Teaching of sports and exercise medicine in Italian University Degree Programmes in Medicine and Surgery: *quo vadis*?

EMILIANO SCETTRI[1], FRANCESCA BATTISTA[1], MARCO VECCHIATO[1], MASSIMILIANO BIANCO[2], FABRIZIO SOLLAZZO[2], RICCARDO MONTI[2], ANDREA ERMOLAO[1], VINCENZO PALMIERI[2], DANIEL NEUNHAEUSERER[1]; IN COLLABORATION WITH THE DIRECTORS OF THE ITALIAN POSTGRADUATE SCHOOLS OF MEDICAL SPECIALISATION IN SPORTS AND EXERCISE MEDICINE

[1]Postgraduate School of Medical Specialisation in Sports and Exercise Medicine, Department of Medicine, School of Medicine, University of Padova, Italy; [2]Postgraduate School of Medical Specialisation in Sports and Exercise Medicine, Faculty of Medicine and Surgery, Catholic University of Sacred Heart, Rome, Italy.

Summary. Introduction. Physical activity and exercise are effective strategies for preventing and treating chronic diseases. Counselling and prescription of physical activity must be part of the curricula of the University degree programmes in Medicine and Surgery. This study examines the current level of training on these topics provided to medical students in Italy. **Methods**. We analysed the content and teaching methods related to Sports and Exercise Medicine (SEM) in University degree programmes in Medicine and Surgery through a structured survey. The survey was disseminated among the twenty-seven directors of Italian Postgraduate Schools of Medical Specialisation in SEM, who are directly involved in University education in this field. **Results.** Twenty-four Universities responded to the survey, representing 89% of currently active Schools. 83% of respondents judged the current training in SEM to be inadequate. In 23 courses, the number of dedicated University Educational Credits (CFU/ECTS) is between 1 and 2, i.e. fewer than 20 hours over a six-years single cycle degree course. Optional courses are offered in 29% of Universities. The most frequent topics in the syllabus were functional assessment (42%), exercise prescription (33%), sports cardiology (29%), and preventive physical activity (29%). 25% and 57% of mandatory and optional courses, respectively, are taught by medical instructors specialise in SEM. The lack of consideration of SEM is seen as the main obstacle to adequate training. **Conclusions.** Although "Medicine of Physical Activity and Wellbeing" is a mandatory core learning activity for University degree programmes in Medicine and Surgery in Italy, its implementation varies across Universities. In order to ensure specific skills for all physicians and thus benefits for the National Health System, it is essential to define a core curriculum in this area of great medical and societal relevance, also by involving specialists in SEM.

Key words. Sports medicine, exercise prescription, physical activity, medical training, degree in medicine and surgery.

L'insegnamento della medicina dello sport e dell'esercizio fisico nei Corsi di Laurea in Medicina e Chirurgia in Italia: quo vadis?

Riassunto. Introduzione. L'attività fisica e l'esercizio fisico rappresentano strategie efficaci per la prevenzione e il trattamento delle malattie croniche. La consulenza e la prescrizione dell'attività fisica devono far parte integrante dei curricula dei Corsi di Laurea Magistrale in Medicina e Chirurgia. Il presente studio analizza il livello attuale di formazione su questi temi offerto agli studenti di Medicina in Italia. **Metodi**. È stata condotta un'indagine strutturata per analizzare i contenuti e le modalità didattiche relative alla Medicina dello Sport e dell'Esercizio Fisico (MSE) nei Corsi di Laurea Magistrale in Medicina e Chirurgia. Il questionario è stato distribuito ai ventisette Direttori delle Scuole di Specializzazione in MSE, coinvolti direttamente nella didattica universitaria in questo ambito. **Risultati**. Hanno risposto 24 Università, pari all'89% delle Scuole attualmente attive. L'83% dei rispondenti ha giudicato inadeguata l'attuale formazione in MSE. In 23 corsi, il numero di Crediti Formativi Universitari (CFU/ECTS) dedicati varia da 1 a 2, ovvero meno di 20 ore nell'arco del corso di laurea a ciclo unico di sei anni. Corsi opzionali sono offerti nel 29% delle sedi. I temi più frequentemente trattati nei programmi didattici sono risultati la valutazione funzionale (42%), la prescrizione dell'esercizio (33%), la cardiologia dello sport (29%) e l'attività fisica preventiva (29%). Il 25% dei corsi obbligatori e il 57% di quelli opzionali sono tenuti da docenti medici specialisti in MSE. La scarsa considerazione attribuita alla disciplina è percepita come il principale ostacolo a una formazione adeguata. **Conclusioni**. Sebbene la "Medicina dell'Attività Fisica e del Benessere" rappresenti un'attività formativa caratterizzante obbligatoria nei Corsi di Laurea in Medicina e Chirurgia in Italia, la sua applicazione risulta eterogenea tra le diverse sedi. Al fine di garantire competenze specifiche a tutti i futuri medici, con ricadute positive sul Servizio Sanitario Nazionale, è essenziale definire un curriculum formativo di base in quest'area di grande rilevanza sanitaria e sociale, coinvolgendo attivamente anche gli specialisti in MSE.

