Student Perceptions of Online Learning in Physiotherapy

Denis Arsovski [1 (A,B,C,D,E)], **Natasha Chichevska Jovanova** [2 (B,D,F)]

[1] University St. Kliment Ohridski Bitola, Higher Medical School Bitola, Department of Physiotherapy, Bitola, North Macedonia
[2] University Ss. Cyril and Methodius Skopje, Faculty of Philosophy, Institute of Special Education and Rehabilitation, Skopje, North Macedonia

Keywords
physiotherapy education, physical therapy modalities, rehabilitation, blended learning, clinical competence

Abstract
Introduction: The COVID-19 pandemic increased the scope for online lessons in physiotherapy, a profession with hands-on practice and direct interaction. While digital platforms provide accessibility and flexibility, they also introduce some challenges, affecting the quality of education.
Objectives: The aim of this study is to investigate the perceptions of physiotherapy students for online learning, with focus on its advantages, challenges and preferred future directions in the education of physiotherapy students.
Methods: In the present study, 122 physiotherapy students from educational institutions in North Macedonia and Bulgaria were included in this research. Data were collected via an online questionnaire that allows to assess demographics, the perceived benefits, challenges and preferences regarding blended learning. Quantitative data were analysed with descriptive statistics, chi-square tests and analysis of variance with post-hoc comparisons. Qualitative responses showed further information about the experience of the students with online learning.
Results: Students showed a preference for blended learning models with combination of online and in-person education. Online learning was valued for its flexibility and accessibility, but the challenges such as limited personal training, technical difficulties and reduced teacher-student interaction were noted. Satisfaction levels varied across academic years ($p<0.001$) with younger students reporting higher satisfaction than advanced students, who required more practical training. Key barriers were insufficient digital tools and digital literacy.
Conclusion: While online learning improves accessibility, it must be integrated with in-person training for competency in clinical skills. Future research should be focused on digital literacy, technical support and interactive content for optimising blended education in physiotherapy.

INTRODUCTION

The appearance of digital technologies transformed the environment of higher education, and online learning is starting to become an important module of instruction in various disciplines[1]. In physiotherapy, a discipline dependent on manual and in-person practices, the transformation to online learning showed many opportunities and challenges[2]. The COVID-19 pandemic increased the usage of online learning tools, obligating institutions to innovate and review education in physiotherapy[3].

Online learning in physiotherapy programmes utilises various digital platforms (learning management systems, video conferencing, virtual simulations and interactive modules) for many subjects, starting from anatomy to kinesiology and kinesiotherapy[4]. These digital tools offer many benefits for physiotherapy students – increased accessibility, flexibility in learning schedules as well as the possibility to reach a wider audience and shed new perspectives regarding their professional subjects[5]. Students can learn at their own speed, record lectures multiple times and access resources that may not be available in the case of in-person education[6]. This flexibility is beneficial for students who are balancing their education with other responsibilities such as work or family obligations. This kind of education is advantageous for students who do not attend classes regularly, especially those part-time, persistent in many countries[7].

Despite these benefits, the transformation to online learning in physiotherapy has not been without some disadvantages[8]. One of the primary concerns is the lack of personal, hands-on training, which is very

The individual division of this paper was as follows: A – research work project; B – data collection; C – statistical analysis; D – data interpretation; E – manuscript compilation; F – publication search

Article received: 8 Mar. 2024 / accepted: 6 Jun. 2025

Please cite as: Arsovski D., Chichevska Jovanova N. Student Perceptions of Online Learning in Physiotherapy. Med Rehabil 2025; 29 (1): 33-41. DOI: 10.5604/01.3001.0055.2081

Internet version (original): www.rehmed.pl

important with regard to obtaining practical skills - for example, the subject of medical massage could not be successfully implemented through digital online learning tools or any other manual techniques and physical examination[9]. Also, the students may face challenges concerning the quality and consistency of Internet access, technical Internet issues and the absence of feedback as well as support from instructors and teachers[10].

The effects of online learning in physiotherapy are also influenced by levels of motivation perceived by the students, which can be further affected by the newly implemented digital format[11]. The lack of personal interaction and the potential for distractions at home may result in feelings of isolation and reduced motivation among the students[12]. Also, the success of online learning depends on the design and implementation of the digital curriculum of the physiotherapy subjects. Interactive elements such as virtual simulations and collaboration among students, or students and teachers, are important for maintaining student participation and showing understanding with reference to the complex concepts of physiotherapy practices[13].

As the role of online learning in physiotherapy education continues to develop, it is very important to explore the perceptions of students on understanding the impact on their learning experiences[14]. Showing the benefits and challenges of online learning, educators and teachers can find areas for improvement and develop different strategies within the educational results among physiotherapy students[15]. Understanding these perceptions will provide information about the future direction of physiotherapy education, as institutions seek to combine online and in-person education for creating an effective learning environment[16].

This research of student perceptions is significant as the field of physiotherapy education is a model subjected to fast-changing conditions. As teachers and institutions rely on the lessons learned from the rapid alterations to online learning, there is an opportunity to review the future of physiotherapy education in a way accepting of technological advancements while maintaining important elements of personal training and interpersonal communication among students[17, 18]. This balance will be important for preparing the next generation of physiotherapists to meet the recommendations and guidelines of healthcare practice in a digital era[19].

