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Impact of extracurricular activities on the self-actualization of medical students: a systematic review

Impacto de actividades extracurriculares en la autorrealización de estudiantes de medicina: una revisión sistemática

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Summary: The world needs medical professionals trained in complex skills. However, the universities' curriculum focuses mainly on the acquisition of theoretical knowledge. Evidence shows that participation in extracurricular activities (EA) allows the development of numerous skills. From Maslow's perspective, engaging in EA would contribute to self-actualization, the highest step in the pyramid of human needs. On the other hand, negative impacts of participation in EC have been documented, such as the presence of burnout. Little is known about the real impact of having an EC during undergraduate medical school, despite the fact that worldwide they are one of the determining factors in opting for future professional alternatives. The objective of this review is to determine, based on current evidence, the impact of EA on the self-actualization of medical students. A systematic search was carried out in four databases: SCOPUS, ERIC, WOS and PubMed, with four concepts: "Extracurricular activities", "Higher education", "Medical Students" and "Self Actualization", where publications between the years were considered. 2018 to 2023, in Spanish, English and German; 5807 results were obtained (526 duplicates). Using the PRISMA protocol and the COVIDENCE platform, three authors reviewed the results and selected those aligned with the inclusion and exclusion criteria. Those studies that led to conflict were reviewed by a fourth author. Finally, 26 publications were obtained, which were reviewed and synthesized by the authors. Within the findings, few investigations addressed the topic of search. The studies have methodologies that lead to the existence of favorable biases towards EAs, due to using small samples or selected populations. In general, EAs appear to be a relevant factor to develop and achieve self-realization in medical students.

Keywords: extracurricular activities, self-actualization, medical education, higher education, medical students.

Resumen: El mundo necesita profesionales de medicina formados en habilidades complejas. Sin embargo, el currículum de las universidades se enfoca principalmente en la adquisición de conocimientos teóricos. La evidencia muestra que la participación en actividades extracurriculares (AE) permite el desarrollo de numerosas habilidades. Desde la perspectiva de Maslow, involucrarse en AE contribuiría a la autorrealización, escalón más alto en la pirámide de necesidades humanas. Por otro lado, se han documentado impactos negativos de la participación en AE, como la presencia de burnout. Poco se conoce sobre el impacto real que implica llevar una AE durante el pregrado en la carrera de medicina, a pesar de que a nivel mundial son unos de los

factores determinantes para optar a alternativas profesionales futuras. El objetivo de esta revisión es determinar a partir de la evidencia actual el impacto de las EA en la autorrealización de estudiantes de medicina. Se realizó una búsqueda sistemática en cuatro bases de datos: SCOPUS, ERIC, WOS y PubMed, con cuatro conceptos: "Extracurricular activities", "Higher education", "Medical Students" y "Self Actualization", donde se consideraron publicaciones entre los años 2018 a 2023, en español, inglés y alemán; se obtuvieron 5807 resultados (526 duplicados). Mediante el protocolo PRISMA y la plataforma COVIDENCE, tres autoras revisaron los resultados y seleccionaron aquellos alineados con los criterios de inclusión y exclusión. Aquellos estudios que llevaron a conflicto fueron revisados por un cuarto autor. Finalmente se obtuvieron 26 publicaciones, las cuales fueron revisadas y sintetizadas por las autoras. Dentro de los hallazgos, pocas investigaciones abordaron el tema de búsqueda. Los estudios tienen metodologías que propician la existencia de sesgos favorables hacia las EA, por utilizar muestras pequeñas o poblaciones seleccionadas. En general, las AE evidencian ser un factor relevante para desarrollar y lograr la autorrealización en estudiantes de medicina.

Palabras clave: actividades extracurriculares, autorrealización, educación médica, educación superior, estudiantes de medicina.

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1. Introduction

Extracurricular activities (EA) are defined as those structured and unstructured activities that students access in the university context, outside or inside the university premises and that are not part of the mandatory study plan (1-2). Based on previous classifications and what was acquired in this research, the following categories of types of EA have been reached: peer support tutoring, academic (divided into scientific research and complementary courses to the study program), social service volunteering , artistic/humanistic, artistic/sports, cultural exchanges, and politics/student representation (3-7). Various determining factors have been described for participating in EA, among these the following stand out: individual factors (personal values, altruism, development of new skills, direction of professional/financial future), social environment (influence of peers or family), physical environment (facilities, transportation and accessibility), the macroenvironment (advertising, cultural norms and values) and necessary skills in the 21st century (ability to solve problems, to adapt to change, work as a team, critical thinking, creativity, communication, effective use of time, learn quickly, propose and evaluate ideas and solutions) (2, 8-11).

Among the benefits of participating in EA for university students, the following stand out: leadership capacity, development of social skills, identity, critical thinking, ability to resolve conflicts, and direct future professional decisions (2, 12). In general, the evidence demonstrates a positive correlation with performing EA and academic performance, which is even associated with lower performance in those who reduce or permanently discontinue their EA. In relation to this, it is observed in those who carry out EA, the acquisition of skills more transcendent to mere scientific knowledge, the main focus of the curricula of many universities. From the perspective of Maslow's human needs, participation in EA would contribute to achieving the last step, that is, self-actualization, which is the complete realization of individual potential, the full development of personal abilities and appreciation for life (13-14). Self-realization includes personal and creative growth (15). On the other hand, negative impacts of participating in EA have been described, where burnout stands out, understood as a mental condition secondary to a prolonged response to chronic emotional and interpersonal stressors in the area of performance (work or study). It is characterized by 3 dimensions: depersonalization, emotional exhaustion and decreased self-perception of fulfillment/achievement. Burnout has been evidenced in health students involved in EA, especially in medical studies. Regardless of participation in EA, a high prevalence that varies between 45-67% is already documented in this group, higher than the general population (12, 16). Burnout can lead to student dropout, decreased clinical empathy, in addition to being an independent risk factor for

suicidal ideation (12). Protective factors against burnout are the development of resilience from support networks and physical activity (17).

Specifically in a medical career, practicing a certain type and amount of EA may be a requirement to continue academic training and obtain specialization in a medical area. For example, in Chile, one option to opt for a primary medical specialization is through the National Entry Contest to the National Health Services System. This considers a series of minimum application requirements: months worked as a student assistant, scientific works published, training and improvement courses taken, among others (18). In this way, the EA are part of a "hidden curriculum" across all schools in the country, not only because of the skills developed collaterally by participating in them, but they are also extracurricular academic background necessary to be able to raise the score. of applications to the different medical specializations/scholarships, if the student wishes to apply for them. This situation varies depending on the country: in some the most important thing to qualify for a medical specialization is the score obtained in the national medical examination, while others request letters of recommendation from academic activities carried out and clinical experience (19-20).

Unfortunately, current knowledge on the impact of performing EAs on medical students is scarce, especially regarding whether they are a contributing factor to self-actualization or rather an overload for the medical student. Therefore, the present systematic review aims to determine, based on current evidence, the impact of EA on the self-actualization of medical students.

2. Methods

This study did not require ethical approval, as it corresponds to a bibliographic review of published literature. The quality of the included studies was guaranteed with the exclusive selection of articles published in journals that require peer review and aligned with the inclusion criteria. For this systematic review, the PRISMA 2020 guideline was used as a guideline, through which studies related to the impact of EA on the self-actualization of medical students were selected.

