

Article

“Sport and Anatomy”: Teaching, Research, and Assistance at the University of Pisa

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Abstract: *Introduction:* Over the last decades, the university system has experienced huge growth, facing several challenges. Accordingly, the University of Pisa recognizes the value and opportunities deriving from research and fully supports collaboration with the world of entrepreneurship and industry, as well as local communities. Study programs, teaching methods and technologies, learning environments, quality assurance, programmed student numbers, and research results are key features of the prestige of the scientific community. *Aim:* In this respect, “Sport and Anatomy”, a brand that includes an academic organization at the University of Pisa, holds two main goals: (i) to offer the top level in both educational and professional fields; and (ii) to optimize the fine-tuning among all these sections, thus becoming a reference point for sports management. *Methods and results:* Indispensable links between basic and specialist sciences through different Masters’ and schools were created. In addition to didactic activity, research activity, medical assistance, and rehabilitation were coordinated. Two main outcomes emerged from this experience: (i) improved stakeholder performances and (ii) optimized cooperation between university and local communities. *Conclusions:* “Sport and Anatomy” plays a key role in supervising and accomplishing in an innovative way all the three missions of the university (i.e., teaching, research, and dissemination of knowledge), thus strongly fulfilling the aims of modern university targets.

Keywords: sports and anatomy; sports sciences; exercise movement techniques; public health; physiotherapy; higher education; teaching; learning; universities



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1. Introduction

The university system has experienced huge growth over the last decades, facing several challenges. Thus, currently, one expects further expansion in the near future. Remarkably, improving the fine-tuning between teaching, research, and dissemination of knowledge represents a key point for the prestige of the scientific community. Even though providing notions to learners is an important part of the university’s mission (competence-based learning), higher education cannot be merely regarded as a process leading to a set of competences. Apart from the competences in a specific field, higher education graduates also need to acquire additional skills, which include analytical and communication abilities, as well as the aptitude to work alone or with a team. For these reasons, generic (such as learning abilities, oral communication, and writing skills) and specific (such as planning, organizational, and teamwork capabilities) competences are distinguished, and they must converge in a complete learning process to promote universal values. As a matter of fact, the Council of Europe identified additional purposes for higher education: preparation for sustainable employment; preparation for life; personal development; and learning and research, with a broad and advanced knowledge base. Finally, competence can be defined in terms of responsibility and autonomy to use knowledge, skills, and personal,

social, and/or methodological abilities, in both work or study environments, as well as in professional and personal development and growth. In addition to managing an educational system and developing research and knowledge, more recently, universities assumed the so-called third mission to disseminate knowledge and transfer technologies to industry (joint collaboration, academic spin-offs, and patenting), also involving the engagement of non-academic stakeholders [1–3].

In a globalized world, internationalization of higher education is a remarkable topic. The Bologna Process aimed to create a system of easily readable and comparable degrees and the establishment of a European Higher Education Area, with a European Credit Transfer System (ECTS; volume of learning, based on the defined learning outcomes and their associated workload). This led to the development of quality assurance standards, with academic and professional recognition promoted by the Lisbon Recognition Convention, and favored the mobility of students in different countries, as in the well-known Erasmus program. A more important outcome-based approach was developed by the Tuning Project, a sector-wide project to unite learning outcomes and competences for all disciplines in Higher Education in Europe [4]. The Tuning Project began in 2000 as an initiative funded by the European Commission to develop common core learning outcomes and competences for degree programs in Europe. Furthermore, as suggested by its name, this project is not characterized by a rigid curricular uniformity, but it takes into account diversity in the educational process. For this reason, it also promotes higher education programs in developing or emerging countries to enhance public health learning and teaching by respecting local habits and cultural differences to achieve additional learning outcomes tailored to individual needs [4].

The University of Pisa recognizes the value and opportunities deriving from research and fully supports collaboration with the world of entrepreneurship and industry as well as cooperation processes with local communities. In this respect, it encourages the creation of activities whose corporate purpose is the exploitation of university research findings. One of the fundamental targets of the third mission of the University of Pisa involves the transfer of scientific research to the productive and entrepreneurial world. Via technology transfer, the academic world aims to create value for society, the economy, and entrepreneurial initiatives through:

- (1) Entrepreneurial culture training for students and researchers
- (2) Support for the creation of businesses and spin-offs
- (3) Protection of intellectual property and promotion of patents
- (4) Collaborations with companies via agreements and projects.