The integration of educational theories offers a deeper understanding concerning the pedagogical implications of online learning in physiotherapy[20]. The Experiential learning theory is focused on the role of active, hands-on arrangement in skill acquisition accenting a limitation of purely online formats[21]. Meanwhile, blended learning theory and constructivist approaches support the combination of digital and face-to-face methods to improve understanding, engagement and clinical competence[22]. Additionally, Vygotsky's social constructivism defines learning as a socially mediated process, reliant on interaction and guided participation, both of which are limited in online environments[23]. Kolb's experiential learning theory also demonstrates the need for active experimentation and concrete experience, which are important in the development of clinical skills and difficult to replicate in virtual environments[24].

OBJECTIVES

The primary objective of this research is to explore the perceptions of physiotherapy students regarding online learning, with a focus on its benefits, challenges and potential improvements for future physiotherapy education. Given the hands-on nature of the profession, the aim of this study is to assess how digital learning influences the theoretical understanding of the students and the development of their practical skills.

METHODOLOGY

The aim of this study is to explore the perceptions of physiotherapy students regarding online learning, focusing on its benefits, barriers and potential future directions in the education of physiotherapy students. The research was conducted in Bitola, North Macedonia and combined quantitative and qualitative analysis for understanding the experiences and preferences of students.

Research design

The research design is a cross-sectional survey for collecting data from physiotherapy students across different academic years. The study aimed to represent information regarding the experience and perceptions of the students with reference to online learning, which became more frequent during and after the COVID-19 pandemic.

Study setting

This research was conducted at educational institutions in North Macedonia and Bulgaria, with participants from different academic years and programmes. The research took place at institutions that offer undergraduate and graduate programmes in physiotherapy and kinesiotherapy, where students have experience with online and in-person learning. The study setting was focused on online learning environments among physiotherapy students, which consisted of learning management systems, video conferencing platforms (Zoom and Google Meet) and virtual simulations. These platforms served as the primary medium for online physiotherapy education, allowing students to recruit with theoretical content, record lectures and take advantage of interactive learning modules. The research was conducted via an online survey, accessing students from different locations and at varying academic levels. The blended learning perspective within these institutions showed a framework for evaluating the integration of digital education in physiotherapy, focusing on the benefits and limitations experienced by students. Although participants were drawn from both North Macedonia and Bulgaria, the research did not include comparative statistical analy-

ses between countries. The aim was to identify general perceptions across different educational environments rather than perform cross-national evaluations.

Participants

The study participants comprised active students of physiotherapy in a variety of programmes and at different educational institutions. A convenient sample was used with students from different academic years, from the first to third year of physiotherapy education in North Macedonia, the second cycle of physiotherapy, which is one year and a small number of kinesiotherapy students from North Macedonia studying in Bulgaria. The sample size of participants in this study totals 122 students, and with this number, we provided multiple demographic physiotherapy profiles of the students. The participants were recruited from various physiotherapy education programmes in North Macedonia and Bulgaria, including both undergraduate and graduate programmes at public universities and higher vocational medical schools. This inclusion of different countries and institutional types defined a broader perspective on student experiences, although it also introduced variability in an educational context.

The inclusion criteria for participants were being active physiotherapy students in physiotherapy programmes in North Macedonia and kinesiotherapy programmes in Bulgaria, students from the first, second or third year of study, having experience with online learning and access to online learning platforms as well as digital tools. The exclusion criteria were being students not currently in physiotherapy study programmes, not having experience in online learning, incomplete responses to the questionnaire, undergoing other healthcare studies than physiotherapy and no Internet access or familiarity with digital learning tools. The data regarding Internet accessibility among students living in dormitories was interesting – there is no Internet access for most of the day.

Interventions

This research did not involve a direct intervention in a traditional experimental sense. The experiences of students were assessed within various online learning interventions used in physiotherapy education during the COVID-19 pandemic and beyond. The primary intervention studied was online learning in physiotherapy programmes, which included digital learning platforms (Moodle, Google Classroom or any specific platforms imposed by the universities for course materials, assignments and quizzes) and video-based instructions (e.g. Zoom, Google Meet and Microsoft Teams for theoretical knowledge). The mixed methods of online theoretical experience and limited in-person practical training where allowed by institutional policies was also evaluated. These educational interventions were analysed through the perceptions of the students, with focus on their effectiveness in providing theoretical knowledge and their limitations in practical skill development. In the research, variables are not manipulated but rather examined as to how online education methods influence the learning experiences of the physiotherapy students.

Outcome measures

The primary outcome measures in this research were focused on the perceptions of the students with regard to online learning, assessing the impact on theoretical knowledge, practical skills and general satisfaction. The outcomes were measured using quantitative and qualitative approaches through an online survey. For the primary outcome measures, we assessed satisfaction of the students with online learning via the Likert scale. Further evaluated were the perceived impact on the theoretical knowledge for understanding the core physiotherapy subjects such as anatomy, kinesiology and rehabilitation through the online platforms and perceived impact on the development of practical skills through the responses of the students on the effects of online learning in some physiotherapy techniques, i.e. massage, kinesiotherapy and electrotherapy.

