

Evaluation of interventions that promote the quality of life of medical students: a systematic review.

Evaluación de intervenciones que promueven la calidad de vida en estudiantes de medicina: revisión sistemática.

Rodrigo Nogueira Pires ¹, Wesley Mentz da Silva ², Rafael Granemann Piola da Silva ³, Elaine Ribeiro Rossi ⁴, Camila Moraes Marques ⁵, Izabel Cristina Meister Coelho ⁶, Rosiane Guetter Mello ⁷.

Faculdades Pequeno Príncipe, Post-Graduation Program in Education in Health Sciences, Curitiba, Brazil.

1, ORCID, [0000-0003-3296-0770](https://orcid.org/0000-0003-3296-0770); 2, ORCID, [0000-0002-3358-9363](https://orcid.org/0000-0002-3358-9363); 3, ORCID, [0000-0001-5618-7407](https://orcid.org/0000-0001-5618-7407); 4, ORCID, [0000-0003-3492-217X](https://orcid.org/0000-0003-3492-217X); 5, ORCID, [0000-0001-5121-922X](https://orcid.org/0000-0001-5121-922X); 6, ORCID, [0000-0002-4904-0746](https://orcid.org/0000-0002-4904-0746); 7, ORCID, [0000-0002-0612-3955](https://orcid.org/0000-0002-0612-3955);

* Correspondence: rosiane.mello@fpp.edu.br

Received: March 8, 2022 ; Accepted: June 21, 2022 ; Posted: June 28, 2022

Abstract: Quality of life is a comprehensive concept that includes ideals of health, psychological well-being, social relations and environmental conditions. The Quality of Life of Medical Students (CVEM) has become a notorious issue in the last decade, even in the scientific community. Increasing rates of anxiety, depression, stress, and drug use related to the college lifestyle have been reported. The objective of this work was to highlight the effectiveness of the interventions used to improve CVEM. The systematic review method was adopted to conduct the study. All stages of the review followed the PRISMA guideline. The search words "Medical Student" and "Quality of Life" were used in the databases: PubMed, ERIC, EMBASE and Scopus. Articles from the last ten years that had evaluated an intervention to improve CVEM scores were included. Ten studies of high quality according to MERSQI were included, which met the eligibility criteria, with half of the studies assessed from CVEM using the WHOQOL-BREF instrument. The interventions or assessments found were relaxation exercises, resilience and educational environment, received social support, physical activity, unified protocol for the treatment of emotional disorders, mindfulness and curricular change. We highlight the effectiveness of three studies that proposed as interventions, relaxation exercises, resilience in an educational environment, social support and implementation of a unified protocol for the treatment of emotional disorders. All of them with the purpose of showing ways in which medical schools can improve the CVEM.

Keywords: Quality of life, medical students, interventions, systematic review.

Resumen: La calidad de vida es un concepto integral que incluye ideales de salud, bienestar psicológico, relaciones sociales y condiciones ambientales. La Calidad de Vida de los Estudiantes de Medicina (CVEM) se ha convertido en un tema notorio en la última década, incluso en la comunidad científica. Se han señalado crecientes índices de ansiedad, depresión, estrés y consumo de drogas relacionados con el estilo de vida universitario. El objetivo de este trabajo fue resaltar la efectividad de las intervenciones utilizadas para mejorar el CVEM. Se adoptó el método de revisión sistemática para realizar el estudio. Todas las etapas de la revisión siguieron la guía PRISMA. Se utilizaron las palabras de búsqueda "Medical Student" y "Quality of Life" en las bases de datos: PubMed, ERIC, EMBASE y Scopus. Se incluyeron artículos de los últimos diez años que habían evaluado una intervención para mejorar las puntuaciones del CVEM. Se incluyeron diez estudios de alta calidad según MERSQI, que cumplieron con los criterios de elegibilidad, con la mitad de los estudios evaluados de CVEM utilizando el instrumento WHOQOL-BREF. Las intervenciones o valoraciones encontradas fueron ejercicios de relajación, resiliencia y ambiente educativo, apoyo social recibido, actividad física, protocolo unificado para el tratamiento de

trastornos emocionales, mindfulness y cambio curricular. Destacamos la efectividad de tres estudios que propusieron como intervenciones, ejercicios de relajación, resiliencia en un ambiente educativo, apoyo social e implementación de un protocolo unificado para el tratamiento de los trastornos emocionales. Todos ellos con la finalidad de mostrar formas en las que las escuelas de medicina pueden mejorar el CVEM.

Keywords: Quality of Life, medical students, Interventions, Systematic review.

1. Introduction.

With advances in the area of health, life expectancy has increased and has brought a concern to measure how people live these years. Thus, based on this concern, the concept of quality of life was introduced as a health outcome measure. There is no consensus in the literature on the concept of quality of life. In this sense, the definition of quality of life, given by the WHOQOL group (World Health Organization Quality of Life) is the one that best reflects the scope of this construct. According to the WHO (World Health Organization), quality of life is defined as "an individual perception of one's position in life, in the context of the culture and value systems in which it is inserted, in relation to their goals, expectations, standards, and concerns. This concept is comprehensive, referring to the physical health, psychological state, level of independence, personal relationships and personalities of the person and their relationship with the environment. This definition that looks at the quality of life is a subjective assessment of the individual from the cultural, social and environmental context in which it is inserted. For example, to better understand the importance of physical activity in promoting health, it is necessary to reflect on a sedentary lifestyle as a risk factor involved in the development of chronic diseases, such as depression, metabolic syndrome and diabetes. In this context, the importance of the physical education professional in health promotion is observed, through a reflection that addresses active life as a protective factor against chronic and mental illnesses (1-2).