Parole chiave. Medicina dello sport, prescrizione dell'esercizio, attività fisica, formazione medica, corso di laurea in medicina e chirurgia.

Introduction

The correlation between physical activity levels and survival can be considered as evidence-based knowledge[1,2]. Physical exercise is recognised as an effective strategy for both primary and secondary prevention, as well as a therapeutic intervention for numerous chronic diseases[3,5]. Nonetheless, physical inactivity and a sedentary lifestyle are increasingly prevalent on both a national and global scale. This is highlighted by the fact that approximately one third of the global population does not meet the minimum amount of weekly exercise recommended by the World Health Organization[6].

The growing tendency towards physical inactivity and sedentary behaviour contributes to the premature ageing of the population, an increased prevalence of chronic non-communicable diseases, and a deterioration in quality of life. This phenomenon is accompanied by an escalation in therapeutic interventions and hospital admissions, which in turn leads to rising healthcare costs[7,8].

Despite the widespread recognition of the importance of physical activity in health policy, significant disparities persist between the recommendations outlined in international guidelines concerning the prevention and treatment of major chronic diseases and their implementation within healthcare systems and in clinical practice. Indeed, it is evident that therapeutic exercise prescription, counselling, and administration are currently not considered or underdeveloped in the majority of healthcare facilities and within the National Health System[9,10].

In light of the compelling evidence and taking into account the identified implementation challenges, a mandatory core learning activity titled "Medicine of Physical Activity and Wellbeing" has been incorporated into the Medicine and Surgery degree courses at Italian Universities through a ministerial directive. This educational activity must consider two to seven University Educational Credits (CFU) equivalent to the European Credit Transfer and Accumulation System (ECTS). Notwithstanding the autonomy of individual Universities in implementing and refining this mandatory training activity in diverse ways, it is imperative to ensure that students receive a robust basic training comprising specific knowledge, skills, abilities, and competencies in the domain of Sports and Exercise Medicine (SEM).

Furthermore, it is up to each individual Medical School to decide whether to address this educational need through mandatory or optional courses, further increasing the variability across institutions. This study therefore aimed to assess and quantify the training offered on topics related to physical activity and exercise within Italian University degree programmes in Medicine and Surgery. In this regard, the role and involvement of Italian Postgraduate Schools of Medical Specialisation in SEM within the context of undergraduate medical education in this specific field was also investigated. The description and analysis of the current situation presented in this article may thus provide a basis for identifying potential gaps and for planning future interventions.

Materials and methods

This cross-sectional study was based on data collected through a digital questionnaire. The Postgraduate School of Medical Specialisation in SEM of the University of Padova acted as the leader of a national project that involved all the Schools of Medical Specialisation in SEM in Italy, coordinating the development and administration of the survey. The respective questions were formulated on the basis of available international scientific literature on the same topic[11-13]. The established inquiries were accordingly adapted to the Italian context, while newly developed questions were also incorporated in order to analyze the specific national setting. The final survey consisted of 40 questions. The questionnaire was sent by e-mail via a link to the "Survey Monkey" platform (SurveyMonkey Inc., San Mateo, California, USA, www.surveymonkey.com) in December 2023 to the Directors of the 27 Postgraduate Schools of Medical Specialisation in SEM present in Italy. The choice to address and target this survey to the Directors of the Postgraduate Schools of Medical Specialisation in SEM was made in an attempt to reach the figures most frequently involved in University teaching of SEM-related topics. In case of a lack of response from the Directors, a reminder e-mail was sent with a new request, while for double responses only the most complete and/or the most recent response among those received was considered. The data collection process ended in March 2024.

The responses were subsequently downloaded and managed in Excel format for the purpose of descriptive statistical analysis. In cases where participants were asked to indicate their level of agreement with a statement using a Likert scale ranging from one (totally inadequate) to five (fully adequate), responses rated as two or below were classified as negative evaluations.