For the secondary outcome measures, the challenges in online learning were assessed considering the challenges reported by the students, such as technical issues, lack of interaction and limited practice of professional subjects, preferences for blended learning models regarding their ideal balance between online and in-person education as well as differences in perceptions across the academic years. Analysis of variance and chi-square tests were carried out for assessing whether students in different academic years demonstrated different levels of satisfaction.

Instrument used in research for data collection

Data were collected using an online questionnaire. The questionnaire was distributed via e-mail and online learning platforms. It consisted of closed- and open-ended questions to assess quantitative data for statistical analysis and qualitative responses to obtain richer information about the students' experiences. The questionnaire was structured into several sections, starting from demographics (age, gender, academic year of the students included in this research), types of used digital platforms, frequency of usage and levels of satisfaction, questions about the benefits, challenges and impact on theoretical knowledge and practical skills as well as questions about the ideal balance between online and in-person components, with desire for integration of online learning in the future. The questionnaire was distributed to students across different institutions, including public universities and higher medical schools in North Macedonia and Bulgaria. While this enabled the range of responses to be varied, it also introduced institutional variability that was not separately analysed, which may have influenced interpretation of the findings. The questionnaire allowed to collect information on the types of digital tools and platforms used by students during online learning, however, this information was not stratified by country, and the

potential differences between platforms or e-learning strategies implemented in North Macedonia versus Bulgaria were not analysed separately in this study.

Statistical analysis

The statistical analysis was structured to evaluate the perceptions of physiotherapy students on online learning, with focus on satisfaction levels, the perceived impact on theoretical understanding and practical skills as well as preferences for future integration of blended learning. Descriptive statistics were applied to analyse demographic characteristics and general questionnaire responses.

Inferential statistics were used to evaluate relationships using chi-square tests, especially for satisfaction levels, practical skill development and preferences for blended learning. Analysis of variance was implemented for mean satisfaction levels were compared across academic years, followed by Tukey's post-hoc tests to identify differences within the group. Prior to conducting analysis of variance, assumption testing was performed to validate the use of parametric analysis. The Shapiro-Wilk test was utilised to assess normality of distribution concerning satisfaction scores within each academic group and non-significant results were shown ($p>0.05$), demonstrating that the data did not differ from normality. Levene's test was applied to check for homogeneity of variance and also returned non-significant results ($p>0.05$), supporting the assumption of equal variances across the groups. These results justified the application of analysis of variance for comparing satisfaction levels across academic years. In addition to *p*-values, effect sizes were calculated to evaluate the practical importance of the results. Eta-squared (η^2) was reported for the results of analysis of variance. The Mann-Whitney U test was included to assess differences in the frequency of technical issues between two groups. Visual representations were used to present results and improve the clarity. Analysis of variance was chosen for group comparisons of normally distributed variables, while the Mann-Whitney test was used for non-normally distributed data, where parametric assumptions could not be assumed.

RESULTS

In Table 1, the age distribution of the participants (n=122) is shown. The majority of students (60.66%) were within the 18-25-year-old age group, followed by 29.51% within the 26-30 group and 9.84% within the 31-35 age group. The mean age of participants was 24.55 years, with a standard deviation of 9.66 years, indicating some variability in distribution regarding the age of participants.

Gender distribution of the participants (n=122) is demonstrated in Table 2. The majority of students (80.33%) were male, while 19.67% were female. This distribution shows higher enrolment of male students in physiotherapy compared to female students.

Table 1

Age demographics

Age range	Participants	%
18-25 years	74	60.66
26-30 years	36	29.51
31-35 years	12	9.84
Total	122	100

Table 2

Gender demographics

Gender	Participants	%
Male	98	80.33
Female	24	19.67

Figure 1 allows to visualise the relationship between student satisfaction levels and online learning, and their impact on theoretical concepts in physiotherapy education. The chi-square test indicated a statistically significant relationship, showing that students who reported higher satisfaction also perceived greater improvements in their theoretical understanding. The results showed clear variability across satisfaction levels. Students who felt engaged and well-supported in online learning reported positive learning outcomes, whereas dissatisfied students were more likely to report a decline in their theoretical understanding. Lower satisfaction appears to be connected with limited interaction, technical difficulties and inadequately structured online resources.

Mean satisfaction levels, the number of participants and standard deviations for different academic years are presented in Table 3. The results for analysis of variance ($F(3, 86) = 30.08$, $p<0.001$) showed a statistically significant difference in satisfaction levels among students at different stages of study. First-year students reported the highest satisfaction (M=8.8, *SD*=2.36), likely due to the adaptability of general theoretical subjects (anatomy, physiology, medical sociology) to online formats. Second-year students (M=7.6, *SD*=1.52) still exhibited relatively high satisfaction but slightly lower than first-year students. Third-year students demonstrated the lowest satisfaction (M=2.2, *SD*=1.21), possibly due to the increasing need for personal clinical training which cannot be replaced by online learning. Graduate students (M=5.8, *SD*=3.33) reported moderate satisfaction, as their coursework involves a mix of theoretical and advanced practical training, requiring more in-person instruction. While early-stage students benefit from online learning, advanced students require more practical education, which online formats