Table 1. Search strategy, identification and expansion of the basic concepts of the search.

Search 1 : expansion of the "Extracurricular activities" concept (terms combined with OR)
Thesaurus: Extracurricular activities, Student activities, Enrichment Activities
Free search: Extracurricular activity
Search 2: expansion of the "Higher education" concept (terms combined with OR)
Thesaurus: Higher Education, Postsecondary Education , Universities , Tertiary Education
Free search: University
Search 3 : expansion of the "Medical Students" concept (terms combined with OR)
Thesaurus: Medical Students , Interns
Search 4 : " Self Actualization " concept expansion (terms combined with OR) (terms combined with OR)
Thesaurus: Self Actualization , Self Development , Self Realization , Life Satisfaction , Personality Development
Free search: Wellness **,** Wellbeing
Search 5 : 1, 2, 3 and 4 combined with AND and with full text delimiters, articles or reviews published in English or Spanish, between the years 2018 - 2023.

A keyword search strategy from the ERIC Thesaurus was used to determine the terms to search in four databases (ERIC, Web of Science, SCOPUS, and PubMed). The following keywords were included: extracurricular activities, higher education, medical students and self-actualization. With the selected terms, the appropriate combination was carried out to obtain results (table 1). The searches were limited to the inclusion and exclusion criteria (Table 2).

Table 2. Inclusion and exclusion criteria applied.

Inclusion criteria	Exclusion criteria
Empirical or primary studies focused on extracurricular activities and their impact on the self-actualization of medical students.	Non-empirical or secondary studies, such as reviews, editorials, commentaries and books.
Studies that report research on medical students.	Studies that measure the impact of extracurricular activity on a population other than medical students.
Quantitative and/or qualitative studies with adequate definitions, reliable methods, operationalization of concepts and data analysis.	Studies focused on the validation and/or construction of instruments.
Studies available in Spanish, English or German.	Studies published in languages other than Spanish, English or German.
Studies published between 2018 and 2023.	Studies on extracurricular activities prior to 2018 and after 2023.

The search was carried out on January 21, 2023. The results were processed with the COVIDENCE software to facilitate the systematization of the information obtained. After importing the files obtained into the platform and discarding duplicate studies, COVIDENCE distributed the studies randomly among the authors PD, EG and PP for title and abstract screening. The authors used the criteria (Table 2) to indicate the inclusion and exclusion of each article. The studies that led to conflict were resolved by the author MR based on the same criteria and in a meeting with the rest of the authors. With the same logistics, COVIDENCE distributed the previously selected studies for subsequent full-text review among the same authors and, likewise, the author MR resolved the conflicts again. Finally, COVIDENCE collected the studies that passed through the previous filters for information extraction. Then all the studies collected were reviewed and the information obtained from each one was characterized in a table with the following variables: name of the article, first author/year of publication/country, objective of the study, study design, sample (size, type of participants), mode of data collection and analysis, and summary of the results. To the extent that the data were systematized, it was ensured that the findings derived from each study were of a significant nature according to the classification of their associated statistical tools, to guarantee validity and reliability.

3. Results

In the systematic review, a total of 5,807 studies published until January 21, 2023 were identified (1,211 studies from SCOPUS, 88 from Web of Science, 2 from ERIC, and 4,506 from PubMed). Of these, 526 studies were excluded because they were duplicates. After title and abstract screening, 5219 studies were excluded for not meeting the inclusion criteria. 62 studies were obtained for full text review. Of these, 26 were included after meeting the inclusion criteria and were part of this bibliographic review (figure 1). The main reasons for exclusion were: study population other than medical students, absence of measurement of the impact of EA on the self-realization of medical students, studies whose methodology was not empirical, studies whose results did not agree with the search objectives. and studies without clear specification on the type of EA performed by medical students.

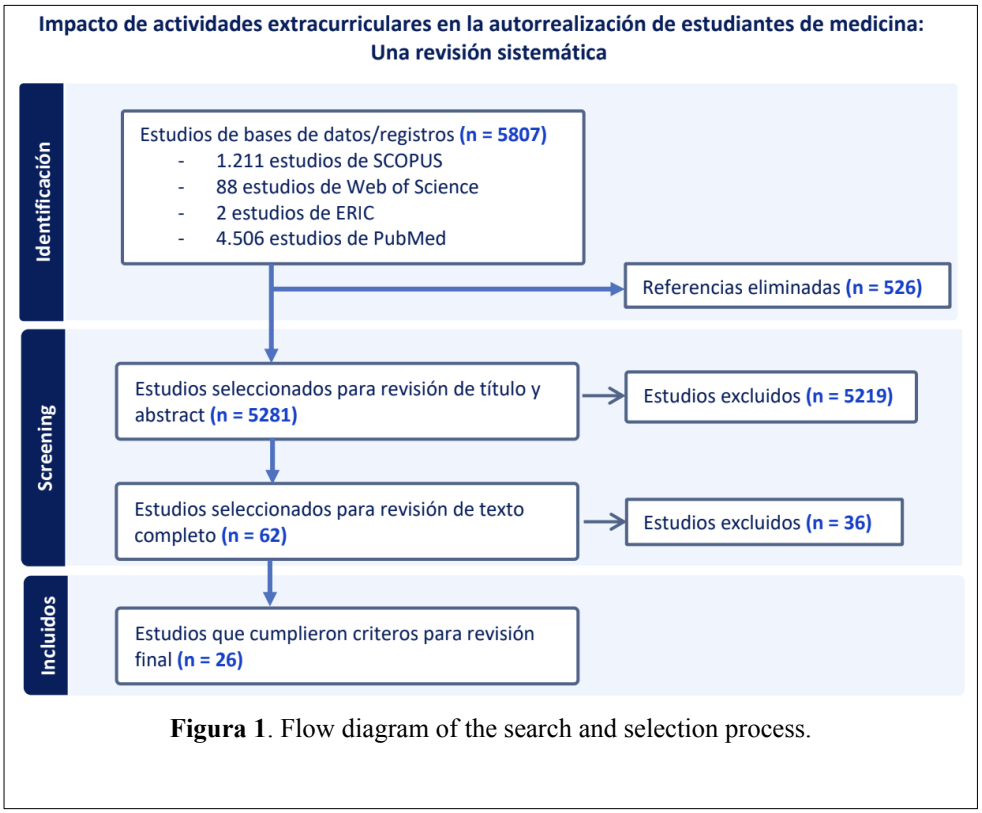

Figura 1. Flow diagram of the search and selection process.

Study characteristics

The selected studies were published between 2018 and 2023, as this covers enough years of the most up-to-date bibliography. The studies used were carried out in the following 16 countries: United States, Saudi Arabia, United Arab Emirates, Germany, England, Kazakhstan, Ireland, Brazil, China, India, Turkey, Thailand, United Kingdom, Italy, New Delhi and Portugal. The methodology used by the studies was quantitative and qualitative, the majority of the design is cross-sectional and surveys are the main way of collecting information from the studied population. The summary of the characteristics of each study is presented in Table 3. The 26 selected studies were categorized according to types of EA and grouped for the description of common themes on the impact they have on the self-actualization of medical students. These findings are mentioned in table 4.