Within the framework of this evolving educational system, academic structures and centers of excellence contributed to the development and realization of these new purposes and ameliorated the cooperation between universities and their local communities. In this respect, sports sciences received a special attention. In fact, over the years, athletic training and rehabilitation managed by specialists have assumed an increasingly important role. To improve the performance of an athlete and reach important goals, a synergistic work between technicians and professionals in public health is essential. Concerning the importance of students' learning and research in sports education [5], the present article describes the unique experience of "Sport and Anatomy", a brand within the academic organization of the University of Pisa, with the aim of becoming a reference point for sports management, creating the indispensable links between basic and specialist sciences through teaching, research, and assistance.

"Sport and Anatomy" of the University of Pisa was initially conceived in 2007 as a brand aiming at synthesizing the link between the sporting gesture and the anatomical district, movement and trauma, biomechanics, and rehabilitation. Since 2004, under the general label "Anatomy and Sport", a series of meetings were organized at the Institute of Human Anatomy of the University of Pisa precluding to the new project. Several personalities from the sport world were invited, including Italy's ex national football team head coach Marcello Lippi, international football referee Pierluigi Collina, and ex World Cup

champion in 1982 Antonio Cabrini. This idea grew up more and more with entrepreneurial and marketing strategies that over the years became a point of reference for many experts in the sector.

Under the label of “Sport and Anatomy”, the Center for Physical and Rehabilitation Medicine “Sport and Anatomy” (CRMSA; for additional information: <http://www.sportandanatomy.com>, accessed on 28 May 2022) was further developed to provide a new rehabilitation medicine facility specializing in rehabilitation and disability in competitive and professional sports. On 25 May 2018, CRMSA was formally inaugurated with a solemn ceremony. The Center is a unique reality on the national scene, being able to integrate university teaching, research, and the high specialization of its students to provide the patient with the latest generation of rehabilitation and performance methods and technologies. Another feature that gives importance to this new reality is the memorandum of understanding signed with the University Hospital of Pisa aimed at supporting research, development, and training in this rehabilitation area.

The site of the center, an elegant, well-finished, and patient-friendly environment, covers an area of about 600 square meters (Figure 1), and includes ten doctors’ offices, a 200-square meters gym equipped with the most advanced rehabilitation technologies (Figure 2), and a classroom for lessons and congresses (Figure 3).



Figure 1. Reception of the Center for Physical and Rehabilitation Medicine “Sport and Anatomy”.

These new technologies include the “Hunova” robot, capable of assisting the medical and physiotherapy staff with over 150 exercises, 30 assessments, and 20 clinical protocols; the “Walker View”, which allows the evaluation of the supports during walking and running, monitoring the patient with a 3D camera; the “Alter G” (Anti-Gravity Treadmill) system, developed by the NASA, which allows to run, reducing body weight by up to 80%. Moreover, the structure is equipped with an innovative isoinertial training system for the recovery of performance. CRMSA has a medical and physiotherapy staff able to work on all pathologies affecting the musculoskeletal system following surgical and medical therapies. In particular, it is possible to carry out preventive and rehabilitative interventions, as well as specific training, integrating all the aspects related to the management of an athlete, in both professional and amateur practitioners.



Figure 2. Gym of the Center for Physical and Rehabilitation Medicine “Sport and Anatomy”.



Figure 3. Classroom for lessons and meetings of the Center for Physical and Rehabilitation Medicine “Sport and Anatomy”.

Since social media is also important in sports education [6], students and all staff members are also organized on dedicated digital platforms, which are useful not only for a mere exchange of information, but also to plan specific teaching and learning programs. The recent COVID-19 pandemic forced the academic world to address educational activities to digital media, creating new opportunities and experiences for students. Moreover, the most popular social networks are recruited to disseminate the different activities.

Therefore, the aim of the present article is to describe the fundamental characteristics pursued by this brand in coordinating and synergizing between sports professionals and federations, private and public centers, as well as national and international teams.

2. Methods and Results

Inspired by the aforementioned proposals of the University of Pisa, different strategies were used in order to ameliorate activities and behaviors in the field of sports sciences with regard to the three university missions. Accordingly, both generic and specific competences were developed and distinguished, converging in a complete learning process to promote universal values. Apart from traditional teaching methods, the paper aims to highlight the advantages and effectiveness of “Sport and Anatomy” in activating creative thinking and analytic and argumentation skills in students and sector practitioners. Place-based learning, which leverages local assets and a context of high professionalism, is another promising example of an educational technique that can help students to develop high-quality knowledge, attitudes, critical thinking, and different skills to address sustainability issues. Indeed, sustainability education focuses not only on imparting knowledge but also on empowering students to become real-world problem solvers. In this respect, the center holds two main goals; on one hand, to offer the top level in both educational and professional fields; on the other hand, to optimize the fine-tuning among all these sections. This, in turn, has positive effects on the local community, showing a significant social impact thanks to all those who benefit from it (both students and the general population).

