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The Benefits and Challenges of Maintaining Social Relationships while Pursuing a Medical Degree: A Systemic Review

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ABSTRACT

Pursuing a medical degree often requires high levels of commitment due to the considerable workloads students must deal with. This systematic review aims to investigate the numerous benefits and significant challenges of maintaining social relationships while pursuing a medical degree. A systematic review was conducted using the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) framework to identify the research outcomes. The PubMed, Embase, Cochrane Library, and Medline databases were searched from 2019 to 2024. Only qualitative articles focusing on medical students and factors leading to success or challenges in project management were included in the review. The primary outcomes comprised the mental health difficulties and psychological distress that medical students face due to social isolation in student accommodation, as well as the increased time spent on digital applications. The secondary outcomes included the shift in learning preferences whereby students prefer accessing online academic information and resources instead of engaging in group-based learning. Out of 300 records, four studies were selected for review. Medical students can find it beneficial to maintain social relationships while pursuing their demanding degrees, as these interactions can help them gain deeper and more nuanced insights into course content.

Keywords: *Benefits, Challenges, Social relationships, Medical degree, Medical students*

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INTRODUCTION

Social relationships and coordination among people have been investigated as significant factors in minimising anxiety and raising self-esteem and confidence (1). Anxiety, depression and stress have considerable impacts on people's lifestyles and behaviours. At the societal level, general anxiety and stress will lead to panic and unhealthy behaviours; the latter will cause a decline in people's health, resulting in the emergence of diseases

and negative impacts on the progression of diseases, as well as on healthcare services (2). Furthermore, when people possess high levels of confidence and empathy, they maintain trust by communicating effectively. Positive mental health and reduced stress are ways to achieve sustainable social relationships.

Medical education is widely recognised as one of the most demanding academic pathways, requiring sustained mental, emotional, and physical commitment. Medical students frequently encounter elevated levels of stress, anxiety, and burnout due to intense academic pressures and limited time for self-care and social engagement. For instance, the prevalence of 67.9% of medical students in the cross-sectional study conducted on the first to fifth year medical students at the School of Medical Sciences, Universiti Sains Malaysia experienced burnout (3). These psychological burdens are compounded by social isolation, particularly among students living in hostels, where the lack of structured social support can exacerbate stress and negatively affect mental well-being. In fact, medical students in hostels should emphasise maintaining positive social relationships with their fellows (4). Social interaction is an essential component of hostel life, as students from various backgrounds collectively require assistance from their fellows.

Social relationships, defined as meaningful connections with peers, mentors, and faculty, have been shown to mitigate these stressors by fostering a sense of belonging, emotional support, and collaborative learning (5). Positive peer relationships are associated with enhanced academic motivation, higher engagement in group learning, and improved coping strategies during stressful periods. Socialising with peers, such as spending at least two hours a day with five or more friends, is one factor that can attenuate the effects of exercise (6). It has been demonstrated that participation in physical activities improves academic performance in medical schools and lowers misbehaviour and other antisocial behaviours brought on by the demanding university student life (5).

Moreover, teacher-student rapport contributes to improved classroom attention and self-esteem (7), creating a healthier educational environment (8). From individual viewpoints, learners provide new perspectives and varied ideas for learning complex lectures. For students, their level of engagement with their fellows enables them to study with proper concentration and dedication, thus effectively performing formative and summative assessments while constructing social communication with their peers. For cognitive learning and group-based tasks, social coordination among students assists them in achieving higher academic grades and good assessment results (9). Understanding insightful knowledge of course curriculum-combined studies assists in mitigating learning gaps (7), as the encouragement from class fellows elevates students' interest while enabling them to focus on learning. In particular, collaborative learning fosters cognitive development through the exchange of ideas and peer feedback, which can reduce procrastination and enhance accountability, which assists in developing personal responsibilities to achieve higher grades (10). However, medical students often struggle to maintain these essential social connections due to time constraints, academic pressures, and increasingly digital learning environments, especially during the COVID-19 pandemic. The shift towards online education has further limited opportunities for organic social interactions, challenging students' ability to form or maintain relationships.