Results

Twenty-four Directors of the Postgraduate Schools of Medical Specialisation in SEM (89% of those invited), or their delegates, participated in the survey. Most of the participants also held positions in the School of Medicine, such as instructor (78%), member of the Course Council (28%) or Course Coordinator/President (16%).

Adequacy of curricular and optional training

The adequacy of educational training on physical activity and exercise in medicine was rated as totally or partially inadequate in 58% and 25% of the cases, respectively, whereas 17% of the participants gave a positive assessment (three or more out of five); none of them rated it as fully adequate (table 1).

With regard to the mandatory core learning activity titled "Medicine of Physical Activity and Wellbeing", 42% of the participants answered that no SEM-related topics are covered, while 17% stated "not always" (table 1). The number of University Educational Credits (CFU/ECTS) allocated to topics related to SEM, with the exception of one case (which includes four credits), ranges between one (33% of respondents) and two (8%), although in many cases it remains not assessable (54%). These findings are largely consistent with the number of mandatory educational training hours provided, which never exceed 20 hours over the six-years single cycle degree course, and in 38% of cases they fall between zero and nine hours (Table I). With regard to Credits and teaching hours, 54% and 42% of participants, respectively, reported being unaware of the corresponding data.

With regard to elective teaching, it is noteworthy that 71% of Universities do not offer any elective courses on these subjects. When activated, such courses are attended by >20 students per year in 57% of cases (table 1). However, other specific educational activities, in particular internships (eight cases) and seminars (nine cases) in the field of SEM are frequently offered (63%).

Involvement of sports and exercise medicine in medical education

Twenty-five percent of the faculty members assigned to a mandatory course covering topics related to SEM hold a specialisation in Sports and Exercise Medicine. This percentage increases to 57% when considering elective courses (table 2). Moreover, the term "Sports and Exercise Medicine" is not included in the title of 88% of the mandatory courses that addresses "Medicine of Physical Activity and Wellbeing" (table 3).

The insufficient integration of SEM within the University degree programme in Medicine and Surgery is

Table 1. General information on curricular and optional teaching programmes.

Do you consider that an adequate level of training on physical activity is offered in the mandatory training courses of the University degree programme in Medicine and Surgery? (1=totally inadequate, 5=totally adequate)						
1	2	3	4	5	I do not know	
14 (58.3%)	6 (25.0%)	2 (8.3%)	2 (8.3%)	-	-	
Does the teaching covering the core learning activity "Medicine of Physical Activity and Wellbeing" actually deal with Sports and Exercise Medicine topics?						
Yes	No	Not always	I do not know			
9 (37.5%)	10 (41.7%)	4 (10.7%)	1 (4.2%)			
How many University Educational Credits (CFU/ECTS) of the teaching covering the core learning activity "Medicine of Physical Activity and Wellbeing" are actually devoted to the topics of Sports and Exercise Medicine?						
1	2	3	4	5	>5	I do not know
8 (33.3%)	2 (8.3%)	-	-	1 (4.2%)		13 (54.2%)
During the University degree programme in Medicine and Surgery, how many total hours of mandatory training on physical activity, exercise prescription and Sports and Exercise Medicine are offered to students?						
0-9	10-19	20-29	30-39	40-49	≥50	I do not know
9 (37.5%)	5 (20.8%)	-	-	-	-	10 (41.7%)
Are Sports and Exercise Medicine topics offered within elective/optional courses in your University degree programme in Medicine and Surgery?						
Yes	No					
7 (29.2%)	17 (70.8%)					
On average, how many students per year participate in this/these optional course(s)?						
0-9	10-19	29-29	30-39	40-49	≥50	I do not know
-	2 (28.6%)	2 (28.6%)	1 (14.3%)	1 (14.3%)	-	1 (14.3%)

Table 2. Specialisations of teaching faculty in mandatory and elective Sports and Exercise Medicine courses.

The faculty member responsible for the mandatory core course related to Sports and Exercise Medicine is specialised in:	
Sports and Exercise Medicine	6 (25.0%)
Internal Medicine	8 (33.3%)
Cardiology	5 (20.8%)
Orthopaedics	-
He/She does not hold a medical degree	-
Other	11 (45.8%)
The faculty member responsible for the elective/optional course(s) related to Sports and Exercise Medicine is specialised in:	
Sports and Exercise Medicine	4 (57.1%)
Internal Medicine	2 (28.6%)
Cardiology	2 (28.6%)
Orthopaedics	-
He/She does not hold a medical degree	2 (28.6%)
Other	2 (28.6%)

Table 3. Presence of Sports and Exercise Medicine in the title of the University courses/teachings.