Faced with this perspective, faced with the need to create an instrument that would assess quality of life globally and that would be comparable between different cultures, the WHO began to build a project in 1991 to assess quality of life. With the help of several collaborating centers around the world, WHO has developed two instruments for measuring quality of life, the WHOQOL-100 and the WHOQOL-BREF, which have been extensively tested in the field. These instruments take into account important aspects for the analysis of quality of life, as well as ways to analyze this topic in an elaborate way, based on statements made by patients with a wide range of diseases, others in good health, and by professionals of health from different cultures (2).

The WHOQOL-100 allows for a detailed assessment of each individual facet related to quality of life, but is too long for practical use. The WHOQOL-BREF, the reduced version of the previous one, contains a total of 26 questions that measure the following domains: physical health, psychological health, social relations and environment (Table 1). WHOQOL-BREF produces a quality of life profile where it is possible to obtain four domain classifications. There are also two items that are examined separately: question 1 on the general perception of the quality of life of an individual and question 2 on the general perception of the individual health of each person. The references of the four domains (physical health, psychological health, social relations and environment) denote the perception of the quality of life of each individual in each particular domain. Domain scores are scaled in a positive direction, that is, higher values indicate higher quality of life. The mean score of the items in each domain is used to calculate the domain score. Mean

scores are multiplied by 4 to make domain scores comparable to scores used in the WHOQOL-100 (1).

Another of the instruments available to measure concepts related to quality of life is the Health Survey in the abbreviated form of Medical Results (SF-36), also a relatively brief generic instrument. The SF-36 was developed by researchers at the RAND Corporation in the United States to assess the health and well-being of people and has been translated into more than 40 countries. The instrument consists of 36 questions, covering 8 domains, such as functional capacity, physical aspects, pain, general health, vitality, social aspects, emotional aspects, and mental health. The last question is a comparison between the current health situation and that related to 12 months ago. As it is a generic questionnaire, its concepts are not specific to a specific age group, pathology or type of treatment. Current health practices consider quality of life to be a very important element in patient-centered medicine. However, many doctors who prescribe healthy habits do not always follow these habits. An attitude of care for one's own quality of life can be stimulated during the period of their training, starting during academic life, persisting and becoming a habit in professional life (3).

In relation to medical students, some studies have shown a higher incidence of anxiety, depression, stress and drug use. Factors related to university life were highlighted as the cause of this increase in incidence, such as lack of time, physical inactivity, competitiveness, excessive activities and lack of sleep. These aspects, associated with the lack of factors that favor quality of life, can have a negative impact on the physical, mental and emotional health of students. In Europe, about 30% of medical students suffer from depression or anxiety. A similar rate was reported in a Brazilian study, in which 20% to 50% of medical students had mood disorders. They also have higher rates of depression and suicidal ideation than the general population, which represents a great challenge for the training of future doctors (4). Although there is a greater concern for the quality of life of students, there is still no evidence in the literature on the effectiveness of the interventions used. In this way, this research aims to analyze the effectiveness of the interventions carried out to improve the quality of life of medical students.

2. Methods.

The methodology adopted for the development of this study was the systematic review of the literature. For the development of all stages of the investigation, the Preferred Reporting Items for a Systematic Review and Meta-Analysis (PRISMA) guide was followed, in order to ensure rigor in conducting and reporting this systematic review (5).

The research question was formulated using the PICO strategy, an acronym for Patient / Population / Problem, Intervention, Comparison / Control and Outcomes / Results. It is a strategy used in evidence-based practice, both for the construction of the research question and to determine the central elements for the bibliographic search for evidence. Research question: Are the proposed interventions effective in improving the quality of life of medical students?

Search strategy

The electronic databases used in this research were PubMed, ERIC, EMBASE and Scopus. Research published in the periods between January 2011 and March 2020 was searched. The keywords used were "Medical Student" and "Quality of Life". The intervention descriptor was not used, since when performing a search simulation with this descriptor, a lower capture of articles was observed, and the non-capture of research

related to the proposed objective. It is worth mentioning that the searches were carried out by two independent researchers between March 18 and 20, 2020.

Inclusion, exclusion and eligibility criteria

For the inclusion of the studies that were captured in the initial screening, the following criteria were applied: articles published between 2011 and 2020, in English and that presented the search words "quality of life" and "medical students". Since the main objective focuses on the interventions carried out on medical students, the title or abstract of the research must address these proposals to improve quality of life. Review articles, abstracts, editorials, and theses and articles that did not present complete information, or the availability of full access to the article, were excluded as it limits the analysis of the research. Eligible investigations were studies that used observational or experimental research methods, and that addressed an intervention or other assessment, with the purpose of improving the quality of life of medical students. Another item evaluated to choose the surveys was the observation of the use of an instrument to assess quality of life. All the steps related to the selection of the articles included in the research are shown in figure 1, a flow chart developed according to the PRISMA guide.

