at the National University of Piura in Peru concludes that the students were satisfied with the online evaluation carried out. However, lower scores were obtained in terms of online pedagogy, coexistence, and the use of the virtual classroom (Valenzuela, Revilla, Scipion & Dias, 2020). On the other hand, a similar project was developed in the subject of Anatomy at the Faculty of Medicine of the University of Singapore, in which the students showed high levels of satisfaction with the acquired learning (Srinivasan, 2020). However, in this study, the students found deficiencies in the pedagogical strategy carried out, identifying as weak points: 1) the lack of regular individual questionnaires to verify the knowledge acquired; 2) the lack of mini questionnaires (not counted towards the overall grade) to assess learning progress and 3) to include more didactic resources, since only the ZOOM platform was used. These drawbacks have been tried to be solved with the present proposal.

In contrast, in question 3 a low rate of correct answers was observed (less than 30%). To correctly answer this question, a high level of anatomy knowledge was needed, as well as an understanding of the anatomical movements of the joint complex carried out by the surfer. For this reason, it is considered a question of high conceptual complexity, including it within the group of 15% of the most difficult questions of the entire exam. One of the weaknesses of online anatomy teaching is the lack of presence in practical classes that, according to students, could negatively impact the learning process and cause a loss of academic commitment (Franchi, 2020). Other authors have highlighted the lack of technological material as an inconvenience for learning anatomy online, either because they do not have a computer or a tablet, or because they have a poor-quality internet connection, considering that they use their mobile phones, which may have deficiencies in quality and speed depending on the megabytes contracted (Pacheco, Noll, Rodrigues, 2020). For this reason, Pather et al. (2020) highlight the importance of developing new technological resources and online pedagogical strategies to improve the e-Anatomy learning. In this way, the proposal presented here is an open and freely accessible pedagogical tool that facilitates the learning of Functional Anatomy in CAFD, which can be used from anywhere. Furthermore, the use of this methodology could be relevant during atypical conditions that do not allow the presence of the students.

Among the few studies on online learning of Functional Anatomy, we found the work of Baños et al. (2021), although scientific literature on e-Anatomy learning is more abundant in fields such as Medicine (Evans et al., 2020; Franchi, 2020; Pather et al., 2020; Srinivasan, 2020; Valenzuela et al., 2020). Due to the scarce didactic proposals of e-learning and the lack of studies that relate online learning with Functional Anatomy applied to sport, it is necessary to carry out more research on this topic. However, the few studies found in literature added to the situation of social distancing caused by COVID-19 lead us to question whether this pandemic can change how anatomy education is carried out and university education in a broader sense (Jones, 2020). Recent experience may reveal that many social norms are outdated, such as commuting to work in an office (Hern, 2020). Societies in their continuous transformation face

challenges that must contribute to their survival in new contexts, placing education as an essential pillar of this change.

Conclusions

The present work put forward an innovative pedagogical proposal for online education, using a blog that contains teaching tools that include audiovisual material and self-assessment questionnaires on Functional Anatomy applied to sport. These resources have been developed by the Teaching Innovation Group in Human Anatomy of the University of Murcia. In addition, this methodology led to successful scores in the final exam since a high rate of students selected the correct answers in the exam questions related to the analysis of the specific surf technique, demonstrating a complex and well-organized anatomical knowledge. Thus, this proposal is presented as a suitable option for the future of online teaching.

As a strength of this work, it is an innovative proposal that provides a solution to the problem previously raised by Srinivasan (2020) concerning the teaching of Anatomy online. However, our proposal has some limitations. On the one hand, an experimental study has not been conducted to assess whether this methodology really improves learning compared to traditional education. On the other hand, it would be interesting to carry out additional research to analyze the commitment, self-concept and academic motivation that is generated in students.

Author contributions: conceptualization, validation and writing original draft: R.B. and J.F.; methodology: R.B., R. M., A.T., M. L., N.M. and J.F.; analysis: R.B., A.T., N.M. and J.F.; writing, critical review and editing: A.T., N.M. and J.F.; supervision and project coordinator: J.F.

Funding: This research received no external funding.

Acknowledgements: The present study was performed within the framework of the following teaching innovation projects at the University of Murcia: a) Production of digital didactic material for the analysis of movement and understanding of anatomy in the CAFD degree (2014/2015); b) Anatomy of the movement in the CAFD degree (2015/2016).

Conflict of interest statement: The authors declare no conflict of interest.

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