Is "Sports and Exercise Medicine" officially in the name of the mandatory University course/teaching?		
Yes	No	I do not know
3 (12.5%)	21 (87.5%)	-
Is "Sports and Exercise Medicine" officially included in the title of at least one elective course?		
Yes	No	I do not know
5 (71.4%)	2 (28.6%)	-

perceived by respondents as the main barrier to providing adequate core mandatory training on physical activity/exercise-related topics in medicine (63%), followed by the limitation in the number of allocable CFU/ECTS (38%), and the lack of cultural awareness during the curriculum configuration process (29%) (table 4, figure 1).

Syllabus content

With regard to the syllabus of the specific SEM-related courses, out of the 17 available topics, the subjects most frequently addressed within the mandatory teaching activities were functional assessment (42%), exercise prescription (33%), sports cardiology (29%), and physical activity in primary and seconda-

Table 4. Factors contributing to the perceived inadequacy of the provided education on physical activity in medicine.

If there is no adequate core/mandatory training offer on exercise prescription provided in the degree programme in Medicine and Surgery at your University, what do you believe is the main reason?	
None, an adequate training offer is in place	1 (4.2%)
Lack of cultural awareness on the topic	7 (29.2%)
Shortage of appropriately trained teaching staff	2 (8.3%)
Limit on assignable University Educational Credits (CFU/ECTS)	9 (37.5%)
Courses assigned to unrelated Scientific Disciplinary Sectors	2 (8.3%)
Lack of proper recognition of Sports and Exercise Medicine in the degree programme	15 (62.5%)
Others	1 (4.2%)

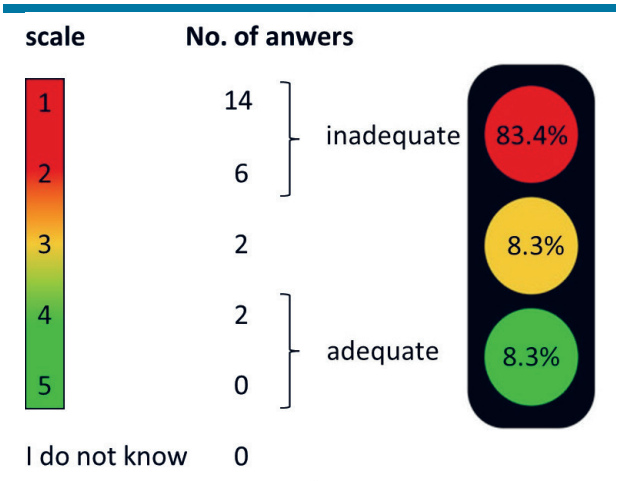

Figure 1. Assessment of the adequacy of medical education on physical activity and exercise.

ry prevention (29%). It is evident from the responses received that not one single topic was addressed in at least half of the Universities, showing heterogeneity in the respective educational offer.

A different pattern emerged when considering elective courses: five of the listed topics were reported to be addressed in more than half of the cases. It is noteworthy that the subject of physical activity in the contexts of primary and secondary prevention was incorporated within all seven elective courses that were analysed (table 5).

Discussion

This study, which was conducted as part of a project that was collectively formulated by all Italian Postgraduate Schools of Medical Specialisation in Sports and Exercise Medicine (SEM), is pioneering in its field. It is the first study of its kind to investigate the extent and quality of national education on physical activity/exercise-related topics within University degree programmes in Medicine and Surgery. Despite the clear body of scientific evidence supporting the role of physical activity and exercise in promoting overall health, improving prognosis in numerous chronic diseases, and enhancing quality of life, the prescription and administration of physical activity remains still underutilised in clinical practice, with significant negative impact on public health costs.

In light of the importance of this issue for public health, it was deemed necessary to examine how these topics are addressed in undergraduate medical education of future physicians. The objective of this study was to identify and quantify potential educational gaps or disparities and their underlying causes, with a view to supporting future cultural, political and organisational initiatives in both academic and healthcare settings.

Adequacy of curricular and optional training

The collected data indicate that a significant proportion of survey participants, specifically more than 80%, expressed concerns regarding the adequacy of the mandatory education on physical activity and exercise provided during the University degree programme in Medicine and Surgery. Ministerial guidelines stipulate that such training should be ensured through the mandatory core learning activity titled "Medicine of Physical Activity and Wellbeing", which should account for between two and seven CFU/ECTS (about 20-70 hours). However, the survey revealed that the number of curricular hours dedicated to physical activity and exercise is extremely limited in nearly all cases: in no case it does exceed 20 hours, while in 38% it ranges from zero to nine hours, and in 42% the data could not be assessed.