Risk of bias and quality assessment

Two reviewers independently performed all stages of the research. After the conclusion of each stage, a consensus meeting was held to identify if there was agreement among the reviewers. In case of divergence, a third investigator was included to minimize research bias. The evaluation of the quality of all the articles included in this research was carried out using the Quality Instrument for Research Studies in Medical Education (Medical Education Research Study Quality Instrument – MERSQI).

Data extraction

Data for this systematic review were manually extracted and inserted into a Microsoft Excel table. The data included information on the publication (reference, year of publication, title of the research, journal where it was published, place of development of the research and country), methodology (method used, characteristics of the participants, instruments used for the evaluation), intervention (characteristic of the intervention) and the result obtained (main results related to the objective of this review). The presentation of this review, due to the use of different evaluation scales in the studies, was qualitative, with categorization of interventions and evaluations.

Table 1. Characteristics of the publications included in this review.

Ref.	Title	Magazine	Country
6	Effects of progressive relaxation on anxiety and quality of life in female students: A non-randomized controlled trial	Complementary Therapies in Medicine	Iran
7	Relationship among medical student resilience, educational environment and quality of life	PLoS ONE	Brazil
8	Perceived Social Support as a Determinant of Quality of Life among Medical Students: 6-Month Follow-up Study	Academic Psychiatry	South Korea
9	Leisure time physical activity and quality of life in medical students: Results from a multicentre study	BMJ Open Sport and Exercise Medicine	Brazil
10	Effects of Group Fitness Classes on Stress and Quality of Life of Medical Students	The Journal of the American Osteopathic Association	United States
11	Healthy exercise habits are associated with lower risk of burnout and higher quality of life among US Medical Students	Academic Medicine	United States
12	Improved quality of life and reduced depressive symptoms in medical students after a single-session intervention.	Brazilian Journal of Psychiatry	Brazil
13	Effects of a Required Large-Group Mindfulness	Journal of General	Brazil

	Meditation Course on First-Year Medical Students' Mental Health and Quality of Life: a Randomized Controlled Trial.	Internal Medicine	
14	Trends in medical students' stress, physical, and emotional health throughout training	Medical Education (online)	United States
15	Implementation of a Longitudinal Mentorship Program for Quality of Life, Mental Health, and Motivation of Brazilian Medical Students	Academic Psychiatry	Brazil

3. Results.

With the criteria applied for the selection of articles, it was possible to identify 385 publications between the period from January 2011 to March 2020. The research and selection were summarized in a flow chart according to the PRISMA criteria (figure 1). The characteristics of the publications can be seen in Table 1. Regarding the year of publication, it was possible to identify that, as of 2015, the number of publications related to interventions with the aim of improving the quality of life of patients has increased. medical students. Thus, studies that evaluate the quality of life of medical students, in order to identify factors that contribute to improving this indicator, have grown in the last 20 years, when the distribution of research per year in the database is observed. of PUBMED data.

Table 2. Analysis of the quality of the articles according to the MERSQI instrument.

Reference	MERSQI (Dimensions)						TOTAL
	1*	2*	3*	4*	5*	6*	
Dehghan, 2011	2	1.5	3	3	3	2	14.5
Tempsky, 2015	1	3	3	3	3	2	15
Hwang, 2016	1.5	2	3	3	3	2	14.5
fight, 2017	1	3	3	3	3	2	15
York's, 2017	1.5	2	3	3	3	2	14.5
Dyrbye 2017	1	3	3	3	3	2	15
Bermudez, 2019	1.5	2	3	3	3	2	14.5
Damian, 2020	3	2	3	3	3	2	16
McKerrow, 2020	1.5	2	3	3	3	2	14.5
Bechara, 2020	1.5	2	3	3	3	2	14.5

*, 1, layout; 2, sampling; 3, data type; 4, validity of evaluation instruments; 5, data analysis; 6, results

The two countries with the highest number of publications were Brazil and the United States, with 5 and 3 articles, respectively. The location of the development of the research was in Universities (100%), probably due to the ease of finding the research participants. The quality of all included articles was assessed using the MERSQI instrument (Table 2). It can be seen that the total scores were between 14.5 and 16. For each of the 6 dimensions it

is possible to assign 3 points; thus, the maximum possible sum is 18. Based on the publication by Reed et al. (17), obtaining a score of 18 is extremely difficult. It is evident that the articles included in this review are of high quality, according to MERSQI.

Table 3 summarizes the methodological and evaluative characteristics and the result of the investigation. It is possible to identify that the quasi-experimental and cross-sectional design contributed 3 articles each, plus 2 cohort studies, 1 case-control and 1 randomized clinical trial (registered in the clinical trials platform). Experimental studies have more evidence than cross-sectional studies. However, the cross-sectional studies reported in this review were multicentre studies, which increases the quality of the research. (8, 10, 12). The sample of students showed great variation, from 62 students (12) to 4,402 (11). Regarding the sample, it should be noted that one study evaluated 100% of the sample of female students and in the other 9 studies the distribution was proportional between genders. Regarding the quality of life evaluation instruments, 50% of the articles used the WHOQOL-BREF (5 articles) (7-9, 13, 15), one used a modified version of the WHOQOL-100, with 50 questions (6) and two used a validated analog scale (10-11), another used a Quality of Life and Satisfaction Questionnaire (Q-LES-Q-SF) (12) and the last one, a quality of life scale related with the 8-item health (SF-8) (14).