At the same time, this center plays a key role in supervising and accomplishing in an innovative way all the three missions of the university (i.e., teaching, research, and dissemination of knowledge), thus strongly fulfilling the aims of modern university targets. Remarkably, improving the fine-tuning between teaching, research, assistance, and dissemination of knowledge represents a key point for the prestige of both the university and the scientific community.

2.1. First Mission: Teaching Activity

Anatomy is still regarded as an important part of biomedical education, especially in sports sciences. In this respect, new teaching methods have been developed for the study of gross anatomy. Apart from traditional tools (cadaver dissection laboratories, chalkboard- and photographic projection-based classroom lectures), interactive multimedia learning methods have been introduced. These include computer technology, such as podcasts, screencasts, and educational software (e.g., Anatomy.tv, Visible Body, Acland’s Video Atlas of Human Anatomy) available for use on a personal computer and mobile devices (smartphones and tablets), with augmented virtual reality/3D anatomical software [7–9]. In this regard, it is worth mentioning that during the last years, sports pedagogy has increasingly emerged as an interdisciplinary area of sports sciences, embracing both scientific, research, technical, and didactic disciplines [10–13]. Nonetheless, even classic approaches were not disregarded [8]. For this reason, in addition to modern teaching technologies, students and practitioners of “Sport and Anatomy” are also invited to visit the Museum of Human Anatomy “Filippo Civinini” of the University of Pisa to admire historical models and anatomical preparations.

A remarkable outcome of how the University of Pisa has achieved the aim of integrating the cooperation between university and local community is represented by the close link between the educational and rehabilitation activities of the center “Sport and Anatomy” with the local football team (Pisa Sporting Club 1909) that competes to reach the top level. In this way, students and doctors have the opportunity to work in a real context of high professionalism, where they can face uncommon and stimulating challenges.

Moreover, a new didactic project regarding anatomical dissection has been proposed as a didactic laboratory for 25 students of the course in physiotherapy selected based on their curriculum. It includes a one-day theoretical-practical stage of anatomical dissection on cadaver, held at the ICLO San Francesco di Sales Center in Verona. Cadaver dissection is the

most effective tool for understanding and memorizing three-dimensionality, shape, position, and relationships of anatomical structures. This project aims to provide an integration tool to the classic lesson of human anatomy in order to develop both generic and specific competences. Dissection allows to view and interact directly with different muscular, articular, and skeletal structures. Thus, it represents an important training opportunity for students, who develop skills and competences in their educational and professional activity, while improving the level of excellence of the course. The stage first deals with the study of surface anatomy, then topographical anatomy through the dissection of the corpse under the guidance of a tutor. The anatomical structures of the upper and lower limbs are highlighted, allowing the student to touch them (hands-on) to understand their location, shape, and relationships. At the end of the stage, an evaluation questionnaire is administered to all students, to verify its usefulness and effectiveness. This is key since it allows a fine-tuning of the project and students' feedback is important to improve the activity.

Teaching contents and strategies included in the study courses have been discussed and approved in the public councils where representative students also participate to give their point of view. The suggestions collected in the questionnaires anonymously administered to students are evaluated not only in terms of numbers, and free comments are also stimulated to receive specific and unexpected remarks. These remarks are deeply examined in order to improve the quality of teaching.

At the same time, "Sport and Anatomy" is the reference brand of three Masters' of the University of Pisa in the field of rehabilitation and athletic training (Sports Physiotherapy, Hydrokinesitherapy, and Athletic Training in Football for Youth Sectors), as well as of a postgraduate course in Anatomy and Manipulation of the Fascia. These courses cooperate with companies, industry associations, and sports clubs, including top-level sports clubs in their respective leagues in Italy and abroad. Participants must pass written and oral tests to be admitted to Masters'.

2.1.1. Master's in Sports Physiotherapy

The Master's in Sports Physiotherapy is now in its fourteenth consecutive edition. Its aim is to train professionals specialized in the sports rehabilitation field to be able to perform both functional and post-surgical treatments. Over the years, it has become the more prestigious Master's in the sports field, with 849 students (832 from Italy, 10 from other European countries, 3 from Asia, 3 from South America, and 1 from Africa) (Table 1) and over 350 affiliated centers of excellence in Italy and abroad.

The teachers do not belong only to the academic world. Many of them are professionals and this opportunity offers cultural and methodological advantages (Figure 4A).



Figure 4. Training moments within practical learning modules held by sector professionals in the Master's in Sports Physiotherapy (A) and Hydrokinesitherapy (B).