These findings are consistent with the number of CFU/ECTS allocated to SEM-related topics within this course unit, which in the vast majority of cases ranges between one and two. A comparable scenario was documented in the study by Strong et al.[11], which was revealed by a survey administered to University programme leaders in Australia. The study showed that 58% of respondents perceived the level of specific higher education to be inadequate, and the mean number of hours dedicated to related learning objectives was 6.6, 5.0, and 12.3, according to the duration of the curriculum (4, 5, or 6 years, respectively). In the United States, 56.4% of accredited programme directors felt that they offered a sufficient level of physical activity-related training for their students, with an average of 8.1 hours of mandatory training in a four-years medical school, as reported in the study by Stoutenberg et al.[12]. Consistent findings were reported by Weiler et al. in the United Kingdom[13], where the Chief Medical Officers' (CMO) guidelines on physical activity were incorporated in only 56% of medical schools, with an average of merely 4.2 hours dedicated to this subject across the entire University degree programme. This national

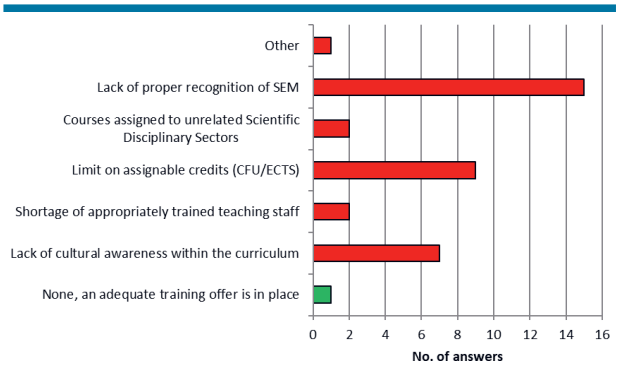

Figure 2. Factors contributing to the inadequacy of medical education on exercise prescription. SEM: Sports and Exercise Medicine. CFU/ECTS: University Educational Credits.

Table 5. Syllabus contents for core and elective courses.

What topics are included in the syllabus of the mandatory course(s) related to Sports and Exercise Medicine?	
Exercise physiology	5 (20.8%)
Sports cardiology	7 (29.2%)
Pre-participation screening for competitive and non-competitive sport activities	3 (12.5%)
Sports injury management and rehabilitation	-
Team physician	-
Anti-Doping	-
The role of physical activity in primary and secondary disease prevention	7 (29.2%)
Exercise in extreme environments	-
Exercise and sport for special populations, including persons with disabilities	5 (20.8%)
Functional assessment in athletes	3 (12.5%)
Functional evaluation in patients	10 (41.7%)
Cardiopulmonary Exercise Testing	5 (20.8%)
Physical exercise prescription	8 (33.3%)
Nutrition	4 (16.7%)
Imaging	1 (4.2%)
Sport-related medical emergencies	-
Psychosocial and supplementary competencies, including research, communication, and managerial skills	2 (8.3%)
Others	11 (45.8%)
What topics are included in the syllabus of the elective/optional course(s) related to Sports and Exercise Medicine?	
Exercise physiology	5 (71.4%)
Sports cardiology	3 (42.9%)
Pre-participation screening for competitive and non-competitive sport activities	3 (42.9%)
Sports injury management and rehabilitation	-
Team physician	-
Anti-Doping	1 (14.3%)
The role of physical activity in primary and secondary disease prevention	7 (100%)
Exercise in extreme environments	1 (14.3%)
Exercise and sport for special populations, including persons with disabilities	3 (42.9%)
Functional assessment in athletes	3 (42.9%)
Functional evaluation in patients	4 (57.1%)
Cardiopulmonary Exercise Testing	4 (57.1%)
Physical exercise prescription	6 (85.7%)
Nutrition	2 (28.6%)
Imaging	-
Sport-related medical emergencies	-
Psychosocial and supplementary competencies, including research, communication, and managerial skills	1 (14.3%)
Others	1 (14.3%)

and international perspective seem to highlight also a cultural problem in the design of medical curricula, still not considering physical activity and exercise as crucial issue for preventive medicine in healthcare.

In addition to the limitations of the core curriculum, the educational offer of elective courses focused on physical activity and exercise in Italian medical schools is also limited, being available in only about

one-third of Universities. When offered, these elective courses tend to enjoy high attendance, suggesting a reasonable level of interest in the topic among medical students. In institutions where no elective courses are available, the educational offer is often supplemented by other initiatives, such as seminars or internships, which are provided by most Universities.