In the modified WHOQOL-100 instrument, the authors took advantage of the adaptation to the Persian language, and the items in the modified version were reduced to 50 in the validation process, the dimensions of physical health were maintained with 6 items, psychological 12, social relationships 8, environment 17, spiritual-religious beliefs 3 and quality of life and health in general 4. The level of independence domain was eliminated in the modified version. All items were rated on a five-point Likert scale, ranging from very little to very much, where 1 indicates low and negative perceptions and 5 high and positive perceptions. Domains were scored using a summative scale. The reliability of the modified version was determined by Cronbach's alpha and was 0.95 for the overall scores (6).

Regarding analog scales, York et al. used a visual scale that was validated for health assessment metrics, such as patients with chronic pain (20). The analog scale was created with clear definitions of physical, mental, and emotional quality of life. Participants rated their physical, mental, and emotional quality of life on a scale of 0 (worst possible) to 10 (best possible) (21). Other research in this review used an analogue scale (11); another investigation in this review using an analogue scale assessed past week quality of life, using a standardized linear scale, where 0 meant the worst possible and 10 the best possible. Mean scores of 7 or more are typical of healthy individuals in the general population (22). The Q-LES-Q-SF scale (23) was used to assess the degree of satisfaction and pleasure in various areas. This includes 16 items and was translated into Portuguese and validated with Cronbach's Alpha of 0.78 (24). The first time it was used to assess the quality of life of students was in the research by Bermudez et al. (12). The 2020 (14) SF-8 Applied Survey, which is an 8-item health-related quality of life research instrument, assesses three domains of health: general health (assessed as a single item), emotional health, and general health. physical (25). Although 50% of the studies used the same scale to assess the quality of life of medical students (WHOQOL-BREF), the previous description of the other scales shows the impossibility of making a comparison between the scores, hence this review assessed the studies independently in relation to the outcome related to the intervention performed in each study. Other evaluation scales were also used according to the objective of the studies. All evaluations are listed in Table 3, in the Intervention or Evaluation column.

4. Discussion.

The results and discussion that follow will be related to the types of interventions / evaluations carried out in the included articles.

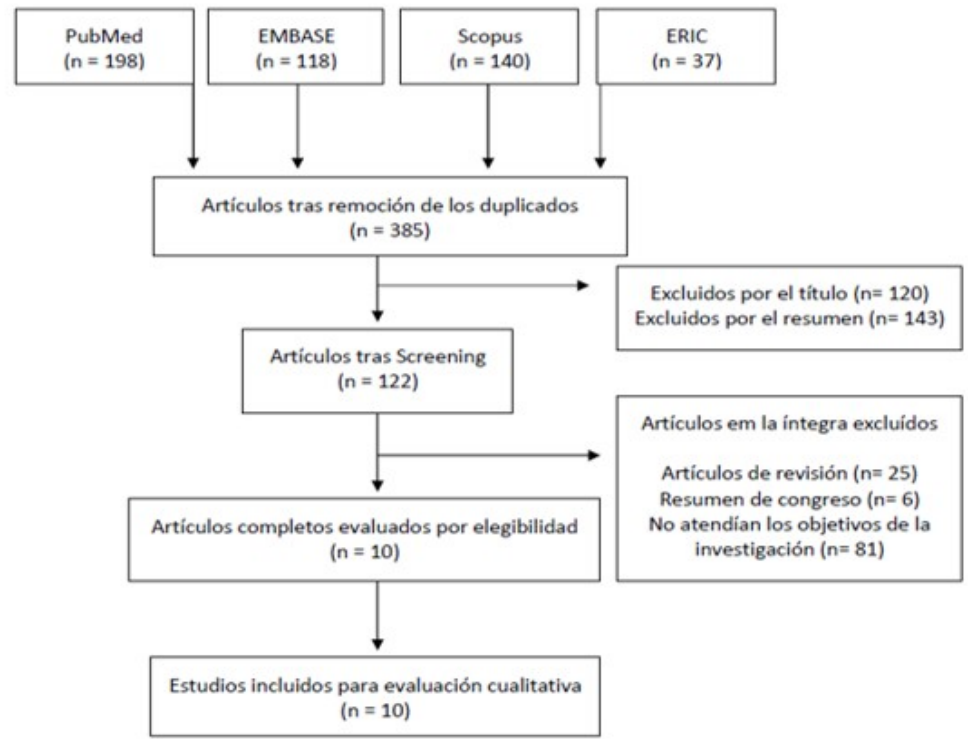
The proposed intervention, in an Iranian study, was a relaxation exercise program with female medical students only (6). The authors point out that excessive anxiety has several deleterious effects on the mind and body of students. Thus, excessive anxiety would imply a decrease in physical quality of life, as well as impair learning and interpersonal relationships. It also reports that according to some studies (26), students end up dealing with excessive anxiety through destructive behaviors, such as smoking and drinking alcohol, others even consider dropping out of medical school. The analyzed intervention shows that the general quality of life score was significantly higher in the experimental group after two months of relaxation exercises. In this way, relaxation techniques can be effective in improving the quality of life and anxiety of medical students.