The present systematic review aimed to explore both the benefits of effective social communication with peers and instructors and the challenges arising from limited social opportunities experienced by medical students trying to maintain social relationships while pursuing their degrees. Specifically, this systematic review sought to identify key difficulties related to social coordination in medical education (e.g., limited face-to-face interactions

and overreliance on digital tools) and evaluate the positive impacts of social interaction on students' mental health, academic performance, and professional development. Ultimately, this review aimed to provide practical recommendations to help students overcome the abovementioned social challenges and balance their academic responsibilities with healthy social connections.

METHODOLOGY

Research Design

The a priori protocol was created and listed under the PROSPERO, under the ID CRD42024542458 of the International Prospective Register of Systematic Reviews. For this review, we followed the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) reporting criteria.

Eligibility Criteria

The eligibility criteria for this review were medical students aged 18 years and older, focusing on qualitative secondary research related to medical students, specifically concerning their social relationships. The inclusion criteria were peer-reviewed journal articles published in English between 2019 and 2023 that discussed the success factors or challenges in project management. These studies prioritised qualitative research methodologies without restrictions on specific aspects of social relationships or project management challenges. The exclusion criteria were studies outside the specified time interval (before 2019 or after 2023) and publications such as book chapters, editorials, dissertations, and theses, as well as non-English works due to translation barriers. Theoretical discussions, case studies without a broader evaluation, and quantitative research articles were excluded.

Search Strategy and Study Selection

From January 2019 to April 2024, a comprehensive search of peer-reviewed articles and conference proceedings was conducted across five electronic databases: PubMed, MEDLINE (Cochrane Library), EMBASE (Ovid interface), Google Scholar, and Web of Science. Relevant studies were also identified through manual searches of academic journals and digital repositories. Additionally, references and citations from the selected articles were reviewed to ensure thorough identification of all potential studies for inclusion. Only studies available in English were considered for inclusion in this systematic review. The search strategies were crafted using a combination of keywords, synonyms, abbreviations, and MeSH terms for ("social relationship" AND "medical students," AND "communication," AND "benefits" AND "challenges," AND "pandemics," AND "role of technology" AND "digital implication"), whereas ("social relationships" OR "medical students" OR "communication" OR "benefits" OR "challenges" OR "pandemics" OR "role of technology" OR "digital implication"). Additionally, terms such as ("business students," NOT "engineering students,"), would be excluded from the search. Appropriate search filters, as endorsed by the Cochrane Collaboration and librarians, were employed to ensure the accurate identification of relevant studies.

During the initial pilot review stage, all retrieved articles were transported to EndNote 20 (Clarivate 2013, Boston, USA), where the studies were first deduplicated. Using Rayyan Software (USA), two independent reviewers (CZT and CZYL) independently evaluated the titles and abstracts in accordance with the specified eligibility requirements after obtaining the full text and any supporting materials (11). The corresponding authors of the relevant articles were contacted via email to request any missing data. Only full-text articles were included in the review.

Outcomes

The primary outcome measure in this review was to assess the impact of e-learning on social coordination among medical students during the COVID-19 pandemic. This includes evaluating how distance learning affects social interactions with peers and educators. The secondary outcome will focus on the effectiveness of e-learning in achieving academic success despite the challenges in social interaction. For effectiveness outcomes, data were collected from cross-sectional and qualitative studies to measure student perceptions of e-learning efficiency, time-saving potential, and barriers, such as technological issues and reduced face-to-face communication. Findings from systematic reviews and qualitative studies were analysed to identify key obstacles related to maintaining social relationships during online learning.