Table 3. Summary of the characteristics of the studies analyzed

Original item name	Author, year, country	Purpose of the study	Type of study	Sample	Data collection	Analysis of data	Summary of results
Impact of Providing Peer Support on Medical Students' Empathy, Self-Efficacy, and Mental Health Stigma	Abrams, et al (United States, 2022)	To test whether participation in a standardized peer support program is associated with empathy, self-efficacy, likelihood to provide support, and decreased mental health stigma. The difference between sexes was compared. Answer the question how helping affects those who help. EA Type : PET	Quasi-experimental design (pre- and post-exposure surveys)	38 medical students from the University of Central Florida who were part of the peer support program from 2nd to 4th years, during one academic year.	Demographic characteristics survey and 4 scales: - Empathy (adapted from the Interpersonal Reactivity Index (IRI)), - Self-efficacy - Tendency to participate in social projects or instances (adapted from Chronic Conditions Survey) - Probability of providing mental health support to peers (adapted from Social Distance Scale).	Through IBM SPSS Statistics 26 for descriptive statistics and Cronbach's alpha to check internal consistency. Comparison of scores of the four scales before and after the study by gender, using chi-square tests and Welch's t tests.	After participation in the peer support program, students obtained higher scores in empathy (both sexes) and self-efficacy (men only). There were no significant changes in mental health stigma or the likelihood of helping peers with mental health problems.
Volunteering among pre-clinical medical students: Study of its association with academic performance using institutional data	Alsuwaidi, et al. (United Arab Emirates, 2022)	To examine the relationship between volunteering and academic performance among medical students in the preclinical phases of the Bachelor of Medicine and Bachelor of Surgery (MBBS) program and explore the factors that influence student volunteering behaviors. EA Type : EANE	Retrospective descriptive study based on real institutional data	153 medical students from Mohamed Bin Rashid University of Medicine and Health Sciences (MBRU) in Dubai.	Volunteering records of 3 cohorts of undergraduate medical students enrolled in the MBBS program between 2016 - 2018 were analyzed. The correlation between the annual grade point average (GPA) and volunteering in the cohorts in each study year was studied.	The non-parametric Spearman test was used to test the strength of association between the two variables and the Mann-Whitney test was used to evaluate differences between gender and nationality, and Fischer's exact chi test to test the dependence between categorical variables.	The average annual grade shows a positive relationship with being a volunteer in the second year of study. Furthermore, students with lower academic achievement volunteer less frequently than high-achieving students.

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Professional and Personal Competency Development in Near-peer Tutors of Gross Anatomy: A Longitudinal Mixed-methods Study	Alvarez,et al. (Germany 2019)	To explore what professional and personal competencies anatomy tutors developed as a result of their teaching activities in a gross anatomy course at a Faculty of Medicine. EA Type: PET	Quantitative and qualitative longitudinal descriptive study	24 medical students, volunteers in a peer tutoring program.	For 18 months, 24 tutors were monitored and questionnaires and semi-structured interviews were applied to them. Any tutor could participate in the study and received compensation. Themes extracted from the focus groups were combined with questions according to the CanMEDS framework. The validity of Final questionnaire was checked by two former tutors.	To evaluate the data, structured content analysis was chosen. The statistical package SPSS, version 23 and MAXQDA Plus was used. quantitative to evaluate quantitative and qualitative data, respectively.	Being a tutor was perceived as challenging, rewarding, offering the opportunity to develop and reinforce skills such as self-confidence, self-knowledge and self-concept, positive thinking and stress management.
More than just a medical student a mixed methods exploration of a structured volunteering program for undergraduate medical students	Badger et al. (England, 2022)	Exploring how volunteering influenced medical students' experience and learning in the hospital during the COVID-19 pandemic. Describe any learning that occurred, including any unforeseen results. Observe if there were differences in experiences between volunteers of different demographic characteristics.	Qualitative cross-sectional study	398 volunteer students (61 were medical students) and 17 supervisors who participated in the COVID-19 health emergency by Imperial College London School of Medicine.	A survey to collect the experiences of all volunteers and supervisors immediately after completing the program and a mixed methods design to measure, explore and explain differences in experiences.	Qualitative responses were coded by team consensus. The analysis was facilitated with "R for Statistical Computing, Version 4.0.3". Ratings of experience in the groups were compared based on demographic variables and possible modulating factors of their experience using Mann-Whitney U tests.	Male students valued the experience more positively. For students in higher courses, the experience was more demanding in terms of skill and usefulness than for students in lower courses, who had lower expectations of their performance and usefulness. Respondents reported a sense of belonging with the communities in which they participate, reciprocity of benefits for volunteers and health services, transformative learning,

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		EA Type : VSS					service contribution and positive impact on well-being, professional learning and identity formation.
Burnout syndrome among medical students in Kazakhstan	Bolatov, et al. (Kazakhstan 2022)	To study the psychological well-being and evaluate burnout of medical students in Kazakhstan. EA Type : EANE	Quantitative cross-sectional study	736 medical students of the University of Kazakhstan.	Application of an anonymous online survey with 2 instruments to measure burnout (Oldenburg Burnout Inventory for college students (OLBI-S) and Copenhagen Burnout Inventory-Students survey (CBI-S)).	Use of means and confidence intervals (95% CI) for quantitative variables and percentages for qualitative variables. Independent samples t test and ANOVA with post hoc test were used respectively. $\chi 2$ tests, correlation tests, logistic and linear regressions were performed to evaluate the associations of the independent variables with burnout.	A significant association was evident between the prevalence of burnout and sex, year of study, depressive symptoms, satisfaction with chosen profession, academic performance, substance use, extracurricular activities, part-time work, among others. Students involved in EA had a lower rate of personal burnout and were less demotivated than those who did not perform EA.
Peer-assisted learning (PAL): skills lab tutors' experiences and motivation	Bugaj T,et al. (Germany, 2019)	To examine undergraduate medical students' motivation to become student tutors in a clinical skills center, what they experienced while teaching, and how they evaluated their experiences. Also evaluate the relationship between student tutors and their	Qualitative descriptive design	9 medical students tutors from the clinical skills laboratory at the University of Heidelberg.	Semi-structured interviews and a questionnaire were applied on sociodemographic data and experiences in the program.	The data were subjected to a qualitative content analysis according to Mayring (inductive category development). After coding with MAXQDA (version 2010, VERBI Software), individual codes were identified.	From the experience of being a tutor, the following were described: a strong motivation and enthusiasm for teaching, aspiration to participate in networking with students and professionals, desire to contribute from the student perspective to learning needs and the intention to be a model to follow.