A study conducted in Brazil, with 22 medical schools, evaluated and compared quality of life, resilience, and the educational environment (7). The data indicate that higher levels of resilience were associated with better self-reported quality of life and WHOQOL-BREF domains. Assigning positive value and meaning to life experiences, even negative ones, is one of the main characteristics of resilient people (27). The authors note that the data is consistent with the concept that resilience is an essential competency for the medical school admissions process.

The Korean survey aimed to assess the association of quality of life with perceived social support and fatigue (8). They used a scale called MSPSS to assess perceived social support (28). In addition, this brief fatigue inventory (BFI) was used (29). The impact of peer support on quality of life was confirmed in the cohort analysis of this study. The final regression models revealed that providing students with more social support and promoting fatigue reduction improved the students' quality of life. Thus, the authors conclude that the creation of student support programs to avoid social detachment and the implementation of strategies to reduce fatigue can improve the quality of life of medical students.

In three publications (9-11), each with a different objective, physical activity was evaluated as a strategy to improve the quality of life of medical students. The multicenter cross-sectional survey by Peleias et al. (9) identified whether students regularly had free time for physical activity. This study showed significant associations between moderate and high levels of physical activity and better quality of life.

Ref.	Method	Sample	Identificación	Screening	Elegibles	Incluidos	Result
6	Quasi-experimental	200 (100% v for th group a the ex group					nt differences were observed the anxiety and quality of the two groups after the tion. The overall quality of e was significantly higher in erimental group after two of relaxation exercises. on techniques can be effective roving quality of life and in medical students.
7	Cross	1,350 from 2 schools.					students with higher levels of e had better quality of life ceptions of the educational ment.
8	Cohort	109 stuc					the sources of support, the of "friends" was identified as n one that affects the Quality n general. The impact of peer on quality of life was ed in longitudinal analysis. gression models revealed that g students with more social and promoting reduced improved quality of life.
9	Cross	1,350 students from 22 medical schools.	PubMed (n = 198)	EMBASE (n = 118)	Scopus (n = 140)	ERIC (n = 37)	The study showed significant associations between moderate and high levels of physical activity and better quality of life. A strong dose-effect relationship was observed between volume of leisure-time physical activity and quality of life in male and female medical students.



10	Quasi-experimental	69 students	Quality of life was assessed using a validated visual analog scale (VAS). EVA was created to assess 3 dimensions: physical, mental and emotional.	Stress Perception Scale (PSS) The group of students was divided and an intervention related to physical activity was programmed into 3, for each one . Group 1 - Group physical activity, at least once a week; Group 2 - Students who perform individual physical activity 2 to 3 times a week and Group 3 - Control group who do not practice physical activity on a regular basis.	12 weeks	Regular participation in group fitness classes led to a statistically significant decrease in perceived stress and an increase in quality of life (physical, mental, and emotional) compared to regular exercise alone or non-regular exercise. Weekly group fitness classes can be a solution to improve the emotional well-being and stress level of medical students.
11	Cross	4,402 medical students	Past week overall quality of life was measured using a standardized linear analog scale.	To assess exercise habits , using CDC guidelines, students were asked to indicate the number of minutes/week of moderate-intensity exercise (eg, brisk walking, flat-terrain cycling, water aerobics), number of minutes/week in vigorous-intensity exercise (eg, running, lifting a bike, swimming, playing basketball) and the number of times per week each major muscle group (eg, legs, hips, back, abdomen) was trained , chest), shoulders, arms). Burnout was evaluated by the Maslach Burnout Inventory .	na	Medical students who follow CDC guidelines for aerobic exercise and strength training are mentally healthier and have a lower risk of burnout and a higher quality of life score.
12	Quasi-experimental	62 students	Quality of Life and Satisfaction Questionnaire (Q-LES-Q-SF)	Mini-International Neuropsychiatric Interview (MINI) Clinical psychiatric interview and intervention in a single session. Unified protocol for the transdiagnostic treatment of emotional disorders. Rosenberg Self-Esteem Scale (RSE), Interpersonal Reactivity Index (IRI), Global Anxiety Severity and Commitment Scale (OASIS), and Beck Depression Inventory (BDI)	Evaluation after 90 days of intervention.	Participants' quality of life improved after the intervention, and improvement in Q-LES-Q was associated with changes in BDI and OASIS scores.