Data Extraction and Risk of Bias Assessment

Duplicates were eliminated from the retrieved articles by importing them into EndNote 20. Data were then extracted, full texts reviewed, and titles and abstracts evaluated for relevance. The risk of bias was assessed using Cochrane's Risk of Bias 2 (RoB2) tool, with assessments categorised as low risk, some concerns, or high risk. Key study details, including study identifier, publication date, recruitment period, study location, study design, and baseline participant characteristics (e.g., sample size, mean age, sex distribution), were extracted and evaluated by two reviewers (CZT and CZYL). The duration of mindfulness or meditation interventions, primary outcomes, intervention type and dosage, and other relevant study features were also considered.

The RoB2 tool was used to evaluate the risk of bias across several domains: (a) randomisation process; (b) deviations from intended interventions; (c) missing outcome data; (d) outcome measurement, (e) selection of the reported results; and (f) overall risk of bias. In cases of disagreement between the two reviewers, a third reviewer conducted independent data extraction and risk of bias assessment to resolve disputes.

RESULTS

Included Studies

This systematic search strategy generated a comprehensive database of 300 articles. The search process and selection results are shown in Figure 1. Additionally, a rigorous screening process was conducted, which eliminated 8 duplicate records and 130 articles in which only abstract text was available. A total of 66 studies were excluded because they were irrelevant to the study focus, including 55 studies discussing the benefits of maintaining

social relationships while pursuing a medical degree, and 11 studies based on qualitative data. After further assessment, 11 studies were excluded. Of the 85 studies assessed for eligibility, 81 were excluded because they did not meet the predetermined inclusion criteria. Ultimately, four studies were included in the review, following the eligibility criteria.

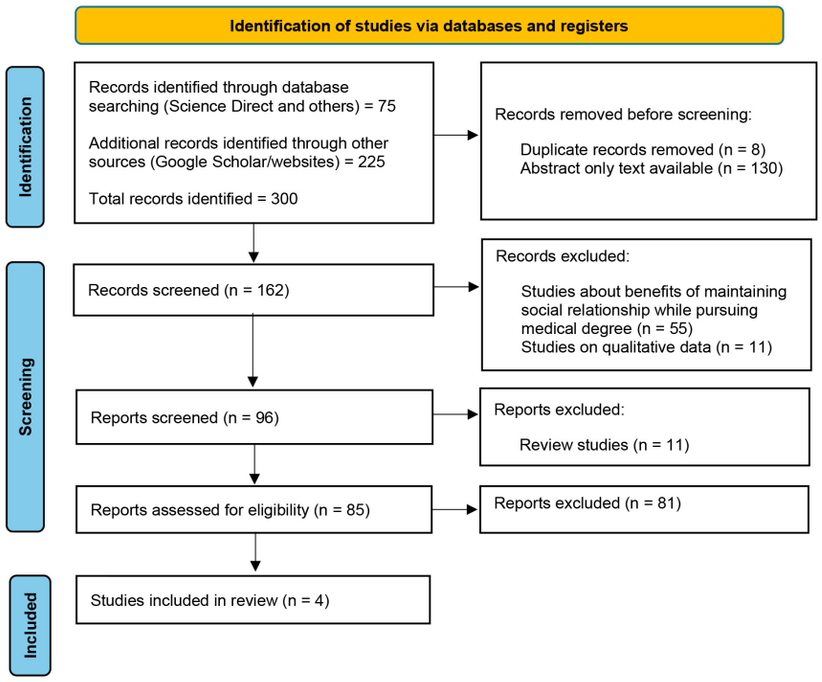

Figure 1: Summary of study search and selection process (PRISMA flow chart).

Study Characterisation

Table 1 presents the characteristic of the studies included in this review, which were conducted in Jordan, Saudi Arabia, and Iran. The studies varied in sample sizes, ranging from small qualitative studies with 12 students and 14 faculty members to larger cross-sectional studies with 3,700 participants. These investigations explored different aspects of e-learning and distance education during the COVID-19 pandemic, focusing on medical students' experiences, challenges, and perceptions of the online learning environment. The duration and context of each study were tailored to the specific educational setting and impact of the pandemic on teaching methods, social interactions, addressing technological barriers, and promoting effective academic outcomes amidst global health challenges.