Involvement of sports and exercise medicine in the educational offer

An analysis of the perceived reasons behind these educational gaps highlights several key factors: a lack of cultural awareness in the academic perception of these topics (29%), the limited number of allocable CFU/ECTS (38% of respondents), and, most notably, the overall lack of consideration given to SEM within the University degree programme in Medicine and Surgery (63%) (figure 2).

In this regard, it is worth noting that in only 13% the term "Sports and Exercise Medicine" appears in the official title of the mandatory course covering the core learning activity "Medicine of Physical Activity and Wellbeing". The situation differs when examining elective courses, where the term is included in five out of seven course titles. This suggests greater awareness and expertise among the faculty members who voluntarily propose such content as elective courses, in contrast with the limited awareness of these topics among the official governing bodies of the University degree programmes.

Similarly, only 25% of the instructors teaching mandatory courses within the core learning activity "Medicine of Physical Activity and Wellbeing" hold a specialisation in SEM; in the remaining cases, faculty members come from different academic backgrounds. The proportion of SEM specialists increases to 57% in elective courses focused on these topics. This further indicates a limited involvement of SEM specialists in teaching roles, and more importantly, a reduced political influence in the allocation of academic teaching responsibilities.

When asked about the number of hours and CFU/ECTS dedicated to SEM-related topics within the core curriculum, many respondents selected the option "I don't know". This may suggest that they are not always directly involved in curriculum design or in the actual delivery of the relevant teaching content within the University degree programme in Medicine and Surgery.

Comparison with foreign Universities is often challenging, as SEM is not formally recognised as a medical specialty in many international contexts[14]. However, Weiler et al.[13] reported that in the United Kingdom, SEM-related topics are frequently integrated into a range of other University courses, such as public health, cardiology, pulmonology, endocrinology, health promotion, and community medicine. This finding highlights both the heterogeneity of training on physical activity-related topics across different countries and their inherently transversal nature, relevant to multiple areas of medical education.

The limited number of training hours included in medical curricula is also observed in Australian and United States settings, which has been identified as one of the main barriers to adequate medical education on exercise prescription and subsequently to implementation[11,12].

Syllabus content

Another critical issue lies in the heterogeneity of the topics addressed in courses related to SEM, as described in the syllabi developed by individual instructors. Although there is a general tendency to cover patient functional assessment, exercise prescription, and physical activity as a strategy for primary and secondary prevention in Universities offering dedicated courses, these topics are entirely absent in over half of the University degree programmes in Medicine and Surgery. This indicates a lack of a unified national vision regarding the specific learning objectives for future physicians, and, consequently, the unclear definition of SEM's role in current undergraduate medical education.

Despite the small sample size (7 responses), elective courses appear to be more coherent and aligned in terms of content. This finding is associated with a greater involvement of SEM-trained faculty in teaching these elective courses, suggesting that instructors with specific expertise in SEM are more consistent in addressing relevant topics. Moreover, these elective courses tend to focus on the role of physical activity and exercise in primary and secondary prevention, individualised exercise prescription as well as exercise physiology.

This picture is consistent with findings from Stoutenberg et al.[12], who reported that in the United States, the most commonly addressed topics include the benefits of physical activity, counselling, guidelines/recommendations, and exercise physiology.

The issue of heterogeneous SEM-related course syllabi has also been addressed by the American Medical Society for Sports Medicine (AMSSM)[15], which therefore developed a core curriculum for medical students through a panel of experts. This curriculum emphasizes the promotion of physical activity in the general population, standard physical activity recommendations and implementation models, individualised exercise prescriptions for major chronic conditions, and behavioural change principles including counselling skills. Similarly, a consensus group

in Thailand identified the essential components of a University-level curriculum on physical activity in medicine. These included definitions, types, and benefits of physical activity, principles of exercise prescription models, and communication skills required to support behavioural change[16].

Based on these experiences - and in light of the strong scientific evidence regarding the impact of physical activity on survival, which contrasts with its limited real-world implementation - there is a clear need for a national consensus on specific educational objectives for medical students. Such consensus should guide the development of a coherent and standardised SEM-related curriculum to include in Medicine and Surgery University degree courses across Italy.

According to the collected data, greater involvement of SEM specialists is essential for appropriate syllabus design and teaching delivery within undergraduate education in medicine University degree programmes, where SEM-related content is still lacking and excessively inconsistent. Additional training interventions could also be included in the specialisation of General Practitioners, as well as in other specialties involved in the management of chronic diseases. Finally, given the positive effects of reducing sedentary behaviour and introducing tailored exercise on prognosis and quality of life – as well as the potential to reduce healthcare costs – these topics deserve structured educational investment[14].