13	Randomized clinical trial	141 students	WHOQOL-BREF	The students were randomized into two groups: an intervention group (participated in a Mindfulness protocol for 6 weeks) and a control group (given a 6-week course containing organizational aspects of medical school).	6 weeks	The incorporation of a Mindfulness course for large groups in the medical course curriculum (first semester) was not associated with an improvement in the mental health and quality of life of medical students.
14	Cohort	146 students	SF-8 (8-item health-related quality of life scale that assesses three health domains).	Curriculum change : competency-based curriculum. Perceived Stress Scale (PSS)	3 years	In a competency-based curriculum, physical, emotional, and general health significantly worsened during the first year, but improved in subsequent years, while perceived stress remained unchanged.
15	case control	95 students	WHOQOL-BREF	Longitudinal curricular orientation program (Mentoring) - Longitudinal curricular orientation program -55 students participated in the orientation program and 40 did not participate. The Program has 6 meetings a year in groups of 10 to 12 students. The students evaluated were from the second year.	1 year	The tutoring did not promote significant changes in the students of this Brazilian institution.

The study by Yorks et al. (10), with a quasi-experimental design, proposed a 12-week intervention. The group of students was divided into 3, for each one an intervention related to physical activity was programmed. For group 1 - Group physical activity, at least once a week; Group 2 - Students who perform individual physical activity 2 to 3 times a week and Group 3 - Control group who do not practice physical activity on a regular basis. From the analysis they were able to conclude that regular participation in group fitness classes led to a statistically significant increase in Quality of Life (physical, mental and emotional) compared to regular self-exercise or no regular exercise.

Another multicenter cross-sectional study, developed in the United States (11), used the guidelines of the Centers for Disease Control and Prevention (CDC) that recommend aerobic exercise of at least 150 minutes per week of moderate intensity, or 60 minutes per week of physical activity vigorous. In this study, a scale to identify Burnout (Maslach Burnout Inventory) was also used. It was concluded that medical students who follow the CDC guidelines for aerobic exercise and strength training are mentally healthier and have a higher quality of life and a lower risk of Burnout. The social aspect of performing physical activity in a group cannot be ruled out as an aspect that improves quality of life and reduces stress. The literature affirms that group physical exercise is therapeutic (31).

In a recent systematic review, an estimate of depression was identified in 27.2% of medical students and 11.1% of suicidal ideation (30). Various strategies have been discussed and regular physical activity has been identified as potentially beneficial for people with depressive and/or anxiety symptoms. (28-29).

Another important point to discuss is that the findings of the study by Yorks et al. (10) should not be interpreted as a condemnation of individual exercise. It is believed that many benefits can be derived from any type of physical exercise, but adding group classes to a population of medical students may have additional benefits. Participation in social conditioning activities could be a solution to improve the well-being of students and doctors.

The quasi-experimental research carried out by Bermudez et al. (12) used a structured psychiatric interview, followed by the Mini-International Neuropsychiatric Interview (MINI) (30). MINI is a brief diagnostic interview for DSM-IV and ICD-10 psychiatric disorders, administered by trained psychiatrists or psychiatric residents. The intervention was carried out in a single session, and was called the Unified Protocol for the Transdiagnostic Treatment of Emotional Disorders, the evaluation was carried out at 90 days. The Unified Protocol for the Transdiagnostic Treatment of Emotional Disorders is a cognitive-behavioral intervention designed to address neuroticism, which has been considered a predictor of depressive and anxiety disorders (32). This study concludes that the Unified Protocol was an acceptable and viable intervention for the prevention of mental disorders in a risk group. The format of a transdiagnostic group in a single 2-hour session reduces economic costs and facilitates the dissemination of the program. The only study with a randomized clinical trial design evaluated the use of mindfulness in a large group (13). A Mindfulness course for large groups was incorporated into the medical course curriculum (first semester). This intervention was a proposal for a 6-week program for groups of 45 students, lasting 2 hours. The authors concluded that the intervention did not promote an improvement in the mental health and quality of life of medical students. It was also noted that there may be differences in relation to mindfulness methods, and the need to identify which groups respond to different methods, taking into account that this is not a passive intervention, since it requires the need to incorporate a change in style of individual's life.

The research of Mckerrow and collaborators (14) aimed to evaluate the effects of curricular change on the well-being of students. In this cohort study, 146 medical students were followed for a period of 3 years. The intervention carried out was the implementation of a competency-based curriculum. Results showed that in a competency-based curriculum, physical, emotional, and general health significantly worsened during the first year, but improved thereafter, while perceived stress remained unchanged. At the beginning of the course, stress and decreased quality of life may be related to concerns about self-efficacy and workload. Although sophomores and juniors show an increase in well-being, concerns about emotional difficulties such as anxiety and irritability persist.

Another proposed intervention at the curricular level was the implementation of a longitudinal curricular monitoring program for students (mentoring). The program foresees 6 annual meetings with groups of 10 to 12 students. The evaluations carried out in this case-control study do not show any difference in mental health, quality of life or motivation of medical students who received a longitudinal orientation program in relation to those who did not receive the program. The results revealed that the evidence supports that the implementation of mentoring is not conclusive and that the decision to implement mentoring for students should be carefully evaluated by medical schools (15).

This review shows that some interventions can be considered effective in improving the quality of life of medical students. Among the interventions, physical activity stands out, evidenced in three studies. Each of the interventions contributed to the study: the relaxation exercise program, resilience and educational environment, social support and fatigue reduction, and implementation of a Unified Protocol for the Transdiagnostic Treatment of Emotional Disorders. Based on these findings, medical schools can implement support for students so that future professionals continue to care for their quality of life.