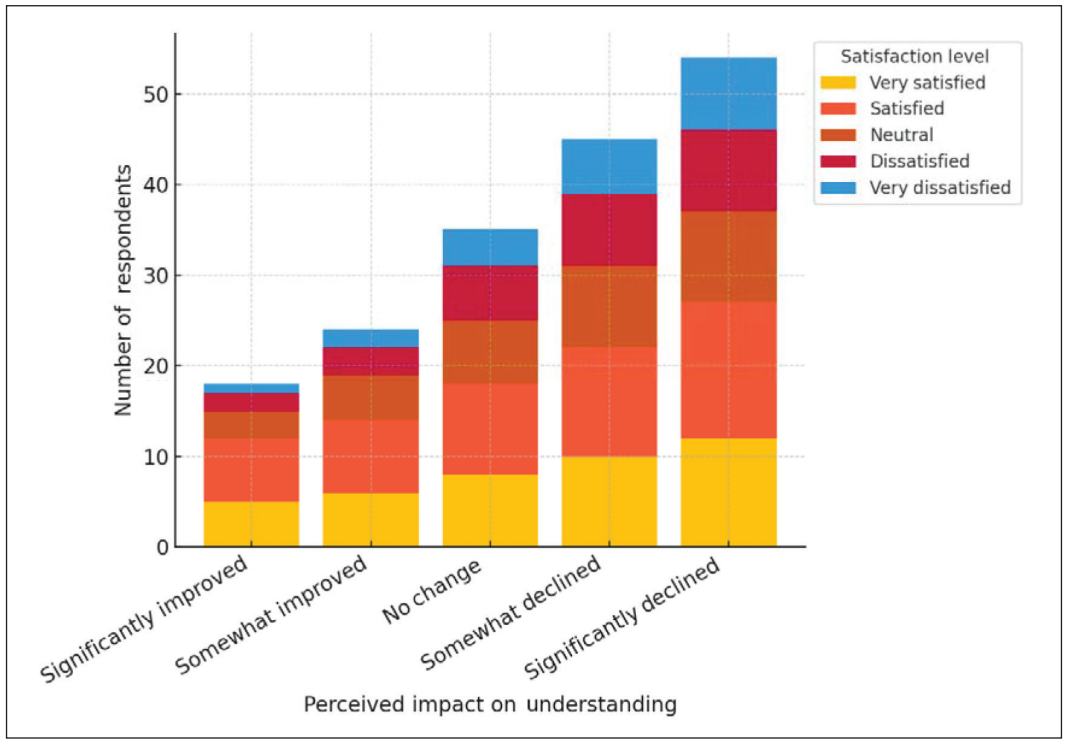

Figure 1

Relationship between student satisfaction levels and impact on theoretical concepts in education of physiotherapists.

Table 3

Analysis of variance – satisfaction levels with online learning by year of study			
Academic year	**Mean satisfaction level**	**Participants**	**Standard deviation**
1st year	8.8	25	2.36
2nd year	7.6	30	1.52
3rd year	2.2	15	1.21
Graduate student	5.8	20	3.33

Table 4

Tukey's post hoc test					
Comparison of groups	**Mean difference**	**Adjusted *p*-value**	**95% CI lower**	**95% CI upper**	**Statistical significance ($p<0.05$)**
First year versus second year	-1.2	0.2054	-2.79	0.39	No
First year versus third year	-6.6	0.0000	-8.52	-4.68	Yes
First year versus graduate students	-3.0	0.0001	-4.76	-1.24	Yes
Second year versus third year	-5.4	0.0000	-7.26	-3.54	Yes
Second year versus graduate students	-1.8	0.0332	-3.50	-0.10	Yes
Third year versus graduate students	3.6	0.0001	1.59	5.61	Yes

cannot effectively provide. The effect size for this analysis, calculated as eta-squared (η^2), was 0.512, indicating large practical significance of academic year on satisfaction with online learning.

In Table 4, the results of Tukey's test are shown. It was conducted to examine differences in satisfaction levels among students across academic years. First-year students reported higher satisfaction compared to third-year students (M=-6.6, $p<0.001$) and graduate students (M=-3.0, $p<0.001$). Second-year students also stated higher satisfaction levels than third-year (M=-5.4, $p<0.001$) and graduate students (M=-1.8, $p=0.0332$). The latter postulated higher satisfaction than third-year students (M=3.6, $p<0.001$). No significant differences were observed between first- and second-year students ($p=0.2054$). The results from the table allowed to indicate that satisfaction with online learning tends to decline as students progress in higher years through