Table 1: A synthesis of the key findings from the studies

Author, Country	Type of study	Sample size	Male: Female Ratio	Purpose of the study	Duration	Intervention details	Outcome measures	Findings	Limitations
Sindiani et al. (12), Jordan	Cross-sectional study	2,212 out of 3,700	Not explicitly mentioned in the document	To examine the impact of the COVID-19 outbreak on the implementation of new methods of teaching at Jordan University of Science and Technology, Faculty of Medicine.	8 days of Google Forms survey	A survey composed of 18 questions on the Google Forms platform was conducted from 22 May to 30 May 2022.	The overall learning experience is not good due to a lack of social interaction with educators and classmates. Distant learning has been determined to be disadvantageous for medical students enrolled in Jordan University of Science and Technology.	The findings indicate that while distance education offered a viable alternative during the pandemic, students faced significant challenges, particularly with internet access and interaction quality. Overall satisfaction was moderate, with concerns about the effectiveness of distance education compared to traditional methods,	Potential biases in self-reported data and the difficulty of generalising the findings beyond the Nigerian context, as the study was conducted in a specific educational environment,
Hayat et al. (15), Iran	Qualitative	12 students and 14 faculty members at Shiraz University of Medical Sciences, Iran	14 males: 12 females	The study aims to elaborate insights on challenges and opportunities encountered by medical education, i.e., health centres, higher education commission, due to the abrupt economic transition due to COVID-19.	6 months	Semi-structured interviews, along with field notes for 35 minutes, were used as data collection strategies.	The transformation to an e-learning process might be challenging for students due to technological barriers. Maintaining social interaction with class fellows might be restricted comparatively from traditional methods of class-based teaching.	The outcome measures focused on factors like course feasibility, standardisation, and faculty support in e-learning, along with advantages such as enhanced digital literacy and control over learning. Challenges included student unfamiliarity, interaction issues, time constraints, and infrastructure problems, while evaluation revealed mixed effectiveness of virtual methods for assessments.	The generalisability of the findings may be limited to the research sample because the study was conducted at a single university. Besides, the researchers are engaged in e-learning programmes and may have been biased in favour of specific responses by interviewees based on their experiences or may have sought confirmation of their own attitudes and beliefs.
Khalil et al. (16), Saudi Arabia	Qualitative study	60 medical students	24 males: 36 females	The study aimed to explore undergraduate medical students' perceptions regarding the effectiveness of synchronised online learning at Unaizah College of Medicine and Medical Sciences, Qassim University, Saudi Arabia.	2 months	Discussion guide, which consists of seven open-ended questions.	Synchronised online learning was well-received by the medical students. At the same time, some challenges for our study participants included technical issues, individual behavioural characteristics, institutional methodology barriers, and the absence of non-verbal clues. Moreover, preclinical students were more likely to opt for online lectures as their preference for the next academic year compared to clinical students.	The study found high satisfaction with synchronised online learning among preclinical students but identified challenges like technical issues and lack of non-verbal communication. It highlighted the need for a balanced approach integrating online and traditional methods in medical education.	The findings of this study cannot be generalised because it was conducted in only one medical school. Besides, to ensure the effectiveness of online learning modules for undergraduate medical students, the principles of online learning model and learning outcomes should be rigorously and regularly evaluated.
Ibrahim et al. (14), Saudi Arabia	Cross-sectional study	340 medical students	123 males: 217 females	To examine the impact of online teaching methods used to teach medical students through digital sources.	Not specified	No intervention per se, as this was a survey-based observational study.	Most participants of the study mentioned that e-learning is a significant approach as it is a comparatively less time-consuming technique than class-based learning. Efficient teaching skills and instructional guiding capabilities among educators are determined as an essential component within the learning management system. Based on participants' responses, it is evident that the clinical learning process is comparatively challenging as assessments during semesters might be adversely affected due to technological barriers, i.e., low internet quality, etc.	The findings included students' acceptance and perceptions of e-learning, preferred Learning Management Systems (LMS), and challenges/ barriers to online education.	The sample size is too small, which often lead to less precise estimates of the population parameters.