4. Conclusions

- This review shows that some interventions can be considered effective in improving the quality of life of medical students. Among the interventions, physical activity stands out, evidenced in three studies.
- Each of the interventions contributed to the study: the relaxation exercise program, resilience and educational environment, social support and fatigue reduction, and implementation of a Unified Protocol for the Transdiagnostic Treatment of Emotional Disorders.
- Based on these findings, medical schools can implement support for students so that future professionals continue to care for their quality of life.

Funding: There has been no funding.

Author contributions: Rodrigo Nogueira Pires, work development, data collection and analysis, article writing; Rafael Granemann Piola da Silva and Wesley Mentz da Silva, data collection and analysis; Camila Moraes Marques and Elaine Ribeiro Rossi, data collection and analysis, writing articles; Rosiane Guetter Mello and Izabel Cristina Meister Coelho, supervision of the development of the work, collection and analysis of data, writing of articles.

Declaration of conflict of interest: The authors declare that they have no conflict of interest.

References

- 1 The WHOQOL Group. Whoqol-Bref: Introduction, Administration, Scoring and Generic Version of the Assessment. Program Mental Heal 1996;16. <https://doi.org/10.1037/t01408-000>
- 2 QUIEN. WHOQOL: measuring quality of life. Psychol Med 1998;28:551-8. <https://doi.org/10.5.12>.

- 3 Solis AC, Lotufo-Neto F. Predictors of quality of life in Brazilian medical students: a systematic review and meta-analysis. *Rev Bras Psiquiatr* 2019;41:556–67. <https://doi.org/10.1590/1516-4446-2018-0116>.
- 4 Capdevila-Gaudens P, García-Abajo JM, Flores-Funes D, García-Barbero M, García-Estañ J. Depression, anxiety, burnout and empathy among Spanish medical students. *PLoS ONE* 2021; 16(12): e0260359. <https://doi.org/10.1371/journal.pone.0260359>
- 5 Moher D, Liberati A, Tetzlaff J, Altman DG, Group TP. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement 2009;6. <https://doi.org/10.1371/journal.pmed.1000097>.
- 6 Cook DA, Reed DA. Appraising the Quality of Medical Education Research Methods: The Medical Education Research Study Quality Instrument and the Newcastle-Ottawa Scale-Education. *Acad Med*. 2015;90:1067–76. <https://doi.org/10.1097/ACM.0000000000000786>.
- 7 Dehghan-nayeri N, Adib-Hajbaghery M. Effects of progressive relaxation on anxiety and quality of life in female students: A non-randomized controlled trial. *Complement Ther Med* 2011;19:194–200. <https://doi.org/10.1016/j.ctim.2011.06.002>.
- 8 Tempiski P, Santos IS, Mayer FB, Enns SC, Perotta B, Paro HBMS, et al. Relationship among medical student resilience, educational environment and quality of life. *PLoS One* 2015;10. <https://doi.org/10.1371/journal.pone.0131535>.
- 9 Hwang IC, Park KH, Kim JJ, Yim J, Ko KP, Bae SM, et al. Perceived Social Support as a Determinant of Quality of Life among Medical Students: 6-Month Follow-up Study. *Academic Psychiatry* 2016;41:180–4. <https://doi.org/10.1007/s40596-016-0503-5>.
- 10 Peleias M, Tempiski P, Paro HB, Perotta B, Mayer FB, Enns SC, et al. Leisure time physical activity and quality of life in medical students: Results from a multicentre study. *BMJ Open Sport Exerc Med* 2017;3. <https://doi.org/10.1136/bmjsem-2016-000213>.
- 11 Yorks DM, Frothingham CA, Schuenke MD, DM Y, CA F, MDS Effects of Group Fitness Classes on Stress and Quality of Life of Medical Students. *J Am Osteopath Assoc* 2017;117:e17–25. <https://doi.org/10.7556/jaoa.2017.140>.
- 12 Dyrbye LN, Satele D, Shanafelt TD. Healthy exercise habits are associated with lower risk of burnout and higher quality of life among US Medical Students. *Acad Med* 2017;92:1006–11. <https://doi.org/10.1097/ACM.0000000000001540>.
- 13 Bermudez MB, Costanzi M, Macedo MJA, Tatton-Ramos T, Xavier ACM, Ferrao YA, et al. Improved quality of life and reduced depressive symptoms in medical students after a single-session intervention. *Rev Bras Psiquiatr* 2019. <https://doi.org/10.1590/1516-4446-2019-0526>.
- 14 Damiao Neto A, Lucchetti ALG, da Silva Ezequiel O, Lucchetti G. Effects of a Required Large-Group Mindfulness Meditation Course on First-Year Medical Students' Mental Health and Quality of Life: a Randomized Controlled Trial. *J Gen Intern Med* 2020;35:672–8. <https://doi.org/10.1007/s11606-019-05284-0>.
- 15 McKerrow I, Carney PA, Caretta-Weyer H, Furnari M, Miller Juve A. Trends in medical students' stress, physical, and emotional health throughout training. *Med Educ Online* 2020;25. <https://doi.org/10.1080/10872981.2019.1709278>.
- 16 Bechara Secchin L de S, da Silva Ezequiel O, Vitorino LM, Lucchetti ALG, Lucchetti G. Implementation of a Longitudinal Mentorship Program for Quality of Life, Mental Health, and Motivation of Brazilian Medical Students. *Academic Psychiatry* 2020;44:200–4. <https://doi.org/10.1007/s40596-019-01141-8>.
- 17 Reed DA, Beckman TJ, Wright SM, Levine RB, Kern DE, Cook DA. Predictive validity evidence for medical education research study quality instrument scores: Quality of submissions to JGIM's medical education special issue. *J Gen Intern Med* 2008;23:903–7. <https://doi.org/10.1007/s11606-008-0664-3>.
- 18 Price DD, McGrath PA, Rafii A, Buckingham B. The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. *Pain* 1983;17:45–56. [https://doi.org/10.1016/0304-3959\(83\)90126-4](https://doi.org/10.1016/0304-3959(83)90126-4).
- 19 McCormack HM, Horne DJ, Sheather S. Clinical applications of visual analogue scales: a critical review. *Psychol Med* 1988;18:1007–19. <https://doi.org/10.1017/s0033291700009934>.
- 20 Cella D, Zagari MJ, Vandoros C, Gagnon DD, Hurtz HJ, Nortier JWR. Epoetin alfa treatment results in clinically significant improvements in quality of life in anemic cancer patients when referenced to the general population. *J Clin Oncol Off J Am Soc Clin Oncol* 2003;21:366–73. <https://doi.org/10.1200/JCO.2003.02.136>.