Original item name	Author, year, country	Purpose of the study	Type of study	Sample	Data collection	Analysis of data	Summary of results
		students. EA Type : PET				Thus, two independent analysts compared recurring themes and assigned them to higher-level categories to reach a consensus.	
Demographics, clinical interests, and ophthalmology skills confidence of medical student volunteers and non-volunteers in an extracurricular community vision screening service-learning program	Burton E, et al. (United States, 2022)	Measure the impact of a community ophthalmology service on students participating in the initiative, to further explore their research and career interests. Collecting information about this instance could contribute to traditional school education. EA Type : VSS	Qualitative cross-sectional study	118 participants in the Vision Screening In Our Neighborhoods (VISION) program at Johns Hopkins University (JHU), a community service led by medical students.	Survey and semi-structured interviews with medical students during 2019-2020 regarding demographics, career and service interests, participation in ophthalmology-related activities, and confidence in their ophthalmology clinical skills.	Fisher test to compare the groups and use of inductive analysis for semi-structured interviews.	Volunteers attributed some degree of their development of ophthalmology skills, more likely to feel confident performing ophthalmology internships, and desire to pursue careers in ophthalmology and public health to their experience at VISION.
Potential of Volunteering in Formal and Informal Medical Education- A Theory-Driven Cross-Sectional Study with Example of the COVID-19 Pandemic	Cerbin-Koczorowska, et al. (Poland, 2022)	Investigate the potential of using volunteer work to educate future adherents of the medical professions and place volunteering within well-established teaching-learning theories. EA Type : VSS	Qualitative study	70 students (42 medical) volunteer COVID-19 for 8 weeks on average at Poznan University of Medical Sciences.	Structured surveys and unstructured interviews.	Quantitative data obtained during the study were analyzed using Mann-Whitney U and Wilcoxon signed-rank tests. The qualitative data from the open questions were analyzed by 2 independent researchers.	Volunteering was described as an example of learning through public service, where self-perception of obtaining new knowledge and skills, development of association between the community and professionals, increased teamwork skills, work under pressure, assertiveness, interprofessional collaboration, medical

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							documentation, communication with patients, patient triage, medical and clinical knowledge and techniques.
Strategies for Enhancing Resilience in Medical Students:a Group Concept Mapping Analysis	Donohoe, et al. (Ireland, 2020)	Investigate resilience strategies to confront the harmful effects of stress on health and well-being. EA Type : EANE	Cross-sectional study divided into 3 phases	204 third year medical students (University College Cork): 98 in phase 1, of them, 18 continue in phase 2, finally 16 finish phase 3.	Group conceptual mapping that incorporates qualitative and quantitative methodologies. Stages undertaken: brainstorming/generation of ideas, categorization of the resilience strategies used, and qualification of these in terms of effectiveness and importance to be included in a self-management program.	Data are analyzed using The Concept System® software through multidimensional scaling and hierarchical clustering.	The findings reinforced a high positive association between resilience in medical students with social support. To relieve stress, the most effective thing was to spend time with "friends and family." Regarding stress self-management, the EAs obtained a low score in terms of effectiveness and importance.
The role of academic leagues as a strategy for pain education in Brazil	García, et al. (Brazil, 2019)	To evaluate the functioning of academic pain leagues (ALPs) and their contribution to pain education. EA Type : ACCPE	Retrospective, observational, descriptive study	Administrative representatives of 17 ALPs (a total of 363 affiliated students belonging to different health careers are reported).	Through an electronic survey distributed by email to ALP representatives between November 2017 and March 2018.	The data obtained from the questionnaire were tabulated and analyzed in GraphPad Prism version 7 (GraphPad software, San Diego, CA, USA).	Participating in leagues helps to make up for the curricular deficiency in pain education at universities, and They help with professional guidance.
The effect and influence of undergraduate research on	Huang, et al. (China, 2018)	Explore how and how much undergraduate research (UR) influences medical students'	Analytical transversal study	1022 students from 2 medical schools: Central South University and	Anonymous self-administered questionnaires to measure scientific	Statistical and data distribution analysis.	UR can improve comprehensive scientific research capabilities and individual development

Original item name	Author, year, country	Purpose of the study	Type of study	Sample	Data collection	Analysis of data	Summary of results
medical undergraduates in China		scientific research skills and their individual development. EA Type : AIC		Hunan Normal University.	research abilities and qualities of students: UR and control participants.		(innovative thinking, deepening understanding of theoretical knowledge), however 17% considered RU meaningless or a waste of time and effort.
Stress and stressors of medical student near-peer tutors during courses: a psychophysiologic al mixed methods stud y	Hundertmark, et al. (Germany, 2019)	Conduct a comprehensive assessment of the stressors of assistantship tutors for undergraduate courses, and the psychophysiological responses to stress. EA Type : PET	Mixed methods design, combining quantitative and qualitative research methods, and both psychological and physiological data	60 student tutors for two peer teaching programs: Anatomie am Lebenden plus [AaL, living anatomy plus] and abdominal ultrasound.	Before the study, it was evaluated personality, perfectionism, resilience, attachment style, chronic stress with specific methods. In three assistantship sessions, the following were evaluated: subjective stress and affective state with appropriate questionnaires, in addition to heart rate variability and salivary cortisol.	Statistical and data distribution analysis.	Reports of chronic stress do not differ significantly from values in the general population. The results suggest that tutors experience an appropriate balance of environmental challenges and individual capabilities, which has beneficial effects on learning and performance.
Predictors of high achievers in Indian medical undergraduates: Association with emotional intelligence and perceived stress	Manjareeka, et al. (India, 2020)	To compare the association of emotional intelligence (EI) score and perceived stress scale (PSS) between undergraduate medical students with average and excellent grades. Finding the predictors of excellent academic performance.	Descriptive cross-sectional study	430 medical students of 2nd, 4th, 7th and 9th semester of the Private University of Odisha, India. Of them, 143, 152 and 135 were in the average, good and excellent groups respectively.	Established prevalidated questionnaires: Schutteself Report EI Test, Cohen Perceived Stress Scale. The students were grouped into three groups: average, good and excellent performance of the grades collected.	Statistical and data distribution analysis.	Perceived stress was lower in those with excellent performance. Attending classes, getting involved in EA, and having a lower stress score were the predictors of excellent academic performance in all medical students.

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		EA Type : EANE					
Effect of Practicing Meditation, Pranayama, and Yoga on the Mental Health of Female Undergraduate Medical Students: An Interventional Study	Manju, et al. (New Delhi, 2022)	To find the effect of meditation, pranayama and yoga on improving mental health in female undergraduate medical students. EA Type : AD	Interventional study with cases and controls	105 medical students aged 19 and in their 1st year of study.	Self-administered survey before and after the intervention.	Statistical and data distribution analysis.	The intervention group increased global well-being with all interventions and decreased anxiety, depression and fear.
Research training program in a Turkish medical school: challenges, barriers and opportunities from the perspectives of the students and faculty members	Öcek, et al. (Türkiye, 2021)	To evaluate the Research Training Program (RTP) of the Faculty of Medicine of Ege University, through the perspectives of students and teachers. EA Type: AIC	phenomenological study	35 participants (14 teachers, 6 program graduates and 15 medical students).	Semi-structured interview technique (central question was whether RTP as a phenomenon was appropriate to provide scientific education and research experience on current challenges and opportunities).	Interpretive analysis approach.	The most frequently mentioned student achievement is learning all stages of research, as well as becoming familiar with critical thinking.
Motivation to Impact: Medical Student Volunteerism in the COVID 19 Pandemic	Phillips, et al. (United States, 2022)	To investigate the motivations behind medical students' volunteering, and explore the effect of volunteering on their well-being during the COVID-19 pandemic. EA Type : VSS	Transversal study	53 medical students from all years of Stony Brook University who participated in volunteer activities.	Survey anonymously to obtain characteristics of the volunteers (motivation for volunteering, types of activities in which they participated), and to learn about the physical, psychosocial and emotional (PSEO) results they	Statistical and data distribution analysis.	Motivation focused on altruistic and humanitarian values predicts positive outcomes from volunteering, including greater resilience, ability to deal with disappointment and loss. Students who volunteered reported feeling less anxious, more empathetic, more resilient, more