Quality Evaluation

All four studies included in this review were either cross-sectional or qualitative in design, with methodologies that varied in their approaches to data collection and analysis. Each study employed rigorous methods, including detailed interviews and focus groups, to ensure comprehensive data coverage. The quality evaluation found that the studies employed different approaches, such as online surveys and face-to-face interviews, to gather comprehensive data. However, they did not always provide information on the handling of missing data or adherence to specific analytical principles. Despite this, the studies collectively provide valuable insights into the effectiveness and challenges of e-learning in medical education. Although none of the studies utilised randomisation or blinding, they provided thorough descriptions of the participant recruitment and data collection processes. The risk of bias was evaluated using the Cochrane Risk of Bias 2 (RoB2) tool, with the majority of studies showing concerns due to potential biases in participant selection and data interpretation. Nonetheless, the studies were transparent regarding their methods and limitations, and no evidence of selective reporting was identified. Overall, the quality of the studies was considered acceptable for providing insights into the effects of mindfulness-based interventions on medical students, contributing to a reliable synthesis of their impact on well-being and educational outcomes.

DISCUSSION

This systematic review investigated the issue of maintaining social relationships during the transition to e-learning in medical education, especially under the unique constraints imposed by the COVID-19 pandemic. The findings show both the advantages and disadvantages inherent in this transition, and they emphasise the critical balance that is necessary to achieve between academic responsibilities and social well-being. Sindiani et al. (12) studied the effects of distance education on social coordination among medical students at the Jordan University of Science and Technology. They found that maintaining social connections was challenging due to the shift to online platforms, with students reporting a lack of effective interactions with peers and instructors. This observation is consistent with the one made by Donelan and Kear (13), who found that virtual learning environments were less conducive to social engagement compared to physical classrooms. Traditional teaching methods provided better opportunities for interaction, discussion and relationship building between students and educators, which was crucial for effective learning.

Ibrahim et al. (14) examined the acceptance and efficacy of e-learning among medical students at King Abdulaziz University in Saudi Arabia. They reported that while e-learning was seen as a less time-consuming and efficient method, it faced significant technological barriers, which affected clinical learning and assessment. These results align with those of Hayat et al. (15), who found similar challenges, including limited social interactions and digital infrastructure issues, during e-learning. Traditional classroom settings have been noted for their superior ability to facilitate direct communication, feedback, and engaging learning environments.

Khalil et al. (16) explored the perspectives of medical students in Saudi Arabia regarding the sudden transition to online learning. The study found that while online learning offered flexibility and convenience, it also created behavioural challenges and reduced social engagement. These findings are supported by Konukman et al. (17), who reported that face-to-face learning provided better opportunities for student engagement and

social coordination. Group-based activities and direct interactions in physical classrooms significantly contributed to maintaining high levels of student involvement and effective learning.

For medical students, the benefits of maintaining social relationships extend beyond mere companionship; they play a vital role in enhancing psychological resilience and academic performance. The reviewed studies show that social connections foster a sense of belonging and emotional support, which can protect against the negative impacts of stress and anxiety commonly faced by medical students. For instance, social interactions can lead to improved motivation, higher levels of engagement and better coping mechanisms in response to academic pressure, thereby enhancing both mental health and academic outcomes. Moreover, collaborative learning, which is facilitated by these relationships, promotes a deeper understanding of course material. Engaging peers in group discussions allows for the exchange of diverse perspectives, ultimately enriching the learning experience (2). Another notable advantage identified is the positive correlation between an active social life and academic performance. Students who allocate time to socialisation report better focus and commitment to their studies, which is essential in a demanding field such as medicine. Additionally, the findings suggest that active participation in social contexts, such as student organisations or study groups, can cultivate essential soft skills, including communication, teamwork and empathy, which are crucial attributes for medical professionals. The importance of maintaining these connections is magnified during times of crisis when shared experiences and mutual support systems become critical lifelines.