Study limitations and future perspectives

The present study acknowledges several limitations that should be taken into account when interpreting the results. Firstly, the scarcity of available quantitative data on this subject necessitated the utilisation of a survey, which, by its nature, is subject to the personal opinions of the participants. Furthermore, it should be noted that the findings primarily represent the perspectives of the Directors of Postgraduate Schools of Medical Specialisation in SEM, and do not include the viewpoints of the broader academic institutions or medical students themselves. Incorporating students' perspectives of SEM- related education could facilitate a more comprehensive understanding of how physical activity is addressed in medical training, thereby offering insights into future physicians' awareness of the importance of physical exercise in clinical practice.

A limited understanding regarding physical activity as a therapeutic instrument and related available tools to assess and promote its implementation, can only result in a reduced impact on the education of the general population on evidence-based physical activity recommendations[17,18]. It is also important to note that the data presented in this study were collected exclusively from Universities offering a Postgraduate School of Medical Specialisation in SEM. In the absence of such postgraduate programmes in Universities, it is reasonable to hypothesise that exercise-related content plays an even more marginal role within medical education. Consequently, it is plausible that the present findings may in fact overestimate the true national extent of SEM-related medical education.

These considerations underscore the necessity for additional research including more institutional roles and perspectives, with the objective of attaining a more comprehensive and representative national overview. The cross-sectional design of this study precludes the detection of trends in the quality or quantity of specific SEM education over time, leading to the need for follow-up analyses. Finally, a significant proportion of respondents selected the "I don't know" option for a considerable number of items. While this may limit the interpretability of certain results, it could also reflect a limited understanding of the overall educational offer by teaching staff or University degree programme members, which – as previously discussed – point to a general lack of SEM involvement in higher education in Medicine and Surgery.

Conclusions

In conclusion, this study provides a cross-sectional overview of the current state of educational training on physical activity and exercise within University degree programmes in Medicine and Surgery at Italian Universities. Despite the existence of clear evidence pertaining to the prevention and treatment of numerous chronic diseases with physical activity, the specific training offer is still perceived as inadequate, both in terms of mandatory and optional courses. The creation of a standardised SEM-related curriculum within higher education in medicine and the monitoring of the implementation of these interventions over time are necessary, in accordance with the ministerial directive related to the mandatory core learning activity "Medicine of Physical Activity and Wellbeing". In this context, SEM should be considered for a leading role in specific training on physical activity and exercise and guiding healthcare policy choices towards a more prevention- based approach.

While there is a shared awareness of the medical and social importance of physical exercise in the prevention and treatment of non-communicable diseases, it is not acceptable today that the respective teaching to future physicians is still so neglected, leading to an education and implementation gap calling for action by respective societies and institutions.

Conflict of interest. The authors declare that there is no conflict of interest.

Authors' contributions. DN and AE contributed to the formulation of the study; DN, ES and FB to the acquisition, analysis and interpretation of data. ES drafted the article; DN, FB, VP, MB, FS, RM, AE, and MV participated in the critical revision. All authors read and approved the final version of the article.

Acknowledgements. We express our gratitude to the Directors of the Italian Postgraduate Schools of Medical Specialisation in Sports and Exercise Medicine: Giuseppe Annino (Roma, Tor Vergata), Rocco Barazzoni (Trieste), Rosario Barone (Palermo), Andrea Benso (Torino), Roberto Bottinelli (Pavia), Paolo Caraceni (Bologna), Michela Casella (Ancona), Iacopo Chiodini (Milano), Giuseppe Cibelli (Foggia), Lia Crotti (Milano, Bicocca), Luca Giuseppe Dalle Carbonare (Verona), Flavio D'Ascenzi (Siena), Carolina De Ciuceis (Brescia), Franca Di Meglio (Napoli, Federico II), Andrea Ermolao (Padova), Marco Gesi (Pisa), Ezio Ghigo (Torino), Maria Adele Giamberardino (Chieti), Bruno Grassi (Udine), Giovanni Grazzi (Ferrara), Germano Guerra (Molise), Ferdinando Iellamo (Roma, Tor Vergata), Cristina Limatola (Roma, La Sapienza), Giampiero Merati (Insubria), Maria Grazia Modena (Modena), Pietro Amedeo Modesti (Firenze), Marcellino Monda (Campania), Daniel Neunhaeuserer (Padova), Vincenzo Ostilio Palmieri (Bari), Vincenzo Palmieri (Roma, Cattolica), Maria Antonietta Pellegrino (Pavia), Giacomo Pucci (Perugia), Giuseppe Santoro (Messina), Filippo Tocco (Cagliari), Antonio Zaza (Milano, Bicocca).