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					experienced after volunteering.		compassionate, better able to cope with the COVID-19 epidemic, happier, emotionally healthier, and had more purpose.
Promoting a sense of belonging, engagement, and collegiality to reduce burnout: a mixed methods study among undergraduate medical students in a non-Western, Asian context	Puranitee, et al. (Thailand, 2022)	Explore the relationships between burnout, sense of belonging (relationship with others) and work commitment; and identify key elements perceived by undergraduate medical students as positively contributing to collegiality, commitment and sense of belonging. EA Type : EANE	Sequential mixed methods exploratory design to collect quantitative and qualitative data	763 medical students from 1st to 6th year from Mahidol University, Thailand.	Three questionnaires were used: MBI-SS to evaluate burnout, the Satisfaction of Basic Psychological Needs at Work Scale and the Utrecht Work Engagement Scale for students (UWESS-9). For the qualitative component, a purposive sample of deviant cases from each year was selected. Students with the highest and lowest levels of burnout were considered deviant cases. Key elements that were perceived as contributing to promoting collegiality, commitment and a sense of belonging were explored.	Statistical and data distribution analysis.	All subscales of satisfaction of basic psychological needs, including the perception of a high level of autonomy, competence, and relatedness with others, were associated with a lower probability of having a burnout indicator. Among the key elements that contribute to promoting collegiality, commitment and a sense of belonging, the results indicated that learning tasks and EAs were crucial for students.
Medical Electives in Sub -Saharan Africa: A 15 -Year Student/ NGO -Driven	Quaglio, et al. (Italy, 2021)	Describe the Wolisso Project (WP), a elective clinical experience in sub-Saharan Africa, driven	Transversal study	141 medical students from 30 Italian universities.	Self-administered questionnaire.	Qualitative and quantitative data analyzed statistically with data distribution.	The elective activity increased students' determination and motivation, influenced career decisions, and contributed to

Original item name	Author, year, country	Purpose of the study	Type of study	Sample	Data collection	Analysis of data	Summary of results
Initiative		by a collaboration between a student organization and a Non-Governmental Organization (NGO). EA Type : IC and VSS					professional development.
The Benefits of Being a "Buddy": Exploring the Medical Student Experience As Mentor to Minority High-School Students	Roche, et al. (United States, 2021)	Understanding medical students' perceptions of being a mentor. and describe contributions to your own medical education. EA Type: PET	Transversal study	12 participating students at least during the last 3 semesters of The Pre-College Physician Aspirants Program at Ohio University Heritage College of Osteopathic Medicine.	Semi-structured interviews	Transcription and thematic analysis of responses.	Mentoring experience evaluated as a valuable addition to learning, contribution to a well-rounded education, reinforcement of professional aspirations, and support for the development of identity and future professional vision.
Academic Difficulties Among Medical Students at Jazan University: A Case–Control Study	Salih, et al. (Saudi Arabia, 2021)	To identify risk factors associated with academic difficulties in medical students by exploring lifestyle and social factors, health problems, study habits and psychological status of students at the Faculty of Medicine, Jazan University, Saudi Arabia. EA Type : EANE	Observational analytical case-control study	40 medical students with academic difficulties and 40 control students.	Self-administered electronic questionnaire.	Statistical and data distribution analysis.	The result was that involvement in EA both inside and outside the university positively affects academic performance.
Compassion and	Santiago, et al.	To assess the	Transversal	901 master's	Online questionnaire.	Statistical and data	It is obtained from the study

Original item name	Author, year, country	Purpose of the study	Type of study	Sample	Data collection	Analysis of data	Summary of results
extracurricular activities of Portuguese Health Sciences students in Portugal	(Portugal, 2022)	compassion levels of medical, dental and pharmaceutical sciences students in Portugal according to major and participation in extracurricular activities. EA Type : AD, AH, and VSS	study	students in medicine, dentistry and pharmaceutical sciences from public universities in Portugal.		distribution analysis.	that there is no relationship between the participation, type and frequency of EA and the levels of compassion of the students who participated.
Medical students' participation in the Volunteering Program during the COVID-19 pandemic: a qualitative study about motivation and the development of new competencies	Siqueira, et al. (Brazil, 2022)	Investigate the motivations and perceptions of developed competencies such as leadership and management skills, in medical students who They joined the COVID-19 Volunteer Program at a Brazilian medical school. EA Type : VSS	Qualitative cross-sectional study	286 5th year medical students from the University of Sao Paulo.	Online survey before and after participating in volunteering.	Statistical and data distribution analysis.	Participation in volunteering increased knowledge, fostered leadership skills and resilience.
The role of extracurricular activities and lectures in mitigating medical student burnout	Sepede, et al. (United States, 2020)	Examine how participation in EC and attendance at burnout conferences can impact burnout in medical students. EA Type: EANE	Transversal study	597 students at Rowan University School of Osteopathic Medicine.	Anonymous online surveys.	Statistical and data distribution analysis.	Greater participation in EC clubs was associated with a higher level of depersonalization. Lectures on burnout They alone do not provide any type of mitigation or protection against burnout/exhaustion.

Original item name	Author, year, country	Purpose of the study	Type of study	Sample	Data collection	Analysis of data	Summary of results
Time use in out-of-class activities and its association with self-efficacy and perceived stress: data from second-year medical students in China	Song, et al. (China, 2020)	To investigate Chinese medical students' time use in out-of-class activities and their association with self-efficacy and perceived stress. EA Type : AD and VSS	Transversal study	686 second-year medical students from Shenyang University of China.	Online survey.	Descriptive statistics and logistic regression.	Greater perceived stress was associated with students who spent less time doing physical exercise. and to participate in volunteering.
'A drive to make change' - exploring the views and experiences of medical students engaging in advocacy: a qualitative study.	Sood, et al. (United Kingdom, 2023)	This study aimed to explore the opinions and experiences of medical students involved in promotional activities. EA Type : PRS	Qualitative study	9 medical students from English-speaking advocacy organizations in the UK.	Individual semi-structured interviews online.	Recording, transcription and thematic analysis of responses.	Participation in promotional activities fosters empathy, generates gain of knowledge about social determinants of health, development of communication skills, leadership, teamwork, compassion.
Community-Based Medical Student Nutrition Counseling Training for Low-Income Families	Williams, et al. (United States, 2018)	To explore the opinions of medical students about their nutrition training and the role of the EHSA program (Eat Healthy, Stay Active: a community-based childhood obesity program to provide nutrition counseling to low-income Head Start families). EA Type : VSS	Transversal study	20 medical students between 2nd and 4th years of medicine participating in EHSA and 5 students from a voluntary EHSA focus group at the Missouri University of Health Sciences.	Qualitative and quantitative surveys.	Paired t test binomial proportions and thematic analysis of qualitative data by the authors.	Most found the overall experience positive and would recommend it to their peers. Increased knowledge and confidence in nutritional counseling. Increased development of empathy towards low-income families. It found that the majority prefer experiential learning.