The transition to e-learning also poses significant challenges, which can hinder both academic and social development. A prevalent theme in the studies is the difficulty of maintaining meaningful social connections in predominantly digital environments. The shift from in-person interactions to online platforms can lead to feelings of isolation among students, as virtual learning often lacks the spontaneous interactions that naturally occur in traditional settings. This isolation can exacerbate feelings of loneliness, decrease mental well-being and hinder the development of supportive peer networks.

Technological barriers, including poor internet connectivity and the lack of familiarity with digital tools, create additional hurdles for students trying to engage with their peers and instructors. These hurdles can lead to miscommunication, reduced participation in class discussions, and overall dissatisfaction with the learning experience. The qualitative nature of some studies reveals that many students felt overwhelmed by the lack of structured engagement opportunities; this underscores the importance of traditional face-to-face interactions, which foster deeper connections. Furthermore, the rapid transition to e-learning altered instructional preferences and sparked a shift in the dynamics of classroom interactions. Students reported that they felt less inclined to actively participate in online discussions compared to in-person classes, where body language and immediate feedback played a significant role in communication (2, 4). This dramatic change can result in disengagement and an overall reduction in academic motivation.

The findings of this systematic review indicate an urgent need for educational institutions to develop strategies that enhance social interaction in online learning environments. Several approaches could be considered, such as implementing hybrid learning models that combine the flexibility of online education with the benefits of face-to-face interactions, including regular in-person classes and social events tailored to foster relationships among students. Additionally, creating structured virtual interactions through dedicated platforms for virtual study groups, peer-mentoring programmes and interactive webinars can encourage active participation and engagement. To facilitate these interactions, it is essential to enhance

faculty training regarding how to effectively conduct online discussions, address technical barriers, and ensure that all students feel empowered to participate fully. Moreover, leveraging digital tools that simulate a classroom environment, such as breakout rooms for small-group discussions and collaborative projects, can significantly enhance the online learning experience.

In summary, the reviewed studies underscore the multifaceted nature of e-learning in medical education. While online platforms provide flexibility and accessibility, they fall short when it comes to replicating the social interactions and engagement achieved in traditional classroom settings. The shift to digital learning has introduced challenges related to maintaining social connections and effective communication, which are essential for comprehensive medical education.

CONCLUSION

In conclusion, this review highlights the key challenges and benefits of maintaining social relationships and effective learning for medical students during the shift to online education during the COVID-19 pandemic. Significant issues, such as technological barriers and limited familiarity with digital tools, have been observed to impact students' engagement and learning effectiveness. Although online platforms provide flexibility, their potential to match the social interaction and engagement levels of traditional face-to-face learning remains limited. Addressing these limitations through structured virtual meetings and enhanced digital training will help improve interaction, communication, and practical learning experiences in virtual environments. Standardising digital tools and expanding support will refine e-learning strategies and enhance the effectiveness of remote education in medical students. Integrating these findings into educational practices will better support students and improve their online learning experience.