Table 1. Masters' and postgraduate courses held by "Sport and Anatomy" and the number of participants over the years.

-	Italy	European Countries	Asia	South America	Africa	Total Participants
Master's in Sports Physiotherapy	832	10	3	3	1	849
Master's in Athletic Training in Football for Youth Sectors	317	4	1	0	1	323
Master's in Hydrokinesitherapy	88	1	0	0	1	90
Postgraduate Course in Anatomy and Manipulation of the Fascia	118	1	0	2	0	121
Total participants	1355	16	4	5	3	1383

This Master's is the only postgraduate training course dedicated to physiotherapists that involves the study of human anatomy at the dissecting table. After an in-depth theoretical part carried out in the classroom with international expert teachers, students participate in a practical training section, which involves the discovery of the anatomical structures through the dissection of the various topographical regions. For this purpose, these practical courses are performed at the University of Bologna, in the dissecting room "Giovanni Mazzotti", equipped with modern tools for human dissection, such as 3D endoscopes. The Master's comprises sixteen teaching modules, including basic disciplines, manual and physical techniques, and pathologies and treatment of the most important joints. In particular, modules are dedicated to imaging, to surgical technique, to the most recent acquisitions in post-surgical recovery, to the correct applications of manual rehabilitation methods, to the guidelines on the application of instrumental physical therapies, and to hydro-rehabilitation. Particular attention is given to manual techniques, sports massage, the treatment of trigger points, and fibrolysis to vertebral manipulations, in addition to functional bandaging in its various forms, from taping to neuromuscular taping.

A module of the Master's is dedicated to motivational aspects in the relationship between operator and patient, an essential tool available to the physiotherapist, which is often underestimated.

2.1.2. Master's in Athletic Training in Football for Youth Sectors

The Master's in Athletic Training in Football for Youth Sectors is in its twelfth consecutive edition, with 323 students over the years (317 from Italy, 4 from other European countries, 1 from Asia, and 1 from Africa) (Table 1). This is an interuniversity course, including the University of Verona (joint degree), sponsored by the Italian Football Federation (FIGC) and the Italian Football Coaches Association (AIAC). It is the first Master's dedicated to athletic training in football recognized as a university training course that meets all the quality criteria defined by the Technical Sector of the FIGC and it allows to obtain the "Athletic Trainer for the Youth Sector certification", issued by the FIGC Technical Sector.

This Master's is based on an evidence-based approach with eleven teaching modules. The objective of the Master's is to provide learners with theoretical and practical teaching in order to be able to develop and conduct physical preparation programs for both professional and amateur football players. The student will be offered a wide range of activities that will enable him to plan and conduct athletic training programs in the different phases of the competitive season and to recondition athletes after an injury, but also to carry out the most common evaluation tests accurately to verify the effectiveness of the interventions.

2.1.3. Master's in Hydrokinesitherapy

The Master's in Hydrokinesitherapy is in its eleventh edition, with 90 students over the years (88 from Italy, 1 from Albania, and 1 from Tunisia) (Table 1). It is dedicated to those who have a degree in the rehabilitation health professions class or equivalent. This

course aims to provide learners with theoretical and practical knowledge, which is essential for treating neuromotor and orthopedic pathologies in water.

In particular, it is possible to perform motor rehabilitation cycles in patients with different types of trauma, as well as with rheumatological, neurological, and congenital diseases. The first part of the course (three modules) deals with anatomical, pharmacological, physiological, and biomechanical concepts. The second part includes seven practical learning modules with many hours dedicated to hydrokinesitherapeutic techniques (Figure 4B). More importantly, this Master's considers the novel Italian method ASP (Approccio Sequenziale e Propedeutico—sequential and propaedeutic approach). According to this method, the patient is subjected to sequential exercises, which are of increasing difficulty, so that each subsequent exercise is introduced only after having acquired the previous one. Propaedeutic means that the exercises allow the patient to settle and adapt in the water [14].

2.1.4. Postgraduate Course in Anatomy and Manipulation of the Fascia

The fifth edition of the postgraduate course in Anatomy and Manipulation of the Fascia, in collaboration with the Fascial Manipulation Association (FMA), has had 121 students over the years (118 from Italy, 2 from Brazil, and 1 from Denmark) (Table 1). It is dedicated to candidates with a degree in health professions in the field of rehabilitation, or specialist degrees in medicine and surgery. The course aims to provide learners with the knowledge of myofascial anatomy, essential for the manual treatment of pain in the musculoskeletal system. The course is divided into two parts. The first part concerns the anatomical study of a biomechanical model of the human body, and it also includes physiology and physiopathology of the connective tissue by means of macro- and microscopic examinations. The second part deals with the treatment of myofascial dysfunctions. Several practical activities allow learning palpation techniques for the treatment of painful pathologies.