*Note: Peer Teaching Tutoring (TEP), Social Service Volunteering (VSS), Politics and Social Representation (PRS), (Cultural Exchange (IC), Academics on Complementary Courses to the Study Program (ACCPE), Academics of Scientific Research (AIC), Artistic/Humanistic (AH), Artistic/Sports (AD), Unspecified Extracurricular Activity (EANE).

Table 4. Impact of different types of EA on the self-actualization of medical students.

EA Type		Impact on the self-actualization of medical students
Peer support tutoring (n = 5)		They are associated with the development of empathy, self-efficacy, development of self-confidence skills, self-knowledge and self-concept.
Academics	Scientific investigations (n = 2)	They allow a deeper understanding of theoretical knowledge. They lead to the acquisition of comprehensive scientific research and critical/innovative thinking skills.
	Complementary courses to the study program (n = 1)	They help to make up for the curricular deficiency, self-perception of more confidence in their future professional practice is reported. They collaborate in professional guidance.
Social service volunteers (n = 9)		They show a positive impact on well-being, development of a sense of belonging and identity formation. They foster teamwork skills, empathy, resilience, and a sense of purpose. They allow the development of communication and leadership skills. They report being a positive experience that reduces stress and increases self-efficacy, and in most studies it is reported to generate more compassionate people. They exert a positive influence on future professional decisions. In addition, they are associated with greater academic performance.
Artistic/humanistic (n =1)		Carrying out artistic activities is not related to higher levels of compassion.
Artistic/sports (n =3)		They lead to an increase in mental health and improve well-being, in addition to reducing stress and increasing self-efficacy.
Cultural exchanges (n =1)		They lead to greater determination and motivation for the career, in addition to providing guidance regarding the professional future.
Policies and social representation (n =1)		They demonstrated increased empathy and compassion, increased knowledge of social determinants of health, increased communication and leadership skills, and fostered the ability to work as a team.
EA not specified (n= 7)		The article does not determine what type of EA, it only encompasses them and describes their undifferentiated impact.

Association between EA, burnout and academic performance

In relation to the association between burnout and exercising EC, the study by Hundertmark et al. evidence that medical student tutors' reports of chronic stress do not differ significantly from the values of the general population (21). In the study by Song et al. (22) it is reported that the stress perceived by medical students was associated with less time dedicated to physical exercise and volunteering. The research by Manjareeka et al. determines the presence of a lower stress score in medical students involved in EA, in addition to being predictors of excellent academic performance (23). Likewise, the analysis by Salih et al. (24) concludes that carrying out EA in general has a positive impact on the academic performance of medical students. Regarding the analysis of Sepede et al. (5) it is concluded that attending conferences on burnout prevention, by themselves, do not provide any type of mitigation or protection against burnout in the study group. Furthermore, they infer that participating in a greater amount of EA leads to a greater degree of depersonalization in the individual. This is due to the decrease in the ability to manage time and own resources to meet the competencies required in each EA.

Limitation of EAs in achieving self-realization

Apart from the impacts of EAs on self-realization mentioned in Table 4, in three investigations EAs were perceived as irrelevant in the development of their self-realization by medical students. The study by Donohoe et al. mentions that EAs were ranked low by students in terms of effectiveness and importance if they were included in a self-management program (25). Along the same lines, the study by Huang et al. (26) reports that a smaller fraction of medical students consider scientific research EAs meaningless or a waste of time and effort. The study by Santiago et al., determines the absence of evidence regarding a relationship between participation, type and frequency of extracurricular activities and levels of compassion of medical students (27).

4. Discussion

The global analysis of the results of this systematic literature review shows a positive association between participation in EA and self-actualization of medical students. EAs provide opportunities to develop skills and knowledge that are not acquired in the curricula of medical programs at different schools, especially interpersonal communication skills and development of self-efficacy, in addition to improving physical and mental status.

Along these lines, the EAs that are most related to the development of such characteristics are peer support tutoring, academic EAs of scientific research, and social service volunteering. These foster the development of empathy and compassion, self-efficacy, critical and innovative thinking, teamwork and resilience skills, communication and leadership skills. Along these lines, the EAs that are most related to the development of such characteristics are peer support tutoring, academic EAs of scientific research, and social service volunteering. These foster the development of empathy and compassion, self-efficacy, critical and innovative thinking, teamwork and resilience skills, communication and leadership skills.

From the above, the fundamental role of EAs for the formation of values and professional ethics in medical students can be elucidated. EAs, such as volunteering and peer tutoring, provide opportunities to interact directly with patients and other students. Direct contact with diverse people contributes to the development of empathy, compassion and respect for individual differences. Likewise, these instances of social contact allow students to face real ethical dilemmas, and thereby make decisions and understand the implications of their choices. This experiential learning contributes to the development of ethical judgment and informed decision making. Likewise, participating in community and social service activities encourages students to recognize their social responsibility as future health professionals. Commitment to the community reinforces the importance of medicine as a profession at the service of society. Participation in research EA fosters intellectual honesty and integrity in the pursuit of knowledge. This emphasis on honesty is reflected in the doctor-patient relationship and transparent communication. Furthermore, it is considered that participating in EA can lead to facing different challenges, which strengthen self-efficacy and resilience. The ability to face difficult situations and maintain value standards contributes to the formation of ethical and trustworthy medical professionals. Likewise, most EAs require collaboration and effective communication. Teamwork and communication are essential skills in medical practice, where effective collaboration improves the quality of care.

On the other hand, in order to successfully practice 21st century medicine, it is necessary to develop key skills, such as critical thinking, empathy, conflict resolution and the ability to adapt. In this sense, research EAs lead medical students to develop research questions, and thereby promote their innovative and reflective thinking. Thus, they test their abilities and are driven to look for solutions. These include being guided by mentors with experience in the subject and having received adequate initial training upon entering the scientific research program. Those who manage to complete their research report high satisfaction with the learning experience. Peer tutoring EAs have the wealth that the tutors are generationally close to the group they are addressing and therefore understand different ways of learning than the teachers. In this way, they generate

innovative forms of teaching in order to achieve the best way for students to acquire knowledge. Likewise, volunteering leads the student to understand and comprehend the needs of the people with whom they interact, for which the development of communication skills, empathy, and compassion is essential, in order to be able to relate in the best way and thus deliver effectively. your service, help and support.

In relation to academic performance, EAs are positively associated with better academic performance, as reported by the studies by Alsuwaidi et al. (29), Hundertmark et al. (21), Manjareeka et al. (23) and Salih et al. (24). Among the EA factors contributing to such achievement are increased socialization and the opportunity to recover from academic stress. No studies were observed that showed a negative association between participating in EA and academic performance. On the other hand, the academic EA of complementary courses to the study program leads to making up for the curricular deficiency in such areas and thus provides a self-perception of more confidence in future professional practice.