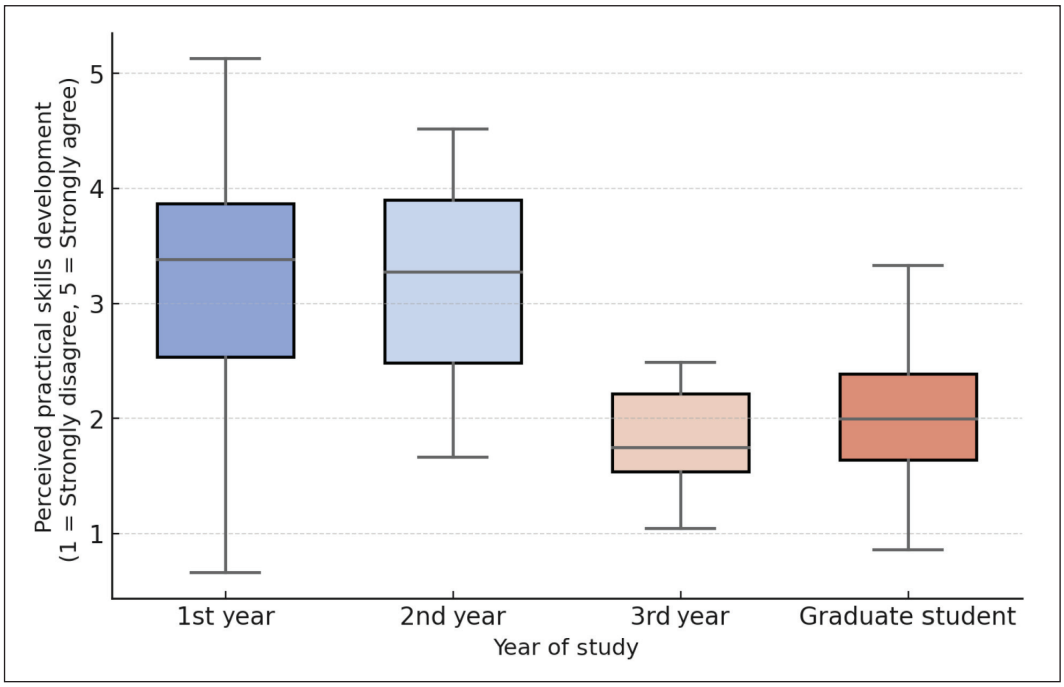

Figure 2

Development of practical skills by year of physiotherapy study.

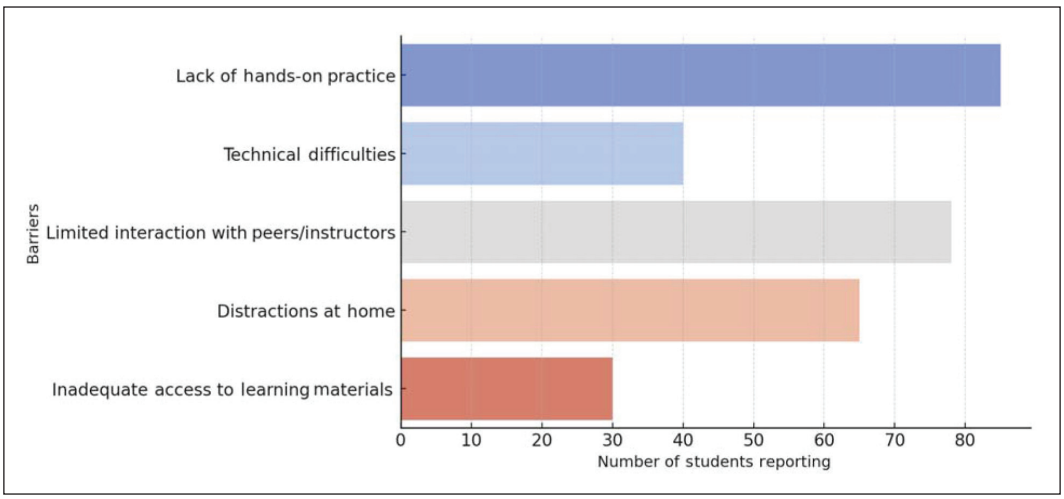

Figure 3

Types of barriers in online physiotherapy education.

their education. While early-year students benefit from the flexibility of online education in theoretical courses, more advanced students, especially those in third year and graduate programmes, require practical, hands-on training, which online formats cannot successfully provide. The gradual decline in satisfaction suggests the need for blended learning models that implement online education and in-person practice.

The perceived impact of online learning on the practical skills across different academic years in physiotherapy education is shown in Figure 2. The results demonstrate a variation in student responses based on year of study. First- and second-year students exhibited a wider range of opinions, with a higher median score, indicating a more positive perception regarding the role of online in skill development. In contrast, third-year and graduate students report consistently low answers, as shown by their compressed interquartile range and lower median scores. Generally, advanced students strongly disagree that online learning supports the development of practical skills, likely due to the increasing need for hands-on clinical experience in later years.

In Figure 3, the frequency is visualised of reported barriers to online learning among the students. The data shows that a lack of hands-on practice and limited interaction with teachers as well as instructors are among the most frequently posed challenges, while technical difficulties and inadequate access to learning materials were reported less often.