- 21 Endicott J, Nee J, Harrison W, Blumenthal R. Quality of Life Enjoyment and Satisfaction Questionnaire: a new measure. *Psychopharmacology Bulletin* (Internet). 1993;29(2):321–6. Available from: <https://pubmed.ncbi.nlm.nih.gov/8290681/>
- 22 Zubaran C, Foresti K, Thorell MR, Franceschini PR, Homero W. Portuguese version of the Quality of Life Enjoyment and Satisfaction Questionnaire: a validation study. *Rev Panam Public Health* 2009;25:443–8. <https://doi.org/10.1590/s1020-49892009000500010>.
- 23 Turner-Bowker DM, Bayliss MS, Ware JE, Kosinski M. Usefulness of the SF-8TM Health Survey for comparing the impact of migraine and other conditions. *Qual Life Res* 2003;12:1003–12. <https://doi.org/10.1023/A:1026179517081>.
- 24 Kleehammer K, Hart AL, Keck JF. Nursing students' perceptions of anxiety-producing situations in the clinical setting. *The Journal of Nursing Education*. 1990;29(4):183–7. <https://doi.org/10.3928/0148-4834-19900401-10>
- 25 Park CL. The Meaning Making Model: A framework for understanding meaning, spirituality, and stress-related growth in health psychology. *Heal Psychol Rev* 2013;2:40–7. <https://www.ehps.net/ehp/index.php/contents/article/view/ehp.v15.i2.p40>
- 26 Park H, Park H, Nguyen T. Validation of multidimensional scale of perceived social support in middle-aged Korean women with diabetes. *Asia Pacific J Soc Work Dev* 2012;22:202–13. <https://doi.org/10.1080/02185385.2012.691719>.
- 27 Yun YH, Wang XS, Lee JS, Roh JW, Lee CG, Lee WS, et al. Validation study of the Korean version of the Brief Fatigue Inventory. *J Pain Symptom Manage* 2005;29:165–72. <https://doi.org/10.1016/j.jpainsymman.2004.04.013>.
- 28 Rotenstein LS, Ramos MA, Torre M, Segal JB, Peluso MJ, Guille C, et al. Prevalence of Depression, Depressive Symptoms, and Suicidal Ideation Among Medical Students A Systematic Review and Meta-Analysis 2016;02115:2214–36. <https://doi.org/10.1001/jama.2016.17324>.
- 29 Peluso MAM, de Andrade LHSG. Review Physical Activity And Mental Health: The Association Between Exercise And Mood. *Clinics* 2005;60:61–70. <https://doi.org/10.1590/s1807-59322005000100012>
- 30 Mammen G, Faulkner G. Physical activity and the prevention of depression: a systematic review of prospective studies. *Am J Prev Med* 2013;45:649–57. <https://doi.org/10.1016/j.amepre.2013.08.001>.
- 31 Amorim P. Mini International Neuropsychiatric Interview (MINI): validation of a short structured diagnostic psychiatric interview. *Rev Bras Psiquiatr* 2000;22:106–15. <https://psycnet.apa.org/doi/10.1590/S1516-44462000000300003>
- 32 Plante TG, Coscarelli L, Ford M. Does exercising with another enhance the stress-reducing benefits of exercise. *Int J Stress Management*. 2001;8(3):201-213. <https://doi.org/10.1023/A:1011339025532>
- 33 Wilamowska ZA, Thompson-Hollands J, Fairholme CP, Ellard KK, Farchione TJ, Barlow DH. Conceptual background, development, and preliminary data from the unified protocol for transdiagnostic treatment of emotional disorders. *DepressAnxiety*. 2010;27:882-90.