2.1.5. International Activities

Thanks to international agreements based on the Erasmus Program and additional institutional agreements, some students could also experience training activities abroad with foreign sports teams. In detail, the Master's in Sports Physiotherapy course has internationally trained 10 students in England, 3 in Switzerland, 1 in Spain, and 1 in Brazil, whereas, for the Master's in Athletic Training in Football for Youth Sectors, 4 students trained in England, Greece, Switzerland, and USA.

Moreover, after the Master's attendance, other people found a job position abroad, in the various positions listed below:

- Match analyst in Qatar; currently an athletic trainer at Paris Saint-Germain football club.
- Liverpool FC International Academy New Jersey; currently Applied Football Scientist at Philadelphia Union.
- Athletic trainer at Politechnica Ias, Romania.
- Athletic trainer of the national Albania football team.
- Athletic trainer for the youth sector of Ferencvárosi Torna Club, Hungary.
- Athletic trainer at Vejle (Denmark), at Hifk ice hockey team in Helsinki (Finland), and at Partizan of Tirana (Albania).

2.1.6. Learning Outcomes

The specific courses of "Sport and Anatomy" offer good opportunities for professional activities. Accordingly, learning outcomes, in terms of what is achieved at the end of a course of study, represent an important aspect in higher education. This assessment is essential in recognizing postgraduate training programs. A final evaluation of the curricular experience is relevant also in sports medicine and science [15]. In line with this, "Sport and Anatomy" also assesses learning outcomes in its different Masters'. The opinion of students can provide basic information for course development and improvement. Students

receive emails requesting their opinions on the course they have attended, via the following online questionnaires:

(Masters' in Sports Physiotherapy and Hydrokinesitherapy: 108 students, from 2011–2020):

1. Current work sector (private 74.1% and public 25.9%)
2. Working in the sport sector (63.9%)
3. Where he/she obtained a work position (85.2% found a job in his/her residential area)
4. Was it useful to attend this master to improve professional skills? (Table 2).

Table 2. Students' answers to question number 4.

1 Negative	2 Partially Negative	3 Partially Positive	4 Positive
1.85%	24.92%	44.51%	28.70%

5. Was the cadaver dissection course useful? (only for Sports Physiotherapy; 86 students) (Table 3).

Table 3. Students' answers to question number 5.

1 Negative	2 Partially Negative	3 Partially Positive	4 Positive
1.16%	5.81%	17.44%	75.58%

6. How useful was the title of master in order to enter into the working world? (Table 4).

Table 4. Students' answers to question 6.

1 Negative	2 Partially Negative	3 Partially Positive	4 Positive
11.18%	23.88%	27.36%	37.58%

(Master's in Athletic Training in Football for Youth Sectors: 94 students, from 2011–2020):

1. Current work sector (football field 83%)
2. Where he/she obtained work placement (74% found the job in his/her residential area)
3. Was it useful to attend this master to improve professional skills? (Table 5).

Table 5. Students' answers to question 3.

1 Negative	2 Partially Negative	3 Partially Positive	4 Positive
4.25%	8.51%	26.59%	60.63%

4. How useful was the title of Master in order to enter into the working world? (Table 6).

Table 6. Students' answers to question 4.

1 Negative	2 Partially Negative	3 Partially Positive	4 Positive
10.21%	21.27%	30.92%	37.58%

5. Did you attend the course for athletic trainers in Coverciano (headquarters of the Italian Referees Association)? (yes 30.85%)
6. Do you possess a UEFA coaching license? (yes 30.85%)

Additional questions were also added, including demographic data and open opinions and suggestions.

Courses are professionally relevant, considering that these Master qualifications are often a prerequisite for employment in high-performance sports settings, including Olympic and national teams. Similar experiences have also been successfully reported in other countries. A Master's of Clinical Physiotherapy is available at the Curtin University of Perth, Australia [16]. A Master's of Sports Medicine is completely delivered online at the University of Melbourne, Australia [17]. The institution of a Master's of Exercise and Sports Medicine in partnership with the Football Association was accomplished at the University

of Birmingham, England [18]. A Master's of Sports Physiotherapy to integrate sports and exercise-related sciences with physiotherapy can be attended at the University College of Dublin, Ireland [19].

2.2. Second Mission: Research Activity

Anatomy is recognized as a research-based discipline. Research has always been one of the main interests of CRMSA. For this reason, all professionals working at CRMSA are also involved in anatomical ground-breaking research.