The frequency of technical disruptions by physiotherapy students at different academic levels is presented in Figure 4. The results show that early-year students reported more

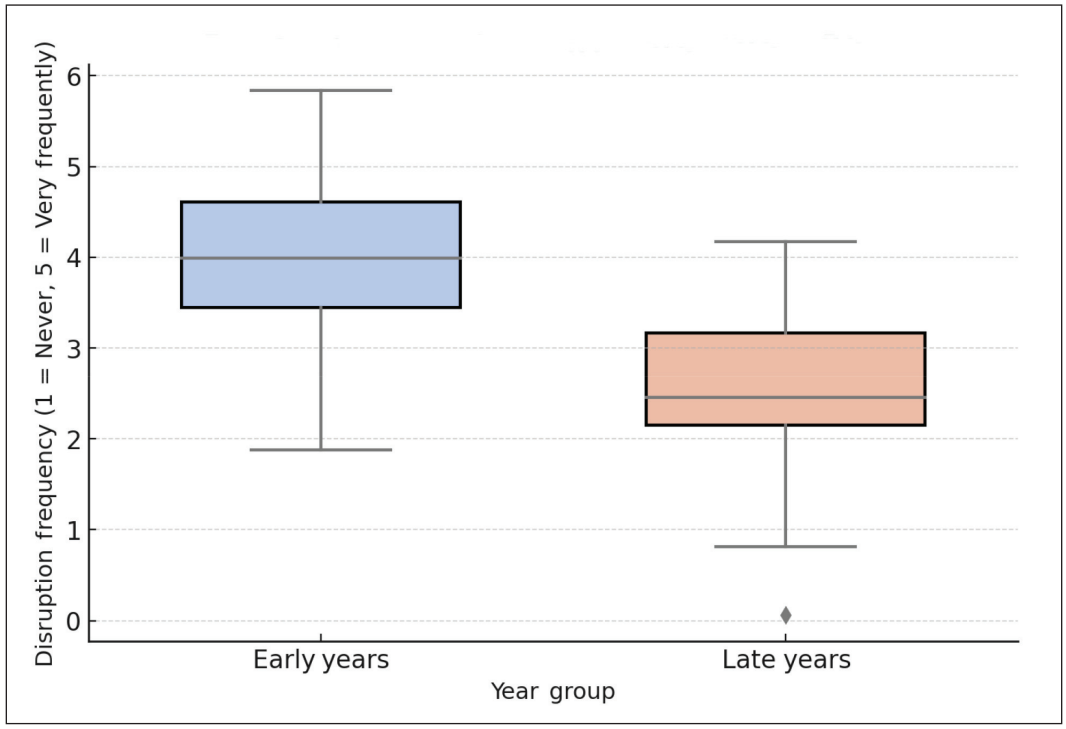

Figure 4

Technical issues by year of education.

frequent technical issues, as indicated by the higher median value and wider range extending towards more frequent disruptions and late-year students reported fewer technical issues, with a lower median and some reporting no disruptions at all. These results suggest that students in early education may have issues with online learning technologies, while those in later years have presumably adapted to digital platforms more efficiently. This accents the need for improved technical support and training for younger students to better their learning experience.

DISCUSSION

In the present study, information is given on physiotherapy learning perceptions for online education, with focus on its benefits and challenges within the context of a traditional form of physiotherapy education. The results show the complexities for integrating digital learning models into physiotherapy education and allow to suggest directions for future educational strategies.

In a certain study, the perspectives of physiotherapy students for online e-learning are explored within the interdisciplinary management of chronic health conditions. Assuming a qualitative approach, in was found in this research that students favour a blended learning format that combines online e-learning with the traditional style of physiotherapy education. The primary advantages of online learning mentioned by students were the flexibility to learn at their own speed and access to universal, evidence-based information. However, students also expressed a strong preference for face-to-face education, focusing on the value of feedback and clarification regarding the subject's issues, which is often lacking in online education forms. In the discussed study, some challenges were also identified, especially in the practical application of physiotherapy and the development of physiotherapy plans for chronic conditions[25]. When compared to our quantitative assessment, some similarities and differences became visible. Both studies are focused on the importance of blended learning models that combine online and in-person learning. In our study, a significant number of participants across different years expressed a preference for a balanced mix of online and in-person learning.

In a different study, information was given on the experiences and perspectives of physiotherapy teachers regarding online learning during the COVID-19 pandemic in India. In this research, it was shown that the rapid transition to online learning was a challenge for many teachers, with a general lack of preparedness and digital literacy among different faculties providing education in the area of physiotherapy. Despite the increased use of software and e-learning tools, challenges were noted in the training of teachers on how to use online technologies effectively. Teachers reported problems with the shift from traditional teaching to virtual platforms (Google Meet, Zoom etc.), focusing the need to improve educational technology[26].

In yet another study, the perceptions of postgraduate students and Ph.D. candidates of online learning platforms were examined, assessing the following factors: educational system and information quality, ease of use and usefulness of online platforms. In this research, it was found that while educational system quality and ease of use positively correlate with satisfaction related to on-

line learning, information quality did not impact student perceptions. These results allow to show that although the quality of the content is important, the structure of online learning platforms plays an important role in physiotherapy students' experiences and satisfaction[27]. Comparing these results to those achieved in our research, it can be observed that both studies are focused on the importance of a well-structured and online learning environment being easy to use.

The research conducted by Waghumbare and Ganvir (2021) allowed to reveal that students in physiotherapy programmes find traditional, in-person classes to be more effective and productive compared to virtual learning. While online classes provide opportunities for improving communication skills and offer accessibility, they also present challenges, such as technophobia, reduced engagement and limited hands-on training. Our results demonstrated that while online learning is valued for its flexibility, students prefer blended learning models that integrate in-person, practical training. Advanced students, whose education requires more hands-on experience, reported lower satisfaction with online learning in our research[28].