References

1. Wen CP, Wai JPM, Tsai MK, et al. Minimum amount of physical activity for reduced mortality and extended life expectancy: a prospective cohort study. Lancet 2011; 378: 1244-53.
2. Williams PT. Physical fitness and activity as separate heart disease risk factors: a meta- analysis. Med Sci Sports Exerc 2001; 33: 754-61.
3. Visseren FLJ, Mach F, Smulders YM, et al. 2021 ESC Guidelines on cardiovascular disease prevention in clinical practice. Eur Heart J 2021; 42: 3227-337.
4. Fletcher GF, Landolfo C, Niebauer J, Ozemek C, Arena R, Lavie CJ. Promoting physical activity and exercise: JACC Health Promotion Series. J Am Coll Cardiol 2018; 72: 1622-39.
5. Kesaniemi Y, Danforth E, Jensen MD, Kopelman PG, Lefèbvre P, Reeder BA. Dose- response issues concerning physical activity and health: an evidence-based symposium. Med Sci Sports Exerc 2001; 33: S351.
6. Global levels of physical inactivity in adults: off track for 2030 [Internet]. World Health Organization; 2024 [cited 2025 Jun 5]. Available from: https://www.who.int/publications/i/item/9789240096905
7. Global Status Report on Physical Activity 2022 [Internet]. World Health Organization; 2022 [cited 2025 Jun 5]. Available from: https://www.who.int/publications/i/item/9789240059153
8. Ortolan S, Neunhaeuserer D, Quinto G, et al. Potential cost savings for the healthcare system by physical activity in different chronic diseases: a pilot study in the Veneto Region of Italy. IJERPH 2022; 19: 7375.
9. Foccardi G, Hansen D, Quinto G, et al. How do General Practitioners assess physical activity and prescribe exercise in patients with different cardiovascular diseases? An Italian pilot study. Eur J Prev Cardiol 2021; 28: e20-4.
10. Hansen D, Coninx K, Beckers P, et al. Appropriate exercise prescription in primary and secondary prevention of cardiovascular disease: why this skill remains to be improved among clinicians and healthcare professionals. A call for action from the EXPERT Network. Eur J Prev Cardiol 2023; 30: 1986-95.
11. Strong A, Stoutenberg M, Hobson-Powell A, Hargreaves M, Beeler H, Stamatakis E. An evaluation of physical activity training in Australian medical school curricula. J Sci Med Sport 2017; 20: 534-8.
12. Stoutenberg M, Stasi S, Stamatakis E, et al. Physical activity training in US medical schools: preparing future physicians to engage in primary prevention. Phys Sportsmed 2015; 43: 388-94.
13. Weiler R, Chew S, Coombs N, Hamer M, Stamatakis E. Physical activity education in the undergraduate curricula of all UK medical schools. Are tomorrow's doctors equipped to follow clinical guidelines? Br J Sports Med 2012; 46: 1024-6.
14. Neunhaeuserer D, Niebauer J, Degano G, et al. Sports and exercise medicine in Europe and the advances in the last decade. Br J Sports Med 2021; 55: 1122-4.
15. Asif I, Thornton JS, Carek S, et al. Exercise medicine and physical activity promotion: core curricula for US medical schools, residencies and sports medicine fellowships: developed by the American Medical Society for Sports Medicine and endorsed by the Canadian Academy of Sport and Exercise Medicine. Br J Sports Med 2022; 56: 369-75.
16. Wattanapisit A, Petchuay P, Wattanapisit S, Tuangratananon T. Developing a training programme in physical activity counselling for undergraduate medical curricula: a nationwide Delphi study. BMJ Open 2019; 9: e030425.
17. Wheeler PC, Mitchell R, Ghaly M, Buxton K. Primary care knowledge and beliefs about physical activity and health: a survey of primary healthcare team members. BJGP Open 2017; 1: bjgpopen17X100809.
18. Wattanapisit A, Lapmanee S, Chaovalit S, Lektip C, Chotsiri P. Prevalence of physical activity counseling in primary care: a systematic review and meta-analysis. Health Promot Perspect 2023; 13: 254-66.

Corresponding author:
Francesca Battista
Postgraduate School of Medical Specialisation
in Sports and Exercise Medicine
Department of Medicine
School of Medicine
University of Padova
Via Giustiniani 2
35128 Padova, Italy
E-mail: francesca.battista@unipd.it