This study has some limitations. Regarding the selection of inclusion and exclusion criteria, the language restriction stands out, since studies that were not available in English, German or Spanish were excluded. Furthermore, by restricting the search to the selected databases, information from other sources, such as conferences, theses or non-indexed journals, was omitted. The limitations inherent to the selected studies should also be mentioned, including small samples of students, lack of randomization and control groups, as well as subjective experiences linked to local contexts that make generalization of the results difficult. In addition, qualitative data from self-report sources, such as surveys, scales, and semi-structured interviews, were used. It is important to note that, due to the nature of the academic requirements in medical school, certain aspects related to EAs could have been underestimated in this study. Specifically, the need to engage in certain types and amounts of EC could be a crucial requirement for advancing academic training and obtaining medical specializations in some countries. These elements could constitute sources of bias in the real reasons that lead students to participate in EA. However, it is crucial to note that this study focused on exploring the effects of practicing EC on medical students to achieve self-actualization, without delving into the students' underlying motivations for participating in these activities.

Students should be encouraged to participate in EA by their university teachers, to promote the development of their maximum potential and promote self-realization in them. Based on this review, regarding scientific research EAs, it is recommended to democratically increase these instances to all those who are interested, since in many universities their participation is preceded by rigorous selection processes. To achieve good results, both scientific and personal growth, these EAs must be planned, have programs that have sufficient trained and economical human resources to acquire the necessary tools to carry out quality research. For volunteer EA, proper organization, clear delegation of functions to students and that they are duly supported and supervised by a tutor is recommended. Regarding the academic EA of courses complementary to the study program, assistance from the university administration with the necessary human and financial resources is recommended, in addition to the existence of a duly certified program with the learning skills to be acquired. Regarding artistic EA, both humanistic and physical activity, it is recommended that students participating in them before entering the degree do not leave them aside and for those who did not do them, get involved in them to mitigate stress and contribute to their perception. of wellness.

5. Conclusions

- Extracurricular activities are a relevant factor to develop and achieve self-actualization. Medical students should be encouraged to practice them to develop their maximum potential.
- Medical schools have a crucial role in this area and should support their students from the first year of their studies, allowing them, in parallel to academics, to develop in other areas that are

fundamental to their lives, both for their own well-being and for their health. Professional future.

- It is worth highlighting the limited evidence on this topic in South America and Spanish-speaking countries, which is why it is suggested to increase the field of research in these countries to have more representative studies.

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References

1. Gallardo, G. Extracurricular Activities in University Education [Internet]. University Youth Observatory: DEA UC; 2007. https://vidauniversitaria.uc.cl/25-activityes-extracurriculares-en-la-formacion-universitaria/file
2. Almasry M, Kayali Z, Alsaad R, Alhayaza G, Ahmad MS, Obeidat A, et al. Perceptions of preclinical medical students towards extracurricular activities. Int J Med Educ 2017;8:285–9. http://dx.doi.org/10.5116/ijme.5973.297a
3. Yao B, Takata SC, Mack WJ, Roll SC. Modeling extracurricular activity participation with physical and mental health in college students over time. J Am Coll Health. 2023;71(4):1232–40. http://dx.doi.org/10.1080/07448481.2021.1926263
4. de Prada Creo E, Mareque M, Portela-Pino I. The acquisition of teamwork skills in university students through extra-curricular activities. EducTrain. 2020;63(2):165–81. http://dx.doi.org/10.1108/et-07-2020-0185
5. Sepede JC, Petrides J, Collins PB, Jones MC, Cantor N, Boyd L. The role of extracurricular activities and lectures in mitigating medical student burnout. Journal of Osteopathic Medicine. 2021;121(7):617–23. http://dx.doi.org/10.1515/jom-2020-0311
6. Fontana MCP, Generoso IP, Sizilio A, Bivanco-Lima D. Burnout syndrome, extracurricular activities and social support among Brazilian internship medical students: a cross-sectional analysis. BMC Med Educ. 2020;20(1). http://dx.doi.org/10.1186/s12909-020-01998-6
7. Babenko O, Mosewich A. In sport and now in medical school: examining students' well-being and motivations for learning. Int J Med Educ 2017;8:336–42. http://dx.doi.org/10.5116/ijme.59b7.8023
8. Rogers A.J.G. Medical student volunteerism and interest in working with underserved and vulnerable populations. BMC Med Educ. 2020;20(1). http://dx.doi.org/10.1186/s12909-020-02048-x
9. Griffiths K, Moore R, Brunton J. Sport and physical activity habits, behaviors and barriers to participation in university students: an exploration by socio-economic group. Sport Educ Soc. 2022;27(3):332–46. http://dx.doi.org/10.1080/13573322.2020.1837766
10. Soffel J. What are the 21st century skills that all students need? [Internet]. World Economic Forum. 2016 [Accessed 8 Oct 2023]. https://es.weforum.org/agenda/2016/09/cuales-son-las-habilites-del-siglo-21-que-todos-los-estudiantes-necesitan/
11. Krieger F, Azevedo R, GrEAsser AC, Greiff S. Introduction to the special issue: the role of metacognition in complex skills - spotlights on problem solving, collaboration, and self-regulated learning. Metacogn Learn. 2022;17(3):683–90. http://dx.doi.org/10.1007/s11409-022-09327-6
12. Almalki SA, Almojali AI, Alothman AS, Masuadi EM, Alaqeel MK. Burnout and its association with extracurricular activities among medical students in Saudi Arabia. Int J Med Educ 2017;8:144–50. http://dx.doi.org/10.5116/ijme.58e3.ca8a
13. Besche HC, Onorato S, Pelletier S, Ashrafzadeh S, Joshi A, Nelsen B, et al. A hierarchy of needs for remote undergraduate medical education: lessons from the medical student experience. BMC Med Educ. 2022;22(1). http://dx.doi.org/10.1186/s12909-022-03479-4