Although data on the types of applied e-learning platforms were collected, in the present analysis, we did not explore whether these platforms influenced satisfaction levels. Differences between students from North Macedonia and Bulgaria were not analysed separately. These comparative analyses could reveal important information as to how platform design and national education policies affect learning satisfaction, and these issues should be addressed in future research.

Limitations

This research has several challenges that should be considered when interpreting its results. First, the relatively small sample size (N=122) limits generalisability of the results to all physiotherapy students across different educational institutions. Second of all, the reliance on self-reported data introduces the possibility of response bias, as participants may either overestimate or underestimate their experiences and perceptions of online learning. The cross-sectional design allows to demonstrate the perspectives of the student at a single point in time, making it difficult to assess changes in attitudes and experiences over time. Differences in digital literacy, institutional infrastructure and online learning resources between North Macedonia and Bulgaria may have also had influence on the results, making it challenging to draw universal conclusions. Furthermore, objective learning outcomes were not measured in the study, but focus was rather on subjective experiences, which may not fully reflect the effects of online learning in the education of the physiotherapists. One methodological limitation is the lack of stratification and comparison between students from North Macedonia and Bulgaria. Differences in curriculum design, balance between theoretical and practical instruction, institutional policies for e-learning content creation and the types of platforms used may have affected student experiences. Future studies should be conducted for comparison of these variables across countries to better understand their effect on student satisfaction with online learning. Also, the use of convenience sampling and the absence of previously validated survey instruments may limit both the generalisability and the internal validity of the results. The aim of future studies should be to use randomised sampling methods and standardised tools to improve methodological robustness. Additionally, in the current study, responses were not stratified according to country or institution type. Differences in national education systems, institutional structures and access to technology across North Macedonia and Bulgaria could influence the experience of the students with online learning. In future research, these contextual factors should be examined separately to provide more targeted conclusions.

CONCLUSION

In this study, the perspective is presented regarding experiences of physiotherapy students with online learning, focusing on its opportunities and challenges. While online education shows flexibility, accessibility and learning advantages, it remains insufficient as a method for such a hands-on discipline as physiotherapy. The results allowed to indicate that younger students reported higher satisfaction with online learning, likely due to the alignment of their early-stage theoretical coursework with digital formats. A major challenge is practical training, which cannot be fully demonstrated through current digital platforms. The decline in satisfaction across academic years shows the need for a structured, blended learning model, implementing theoretical online instruction with hands-on, in-person training. For better future improvements, educational institutions must invest in enhancing the digital literacy of the students and access to interactive learning technologies. While teacher preparedness was not directly assessed in this study, in prior research, it has been demonstrated that faculty training in digital pedagogy is also a critical component of effective blended learning environments. The success of blended learning approaches may depend on factors such as digital literacy of students, access to stable Internet connections and institutional capacity to implement interactive digital content. Future implementation strategies must take these contextual differences into consideration to ensure equitable and effective physiotherapy education.

To improve the educational experience in physiotherapy programmes, institutions should consider integrating virtual simulation tools for developing basic clinical reasoning, incorporating structured feedback mechanisms into online learning environments and designing framed training modules that gradually transition from theoretical knowledge to supervised practical tasks. These strategies can help reduce the loss of hands-on engagement in fully digital formats

and support the development of clinical competence. In future studies, the impact of specific e-learning platforms and national contexts on student satisfaction should also be examined to better tailor digital strategies to the needs of diverse student populations.