Some recent research projects are in collaboration with different hospital centers of the University of Pisa. One of these is a joint project with the School of Specialization in Orthopedics and Traumatology which deals with "Comparison in gait analysis and in functional outcome in total knee arthroplasty (TKA) with two different implant designs (PS and Medial Pivot)" Another project is with a rheumatology center which includes the following research: "Rehabilitation of the upper limb in subjects suffering from rheumatic diseases with particular attention to the hands in patients suffering from scleroderma".

An important research grant was obtained in the program Horizon 2020—ICT (Information and Communication Technologies). This project is PRIME-VR2—(Personalized recovery through a multi-user environment: Virtual Reality for Rehabilitation), in collaboration with University of Strathclyde (Scotland), University of Malta (Malta), University of Oulu (Finland), and University College of London (England). It aims to develop a state-of-the-art digital virtual reality environment for rehabilitation at home through a virtual gaming space that will provide proper stimulation and friendly competition. The treatment concentrates on motor skills of the upper body (arm, hand, and finger movements). The virtual reality environment will be customized through adaptive controllers and shaped individually for each user according to their condition. It is a great step forward for European interactive technology in improving physical health and performance. CRMSA participates as one of the four living labs that will provide the case studies for the validation activities.

CRMSA is also involved in a University of Pisa-funded research project entitled "HARMD: Hand Remote Machine Diagnosis" dealing with a hand trauma remote diagnostic device. This project aims at tackling the problems related to the delay in treatment of hand trauma through a very easy and fast system able to optimize the lack of specialists in hand surgery. The device, including electrodes for electrical stimulation, oximeter sensors, infrared sensors, and cameras, was tested on voluntary adults in different scenarios of simulated ischemia accidents. Preliminary data provided promising results encouraging further studies to validate this new instrument that could revolutionize the network of hand trauma care.

Furthermore, in recent years, CRMSA has contributed to the activation of various research grants for joint higher education projects co-financed by the Region of Tuscany, in collaboration with the EndoCAS, a center of excellence of the University of Pisa for computer-assisted surgery. The research field of this center focuses on the management of rehabilitation with the help of virtual and augmented reality. Indeed, it is the only Italian center accredited by the American College of Surgeons and possesses the first dV-Trainer simulator by Mimic for robotic surgery installed in Italy with full simulated procedure in augmented reality. Finally, it has the latest LapSim simulator by Surgical Science with haptic feedback for simulated laparoscopic procedures in virtual reality. More in depth, in 2009, an agreement between the University of Pisa and the hospital led to the establishment of EndoCAS for scientific research, education, and training of medical and paramedical staff.

The scientific collaboration with EndoCAS promoted different projects with the purpose of improving rehabilitation techniques by means of virtual reality and new imaging approaches. In detail, the research involved the morphological and functional study of the musculoskeletal system and the development of simulation modalities for clinical and educational purposes. Among the different anatomical structures, particular attention was given to the deep fascia. The project involved the use of imaging methods, such as MRI and

3D ultrasound, and post-processing techniques for the anatomical and functional study of the musculoskeletal structures, as well as virtual reality techniques for the simulation and presentation of morphological and functional information acquired. The application of 3D US screening was used for the *in vivo* 3D fascial motion assessment, to develop an innovative semiautomatic method allowing, for each fascial layer, the simulation of a 3D motion vector field describing the displacement of salient fascial features during a muscular contraction. Such analysis of fascial layer mobility may offer new insights to achieve a deeper understanding of the myofascial system, and the role of the deep fascia in musculoskeletal dynamics and dysfunctions.

The project of another grant focused on the development of a serious game for upper limb rehabilitation. The goal was to overcome the limitations of traditional treatments offering a more specific, intensive, and enjoyable therapy with real-time feedback of the user's performance. The system was designed from traditional rehabilitation exercises selected in collaboration with clinicians. The project involved the use of augmented reality (AR) and virtual reality techniques for the development of two versions of the serious game:

- (1) A wearable application "AR rehab game app" based on head-mounted displays (HMDs) technology (i.e., Microsoft HoloLens). Preliminary tests showed that AR technology allows promising results in terms of immersive experience and user motivation but needs further evolution to improve the field of vision and ergonomics (e.g., the HMD weight).
- (2) A non-wearable application based on a standard desktop computer, a screen, and the Leap Motion Controller as a hand tracking system. A limitation of this version compared to the AR one is the reduction of immersive experience. However, this limitation was balanced by other factors, such as ergonomics. The results showed that the application is attractive, ergonomic, and clinically useful.

Overall, the objective of both versions was to maintain the medical benefits of traditional rehabilitation, while reducing human resources and costs and facilitating the active participation of the patient. These versions could also be used in shoulder rehabilitation, with appropriate modifications.