14. Perera A. Self-actualization in psychology: Theory, examples & characteristics. Simply Psychology [Internet]. 2022 [Accessed 8 Oct 2023]; https://www.simplypsychology.org/self-actualization.html
15. Vinney C. Understanding maslow's theory of self-actualization [Internet]. ThoughtCo. 2018 [Accessed 8 Oct 2023]. https://www.thoughtco.com/maslow-theory-self-actualization-4169662
16. Dyrbye L, Shanafelt T. A narrative review on burnout experienced by medical students and residents. Med Educ. 2016;50(1):132–49. http://dx.doi.org/10.1111/medu.12927
17. Fares J, Saadeddin Z, Al Tabosh H, Aridi H, El Mouhayyar C, Koleilat MK, et al. Extracurricular activities associated with stress and burnout in preclinical medical students. J Epidemiol Glob Health. 2015;6(3):177. http://dx.doi.org/10.1016/j.jegh.2015.10.003
18. Clouet-Huerta DE, González B, Correa K. Medical specialization in Chile: types, mechanisms and application requirements. An update on processes for general practitioners. Rev Med Chil. 2017;145(11):1454–62. http://dx.doi.org/10.4067/s0034-98872017001101454
19. How to get a medical residency in the United States as an international doctor? [Internet]. Estudioyviaja.com. [Accessed 8 Oct 2023]. https://www.estudiayviaja.com/kaplan-medical-inscripcion/
20. Akaki Blancas JL, López Bárcena J. Training of medical specialists in Mexico. Medical education [Internet]. 2018;19:36–42. http://dx.doi.org/10.1016/j.edumed.2018.03.007
21. Hundertmark J, Alvarez S, Loukanova S, Schultz JH. Stress and stressors of medical student near-peer tutors during courses: a psychophysiological mixed methods study. BMC Med Educ. 2019;19(1). http://dx.doi.org/10.1186/s12909-019-1521-2
22. Song X, Ding N, Jiang N, Li H, Wen D. Time use in out-of-class activities and its association with self-efficacy and perceived stress: data from second-year medical students in China. Med Educ Online. 2020;25(1). http://dx.doi.org/10.1080/10872981.2020.1759868
23. Manjareeka M, Yadav S. Predictors of high achievers in Indian medical undergraduates: Association with emotional intelligence and perceived stress. J Educ Health Promot. 2020;9(1):202. http://dx.doi.org/10.4103/jehp.jehp_263_20
24. Salih S, Fageehi M, Hakami S, Ateya E, Hakami M, Hakami H, et al. Academic difficulties among medical students at Jazan university: A case–control study. Adv Med Educ Pract. 2021;12:723–9. http://dx.doi.org/10.2147/amep.s307554
25. Donohoe J, O'Rourke M, Hammond S, Stoyanov S, O'Tuathaigh C. Strategies for enhancing resilience in medical students: A group concept mapping analysis. Acad Psychiatry. 2020;44(4):427–31. http://dx.doi.org/10.1007/s40596-020-01208-x
26. Huang Q, Yue Z, Lin J, Zhang Y, Yuan S, Zhuang Q, et al. The effect and influence of undergraduate research on medical undergraduates in China. Biochem Mol Biol Educ. 2019;47(1):41–50. http://dx.doi.org/10.1002/bmb.21194
27. Santiago LM, Rosendo I, Valente C, Ferreira AC, Simões JA. Compassion and extracurricular activities of Portuguese Health Sciences students in Portugal. BMC Med Educ. 2022;22(1). http://dx.doi.org/10.1186/s12909-022-03419-2
28. Öcek Z, Batı H, Sezer ED, Köroğlu ÖA, Yılmaz Ö, Yılmaz ND, et al. Research training program in a Turkish medical school: challenges, barriers and opportunities from the perspectives of the students and faculty members. BMC Med Educ. 2021;21(1). http://dx.doi.org/10.1186/s12909-020-02454-1
29. Alsuwaidi L, Powell L, Alhashmi D, Hassan Khamis A, Zary N. Volunteering among pre-clinical medical students: Study of its association with academic performance using institutional data. MedEd Publish 2022;12:24. http://dx.doi.org/10.12688/mep.19105.2
30. Abrams MP, Salzman J, Espina Rey A, Daly K. Impact of providing peer support on medical students' empathy, self-efficacy, and mental health stigma. Int J Environ Res Public Health. 2022;19(9):5135. http://dx.doi.org/10.3390/ijerph19095135m,m
31. Alvarez S, Schultz JH. Professional and personal competence development in near-peer tutors of gross anatomy: A longitudinal mixed-methods study. Anat Sci Educ. 2019;12(2):129–37. http://dx.doi.org/10.1002/ase.1798
32. Badger K, Morrice R, Buckeldee O, Cotton N, Hunukumbure D, Mitchell O, et al. "More than just a medical student": a mixed methods exploration of a structured volunteering program for undergraduate medical students. BMC Med Educ. 2022;22(1). http://dx.doi.org/10.1186/s12909-021-03037-4

33. Bolatov AK, Seisembekov TZ, Smailova DS, Hosseini H. Burnout syndrome among medical students in Kazakhstan. BMC Psychol. 2022;10(1). http://dx.doi.org/10.1186/s40359-022-00901-w
34. Bugaj TJ, Blohm M, Schmid C, Koehl N, Huber J, Huhn D, et al. Peer-assisted learning (PAL): skills lab tutors' experiences and motivation. BMC Med Educ. 2019;19(1). http://dx.doi.org/10.1186/s12909-019-1760-2
35. Burton E, Assi L, Vongsachang H, Swenor BK, Srikumaran D, Woreta FA, et al. Demographics, clinical interests, and ophthalmology skills confidence of medical student volunteers and non-volunteers in an extracurricular community vision screening service-learning program. BMC Med Educ. 2022;22(1). http://dx.doi.org/10.1186/s12909-022-03194-0
36. Cerbin-Koczorowska M, Przymuszała P, Kłos M, Bazan D, Żebryk P, Uruski P, et al. Potential of volunteering in formal and informal medical education—A theory-driven cross-sectional study with example of the COVID-19 pandemic. Int J Environ Res Public Health. 2022;19(24):16955. http://dx.doi.org/10.3390/ijerph192416955
37. Garcia JBS, Neto JOB, Rodrigues TA. The role of academic leagues as a strategy for pain education in Brazil. J Pain Res 2019;12:1891–8. http://dx.doi.org/10.2147/jpr.s205481
38. Sunita, Lata M, Mondal H, Kumar M, Kapoor R, Gandhi A. Effect of practicing meditation, pranayama, and yoga on the mental health of female undergraduate medical students: An interventional study. Cureus. 2022; http://dx.doi.org/10.7759/cureus.28915
39. Phillips HE, Jennings RB, Outhwaite IR, Grosser S, Chandra M, Ende V, et al. Motivation to impact: Medical volunteer studentism in the COVID 19 pandemic. Med Sci Educ 2022;32(5):1149–57. http://dx.doi.org/10.1007/s40670-022-01639-1
40. Puranitee P, KEAwpila W, Heeneman S, van Mook WNKA, Busari JO. Promoting a sense of belonging, engagement, and collegiality to reduce burnout: a mixed methods study among undergraduate medical students in a non-Western, Asian context. BMC Med Educ. 2022;22(1). Available at: http://dx.doi.org/10.1186/s12909-022-03380-0
41. Quaglio G, Maziku D, Bortolozzo M, Parise N, Di Benedetto C, Lupato A, et al. Medical electives in sub-Saharan Africa: A 15-year student/NGO-driven initiative. J Community Health. 2022;47(2):273–83. http://dx.doi.org/10.1007/s10900-021-01045-5
42. Roche R, Manzi J, Kruithoff BC. The benefits of being a "buddy": Exploring the medical student experience as mentor to minority high-school students. Health Equity. 2021;5(1):1–7. http://dx.doi.org/10.1089/heq.2020.0060
43. Siqueira MAM, Torsani MB, Gameiro GR, Chinelatto LA, Mikahil BC, Tempski PZ, et al. Medical students' participation in the Volunteering Program during the COVID-19 pandemic: a qualitative study about motivation and the development of new competencies. BMC Med Educ. 2022;22(1). http://dx.doi.org/10.1186/s12909-022-03147-7
44. Sood M, Blane DN, Williamson EA. 'A drive to make change' - exploring the views and experiences of medical students engaging in advocacy: a qualitative study in a UK medical school. Educ Prim Care. 2023;34(1):44–6. http://dx.doi.org/10.1080/14739879.2022.2161071
45. Williams AS, Patel PM, Beucke NL, Koopman RJ. Community-based medical student nutrition counseling training for low-income families. First. 2018;2. http://dx.doi.org/10.22454/primer.2018.809708