References

1. Haleem A., Javaid M., Qadri M.A., Suman R. Understanding the role of digital technologies in education: A review. Sustainable Operations and Computers 2022; 3: 275-85. doi: 10.1016/j.susoc.2022.05.004.
2. Lukács A., Simon N., Kiss-Kondás D., et al. Exploring the pros and cons of online courses for physiotherapists—A theoretical study. Health Promotion & Physical Activity 2023; 24: 33-9. doi: 10.55225/hppa.527
3. Rossettini G., Geri T., Turolla A., et al. Online teaching in physiotherapy education during COVID-19 pandemic in Italy: a retrospective case-control study on students' satisfaction and performance. BMC Med Educ 2021; 21:456. doi: 10.1186/s12909-021-02896-1
4. Varmaa P., Lakshyashree L., Chheda K., et al. Digital learning in physiotherapy education: Exploring design approaches through meta-analysis. MultidiscipRev 2023; 6 (Suppl issue: Social Sciences): e2023ss045. doi: 10.31893/multirev.2023ss045
5. Ødegaard N.B., Myrhaug H.T., Dahl-Michelsen T., Røe Y. Digital learning designs in physiotherapy education: A systematic review and meta-analysis. BMC Med Educ 2021; 21(1): 48. doi: 10.1186/s12909-020-02483-w
6. Morris N.P., Swinnerton B., Coop T. Lecture recordings to support learning: A contested space between students and teachers. Comput Educ 2019; 140: 103604. doi: 10.1016/j.compedu.2019.103604
7. Kamraju M., Krishnaiah J., Durgesham G., et al. Exploring the impact of online education on higher education. ASEAN J Sci Technol Dev 2024; 3: 27-36.
8. Estel K., Scherer J., Dahl H., et al. Potential of digitalization within physiotherapy: a comparative survey. BMC Health Serv Res 2022; 22: 496. doi: 10.1186/s12913-022-07931-5
9. Chesterton P., Richardson M., Tears C. Student physiotherapists' perceptions of online curriculum delivery during the COVID-19 pandemic. BMC Med Educ 2022; 22(1): 440. doi: 10.1186/s12909-022-03486-5
10. Mushtaha E., Abu Dabous S., Alsyouf I., et al. The challenges and opportunities of online learning and teaching at engineering and theoretical colleges during the pandemic. Ain Shams Eng J 2022;13(6):101770. doi: 10.1016/j.asej.2022.101770
11. Akpen C.N., Asaolu S., Atobatele S., et al. Impact of online learning on students' performance and engagement: A systematic review. Discov Educ 2024; 3: 205. doi: 10.1007/s44217-024-00253-0
12. Yan C.S., Vasanthi R.K., Subramaniam A. Physiotherapy students' perceptions of e-practical learning on achieving learning outcomes—A pandemic perspective. Int J Learn Teach Educ Res 2022; 21(4): 355-64. doi: 10.26803/ijlter.21.4.20
13. Pandita A., Kiran R. The technology interface and student engagement are significant stimuli in sustainable student satisfaction. Sustainability 2023; 15(10): 7923. doi: 10.3390/su15107923
14. Peacock S., Hooper J. E-learning in physiotherapy education. Physiotherapy 2007; 93(3): 218-28. doi: 10.1016/j.physio.2006.11.009
15. Belcher S., Larmer P., Christopherson R., Kovanur Sampath K. Physiotherapy students' perspectives of a blended learning approach through the COVID-19 pandemic years. N Z J Physiother 2024; 52(1): 8-16. doi: 10.15619/nzjp.v52i1.343
16. Ahola S., Piirainen A., Vuoskoski P. Perceptions of learning and teaching human movement in physiotherapy: A systematic review and metasynthesis of qualitative studies. Int J Qual Stud Health Well-being 2023; 18(1): 2225943. doi: 10.1080/17482631.2023.2225943
17. Maayah M.F., Al-Jarrah M., Mysore S., et al. The perception of physical therapy students towards their profession in Jordan. Healthcare (Basel) 2022; 10(5): 849. doi: 10.3390/healthcare10050849
18. Schoeb V., Chong D. Students' learning preferences and experience in a globalised world: Opportunity to optimise internationalisation in physiotherapy education. Open Physio J 2019. doi: 10.14426/art/522
19. Swaminathan N., Ravichandran L., Ramachandran S., Milanese S. A comparison of physiotherapy students' perception about blended learning with online learning during COVID-19 pandemic: A mixed method of study. J Educ Health Promot 2022; 11: 335. doi: 10.4103/jehp.jehp_1801_21
20. Pagels L., Schindler O., Luedtke K. Overview of styles, content, learning effects and attitudes of students towards digitally enhanced physiotherapy education – a scoping review. BMC Med Educ 2025; 25: 176. doi: 10.1186/s12909-025-06750-6
21. Kolb A.Y., Kolb D.A. Experiential Learning Theory as a guide for experiential educators in higher education. ELTHE 2022 Sep. 1; 1(1): 38. doi: 10.46787/elthe.v1i1.3362
22. Serrano D.R., Dea-Ayuela M.A., Gonzalez-Burgos E., et al. Technology-enhanced learning in higher education: How to enhance student engagement through blended learning. Eur J Educ 2019 Apr 5; 54(2): 273–87. doi: 10.1111/ejed.12330
23. Wibowo S., Wangid M.N., Firdaus F.M. The relevance of Vygotsky's constructivism learning theory with the differentiated learning primary schools. J Educ Learn (EduLearn) 2023; 19(1): 1-8. doi: 10.11591/edulearn.v19i1.21197
24. Akella D. Learning together: Kolb's experiential theory and its application. J Manag Organ 2010; 16(1): 100–112. doi: 10.5172/jmo.16.1.100
25. Gardner P., Slater H., Jordan J.E., et al. Physiotherapy students' perspectives of online e-learning for interdisciplinary management of chronic health conditions: A qualitative study. BMC Med Educ 2016; 16: 62. doi: 10.1186/s12909-016-0593-5
26. Tajane I.A. Online learning is going viral during COVID-19 lockdown! What lessons do we take to guide the future of physiotherapy education? A cross-sectional survey from teachers' perspectives. J Health Commun 2021; 6(S3): 004.
27. Giday D.G., Perumal E. Students' perception of attending online learning sessions post-pandemic. Soc Sci Humanit Open 2024; 9: 100755. doi: 10.1016/j.ssaho.2023.100755
28. Waghumbare R., Ganvir D.S. Perception of physiotherapy students on virtual classes. VIMS J Phys Ther 2021; 3(2): 93–99. doi: 10.46858/VIMSJPT.3207

Address for correspondence

Denis Arsovski
University St. Kliment Ohridski Bitola
Higher Medical School Bitola, Bitola, North Macedonia
Phone: +38978828530
e-mail: denis.arsovski@uklo.edu.mk