The University of Pisa has invested in research facilities, specifically in supporting instruments and equipment. The Center "Sport and Anatomy" recently inaugurated an advanced unit of Biomechanics. This represents a great opportunity of integrated activities, in terms of teaching, research, assistance, and rehabilitation.

As demonstrated by several recent research articles [20–29], all these research activities led to many publications in the last four years in different peer-reviewed international journals, with a total Impact Factor of 22.4, and a total number of citations of 141 (35.25 mean citation per year) (source: Scopus.com; last update: 21 June 2022).

The Journal of Sport and Anatomy

On 23 January 2015, The Journal of Sport and Anatomy was presented at the behest of the same graduate students expressing the need to maintain contacts with both teachers and colleagues. The ex-football player Gianni Rivera, past president of the technical sector of FIGC, was present at the ceremony. Subsequently, the journal became the pride of CRMSA.

The journal is published quarterly and aims to be a means of communication and update for those who work in the sports world. It has the intent to discuss and validate results and present experiences and working hypotheses on the various problems that involve athletes. It publishes original research articles in the growing field of exercise and sports sciences, including several disciplines, such as anatomy, biomechanics, psychology, ergonomics, design of sports equipment, and other interdisciplinary topics. The readership of the journal ranges from academic research workers to professionals and students.

2.3. Third Mission: Dissemination of Knowledge

CRMSA represents a modern and dynamic university reality that enters by right into the many initiatives that this ancient Italian university is carrying out in the so-called third mission. It not only supports but integrates the more traditional university missions concerning research and education. This reality leads to the creation of new opportunities, leading the university to adopt behaviors and entrepreneurial characteristics that are more attentive to the evolution of the socio-economic context, to the needs of society and its territory. Thus, it is not surprising that “Sport and Anatomy” has been officially included in the list of “Structures and Research Facilities” of the University of Pisa.

At the same time, even social media were exploited to plan specific teaching and learning programs, as well as to disseminate different opportunities and activities for sports sciences students. Numerous students, professionals, and all staff members of the center joined two different Facebook pages; in detail, the Facebook page of the brand “Sport and Anatomy”, at present, counts 6027 individuals (i.e., total followers), owing to a total of 5873 likes), while 1045 individuals joined the Facebook page of the Center for Physical and Rehabilitation Medicine “Sport and Anatomy” (owing to a total of 982 likes).

In recent years, the University of Pisa has launched a series of initiatives to support applied research and the consequent enhancement of research products. On the model of other experiences abroad and in Italy, a call for the financing of Technological Demonstrators was prepared in order to encourage the development of technologies to support research groups of the University of Pisa in carrying out the activities necessary for the technological transfer of innovation.

The Research and Technology Transfer Services Department organizes research promotion and communication activities such as international conferences and workshops, as well as the “European Researchers’ Night” initiative, funded by the European Union. This Department provides an information service for funding opportunities and research policies in the form of two dedicated newsletters and a monthly column on the researcher of the month, dedicated to research projects and experiences in Europe. Research projects and activities are also highlighted through news from the Communication Office, the social media channels of the University, the Research Services Unit, and the Technology Transfer Services Unit. Further insights are offered by the series of videos entitled “Recounting the research” that addresses important topics of interest to the wider public and on which the University of Pisa is developing important research. The videos communicate in a simple but scientifically rigorous way, presenting those who commit themselves daily to research activities.

Moreover, a meeting was recently organized by “Sport and Anatomy” at the University of Pisa to promote the dual career according to guidelines established with the main referents for Italian sports. Indeed, it is now well accepted to recognize the elite students/athletes for the results achieved in their sporting career, at a national and international level [30]. Presidents of Italian University Sports Centers, Italian National Olympic Committee, Unisport Italia, and European Athlete as Student (EAS) Network participated at the meeting. These are the objectives of Unisport Italia: to formalize two new student figures, elite agonists and non-elite agonists; to build for these students/athletes a specific support that allows them to successfully attend their university studies, harmonizing them in their sporting path; to recognize these athletes and their sporting commitment with university training credits; and to define the figure of student-elite athlete. EAS also acts as an observer in the European Expert Groups on Human Resource Development in Sport and on Good Governance, and as a stakeholder for dual career of the Council of Europe’s Enlarged Partial Agreement on Sport (EPAS) and the European Parliament.