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REFERENCES

1. Harris MA, Orth U. The link between self-esteem and social relationships: a meta-analysis of longitudinal studies. J Pers Soc Psychol. 2020;119(6):1459–77. https://doi.org/10.1037/pspp0000265

2. Wu J, Liu Z, Hu X, Lou H, Kueh YC, Kuan G. Anxiety, depression and stress impact of the COVID-19 pandemic and physical activities: systematic review and future. Malays J Med Health. 2024;20(3):286–97. https://doi.org/10.47836/mjmhs.20.3.39

3. Chin RWA, Chua YY, Chu MN, Mahadi NF, Yusoff MSB, Wong MS, et al. Prevalence of burnout among Universiti Sains Malaysia medical students. Educ Med J. 2016;8(3):61–74. https://doi.org/10.5959/eimj.v8i3.454

4. Simons-Morton BG, Crump AD, Haynie DL, Saylor KE. Student–school bonding and adolescent problem behavior. Health Educ Res. 1999;14(1):99–107. https://doi.org/10.1093/her/14.1.99

5. Janssen I, Carson V, Lee I-M, Katzmarzyk PT, Blair SN. Years of life gained due to leisure-time physical activity in the U.S. Am J Prev Med. 2013;44(1):23–9. https://doi.org/10.1016/j.amepre.2012.09.056

6. Hadyaoui A, Cheniti-Belcadhi L. Ontology-based group assessment analytics framework for performances prediction in project-based collaborative learning. Smart Learn Environ. 2023;10(1):43. https://doi.org/10.1186/s40561-023-00262-w

7. Esra M, Sevilen Ç. Factors influencing EFL students' motivation in online learning: a qualitative case study. J Educ Technol Online Learn. 2021;4(1):11–22.

8. Oberle E, Gist A, Cooray MS, Pinto JBR. Do students notice stress in teachers? Associations between classroom teacher burnout and students' perceptions of teacher social–emotional competence. Psychol Sch. 2020;57(11):1741–56. https://doi.org/10.1002/pits.22432

9. Kashan K, Dahar MA, Parveen Q. Impact of teachers' attitude on self-esteem of undergraduate students. Russ Law J. 2023;XI(3):3236–46.

10. 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 programme for undergraduate medical students. BMC Med Educ. 2022;22:1–12. https://doi.org/10.1186/s12909-021-03037-4

11. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. Syst Rev. 2016;5(1):210. https://doi.org/10.1186/s13643-016-0384-4

12. Sindiani AM, Obeidat N, Alshdaifat E, Elsalem L, Alwani MM, Rawashdeh H, et al. Distance education during the COVID-19 outbreak: a cross-sectional study among medical students in North of Jordan. Ann Med Surg. 2020;59:186–94. https://doi.org/10.1016/j.amsu.2020.09.036

13. Donelan H, Kear K. Online group projects in higher education: persistent challenges and implications for practice. J Comput High Educ. 2024;36(2):435–68. https://doi.org/10.1007/s12528-023-09360-7

14. Ibrahim NK, Al Raddadi R, AlDarmasi M, Al Ghamdi A, Gaddoury M, AlBar HM, et al. Medical students' acceptance and perceptions of e-learning during the COVID-19 closure time in King Abdulaziz University, Jeddah. J Infect Public Health. 2021;14(1):17–23. https://doi.org/10.1016/j.jiph.2020.11.007

15. Hayat AA, Keshavarzi MH, Zare S, Bazrafcan L, Rezaee R, Faghihi SA, et al. Challenges and opportunities from the COVID-19 pandemic in medical education: a qualitative study. BMC Med Educ. 2021;21(1):247. https://doi.org/10.1186/s12909-021-02682-z

16. Khalil R, Mansour AE, Fadda WA, Almisnid K, Aldamegh M, Al-Nafeesah A, et al. The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: a qualitative study exploring medical students' perspectives. BMC Med Educ. 2020;20:285. https://doi.org/10.1186/s12909-020-02208-z

17. Konukman F, Filiz B, Moghimehfar F, Maghanoy MA, Graber K, Richards KA, et al. Exploring physical education teachers' intention and perceived constraints in offering online lessons using the theory of planned behavior: a multi-country analysis. Behav Sci. 2024;14(4):305. https://doi.org/10.3390/bs14040305