The internationalization of the university system is one of the goals that the University of Pisa has set itself to achieve through the encouragement of various activities, such as the pledging of a framework agreement with European and international universities, the creation of joint and double qualifications, and the enhancement of services offered to international students. Among these university activities promoted as part of the interna-

tionalization process, there are institutional visits at partner universities and at university institutions, which offer the possibility of new collaborations, as well as participation to international fairs organized by various recruitment agencies to promote the academic offer of universities to students interested in studying abroad.

Most policy priorities include reinforcing the mobility of students and staff. Continuing monitoring and improvement of teaching/learning/assessment on the basis of quality criteria will keep degree programs up to date and up to the highest standards. Thus, quality and relevance can be ensured by continuous checking, updating of relevant competences, and consultation with stakeholders.

In line with this, the Education Model for Parents of Athletes in Academics (EMPATIA) was also considered [31]. It is a European Collaborative Partnership within the Erasmus+ Sport Program, with its different activities (traineeship, free mover, etc.), to promote the dual career of talented athletes by empowering their parents. This project aims to identify the actual gap of knowledge on dual career parenting and to develop its educational program based on a solid theoretical background. In particular, it is important to recognize parents' experiences, opinions, and needs in supporting those athletes who are also students.

3. Conclusions and Future Perspectives

One of the major challenges that traditional programs (teaching methods) face today is the constant search for synergy between theoretical disciplines and practical-applicative activities within the context of work environments, entrepreneurship and industry worlds, and local communities. Therefore, the challenge is the constant search for a superior quality provided at various educational and professional levels. In this regard, "Sport and Anatomy" is trying to accomplish an important task, which is to meet students' requirements of the different degree courses. Students often complained about the impossibility of following complex and long-lasting rehabilitation procedures due to the very short time of patients' hospitalization in the medical setting.

Therefore, the purpose of "Sport and Anatomy" is to furnish the opportunity for students to work closely with practitioners of the sector within a real context of high professionalism, where they can face uncommon and stimulating challenges, activating creative thinking, and analytic and argumentation skills. In the courses managed by the Center "Sport and Anatomy", students and professors who do not yet have a business idea or whose idea is currently in an embryonic state are also stimulated to promote entrepreneurial culture and innovation, valuing ideas and interdisciplinarity. Accordingly, participants from different disciplinary fields can know each other and work together on common projects, developing their skills and specific competences, including planning, organizational, and communication capabilities.

As an incoming ambitious project, the center started in December 2021 to expand the university structure to organize sports medicine. The center will be the point of reference for the School of Specialization in Sports Medicine of the University of Pisa. Further professional figures will be also considered, such as neurologists, psychologists, and cardiologists to expand their specific competences to many other pathologies, including those related to metabolic dysfunctions. Accordingly, the rooms dedicated to sports medicine and administration, and a biomechanics laboratory with a latest-generation synthetic grass floor will be also arranged. This new laboratory will be equipped with the most sophisticated equipment for the assessment of athletic movement and posture, and to facilitate the recovery of walking and running after injury. The association between physical education and academic performance, including indicators of cognitive skills and attitudes, academic behaviors and achievement, as well as recent technological advancement [32,33] is an important aspect in different sectors including sports activities [34].

The organization of "Sport and Anatomy" involves multiple professional experts in the field of sports medicine: higher education, medical assistance, rehabilitation, sport trainers, management, and marketing. It is a recognized brand of the highest quality, advertised in national newspapers, television broadcasters, and on on-board LED screens fields in

the most important football stadiums in Italy, and many other national and international sporting events.

In conclusion, the Center for Physical and Rehabilitation Medicine, under the label of “Sport and Anatomy”, represents a unique experience within an academic organization, namely the University of Pisa, playing a key role in supervising and accomplishing in an innovative way all the three missions of the university (i.e., teaching, research, and dissemination of knowledge), thus strongly fulfilling the aims of modern university targets.

The lack of scientific analysis and comparison with other programs within the context of sports sciences represent a limitation of the present study. Nonetheless, at present, we are not aware of any similar experiences, centers, and/or academic organizations which act as the main point of reference for all the three missions of the university.

As far as we know, this represents a pioneer experience, with the aim of developing a multidisciplinary and interdisciplinary approach to coordinate additional tasks, including research activity, medical assistance, and rehabilitation in the context of sports sciences. In this respect, “Sport and Anatomy” of the University of Pisa becomes a reference point for sports management, creating the indispensable links between basic and specialist sciences through different Masters’ and schools. The present outcomes encourage further experiences and research with the aim of improving the performances of stakeholders, while ameliorating the cooperation between the university and the local communities.

Although to date it was not possible to carry out a transversal comparison with other similar performances, future scientific analyses should be oriented towards longitudinal comparisons that allow the evaluation over time of the impact and repercussions of all the center’s activities on university and local communities.

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