

Self-Assessment of Physiotherapy Students' Competence During the COVID-19 and Non-COVID-19 Pandemic in Slovenia: A Retrospective Cross-Sectional Case-Control Study

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Abstract: Competency-based higher education aims to equip students with the knowledge, skills, values and attitudes necessary for professional practice and lifelong learning. The COVID-19 pandemic has led to significant adjustments in teaching, assessment and clinical education. This study compares the self-assessed professional competences of graduates of the Faculty of Health Sciences at the University of Ljubljana who graduated during the COVID-19 pandemic with those who graduated before the pandemic. Using a structured survey, the graduates assessed 13 core competences that they had acquired during their academic education and clinical practise. Descriptive and inferential statistical methods were used to compare the cohorts. Although no statistically significant differences in overall competency scores were found between groups, pandemic-era graduates reported slightly lower confidence in competencies acquired through academic training and slightly higher confidence in competencies acquired through clinical practise. Our findings suggest that the blended learning approaches introduced during the pandemic are as effective as traditional face-to-face teaching in promoting skills development. However, the generalisability of the results to the studied group of physiotherapy graduates is limited. The results support further research into virtual and hybrid learning models in physiotherapy education.

Keywords: online teaching and learning; pandemic; physiotherapy, student

Introduction

In the last two decades, competence-based education has been widely discussed and researched in higher education. Within this context, the Bologna Process was a significant reform initiative designed to restructure higher education in the European Union (EU), focusing on quality assurance, employability, and expanding access (Vissers et al., 2014). Competency-based education does not focus solely on isolated knowledge and skills, but on the holistic application of knowledge, skills, attitudes, behaviours, integrated and internalized abilities, and on ensuring effective performance in an individual's professional tasks (Baartman & Ruijs, 2011). A set of standardized descriptions that allow for a clear and comparative understanding of the levels of acquired competencies of students in various higher education programs and institutions in Europe are provided by the Dublin Descriptors. These descriptors serve as markers of the difficulty levels of the Bologna cycles (undergraduate, postgraduate, and doctoral) within the European Qualifications Framework (EQF) in the European Higher Education Area. They refer to the following five dimensions: "knowledge and understanding", "application of knowledge and understanding", "judgment ability", "communication skills", and "lifelong learning skills" (EQF, 2017). In 2008, Slovenia began developing the Slovenian Qualifications Framework (SQF) in order to implement the recommendations of the European Parliament and the Council of the EU on the introduction of the EQF. In Slovenia, it is mandatory for all higher education institutions to clearly outline the specific competences that students should develop by the time they complete their studies and obtain their degree. This requirement ensures that the educational objectives are in line with the Slovenian Qualifications Framework (SOK, 2020), which serves as a standardised benchmark for measuring students' competences in various qualifications. By defining these competences, the institutions aim to ensure that graduates have the necessary skills and knowledge to succeed in their respective fields and meet the demands of the labour market. This framework not only helps to maintain a high standard of education, but also facilitates the transparency and comparability of qualifications, both nationally and internationally.

With the outbreak of the Coronavirus disease in 2019 (COVID-19), a public health emergency of international concern was declared on January 30, 2020 (WHO, 2020), leading to the adoption of numerous safety measures worldwide, including the closure of

educational institutions. The pandemic affected more than 80% of the global student population (Aristovnik et al., 2021; Niranjana, 2020). There is no doubt that the COVID-19 pandemic has put academic systems around the world to the test and forced universities to quickly shift from traditional forms of education to online education. The study of physiotherapy at the Faculty of Health Sciences at the University of Ljubljana – Slovenia (FHS UL) was no exception. The declaration of a global pandemic by the World Health Organization on March 11, 2020, led to emergency protocols at national and institutional levels, including the widespread closure of universities and a rapid shift to distance learning. The transition was abrupt and the FHS UL was faced with the challenge of maintaining the quality of education. As governments mandated physical distancing and public health measures, FHS UL's academic programs had to revise curricula, adjust assessment methods, and postpone or restructure clinical placements.

With no time for extensive training on online teaching and learning and no opportunity to modify the study program content, physiotherapy teachers and students faced the challenge of effectively teaching and learning with the online pedagogical approach while ensuring the same level of acquired competencies as students did before the pandemic (Ng et al., 2021; Rossettini et al., 2017). Physiotherapy is a profession that requires the acquisition of practical skills to develop patient assessment skills and implement the physiotherapy process (WCPT, 2020). During the pandemic, theoretical knowledge could be delivered online, while the practical components of physiotherapy education were more difficult to replicate.

The COVID-19 pandemic had a significant impact on physiotherapy students' competence in several ways. Studies have shown that the pandemic led to a perceived decline in confidence and competence among healthcare students (Wilcha, 2020), including those in physiotherapy. Chesterton et al. (2022) assessed the perceptions of physiotherapy students (n = 236) regarding the transition to virtual study, with 79% of students stating that it negatively affected their understanding of the study material due to a lack of hands-on skills, 67% were less motivated to study compared to the traditional method, and 55% reported that academic staff lacked the necessary knowledge to deliver study content online. Hilburg et al. (2020) argued that the lack of face-to-face teaching for skills, such as history taking and physical examinations, would negatively impact students' transition to their clinical years. Salim Kazi Hakim et al. (2021) studied which mode of study (traditional, virtual, and blended) was more suitable for physiotherapy

students (n = 138) and found that while students enjoyed online assignments, they rated the traditional mode of teaching and learning better. The authors concluded that a balanced approach to the choice of study mode is very important for learning outcomes and student success. Ng et al. (2021) reported that the transition to a full e-learning approach in an undergraduate physiotherapy programme during the COVID-19 pandemic resulted in undergraduate students experiencing increased negative emotions due to overuse of information technology, reduced motivation and overload. Students valued face-to-face practical classes to learn and receive social support from peers and tutors.

To the author's knowledge, no study to date has examined FHS UL physiotherapy students' perceptions of self-assessed acquired competencies during the COVID-19 pandemic, and therefore our study aims to be the first to investigate this. Accordingly, the aim of this retrospective cross-sectional case control study is to present the self-assessment of acquired competencies of physiotherapy students who completed their studies at the FHS UL during the COVID-19 pandemic and to compare them with the group of students who underwent the same course delivered before the COVID-19 pandemic.

Methodology

In this study, a retrospective cross-sectional case-control design was used, allowing comparison between student cohorts educated before and during the COVID-19 pandemic. This design is well suited to identify differences in self-perceived competency development in different educational contexts, particularly those that have been influenced by emergency-related changes in policy and pedagogy.

1. Participants

Students who attended the course in the academic years 2019/2020, 2020/2021, 2021/2022 and 2022/2023 were considered as the COVID-19 online group. For this study, the COVID-19 group was defined as students who were exposed to educational disruptions caused by the COVID-19 pandemic at any point during their three years of education. These disruptions included online classes, adjusted assessment methods and postponed or restructured clinical placements. Although data collection took place in spring 2022 (March–April), students from the 2022/2023 cohort were included if they

were continuing their studies in that academic year (e.g., students preparing to graduate). These individuals had already experienced online teaching in earlier years of their studies. As students from different academic years were affected to varying degrees, we did not stratify participants by academic year. Data were collected from March 28 to April 28, 2022.

Students who had attended the same face-to-face course in the 2013/2014 and 2014/2015 academic years were considered as a control group as a pre-COVID group. They were selected based on their curricular stability prior to significant digital integration or the impact of the pandemic, and represent periods of stable, traditional teaching prior to digital transformation or pandemic-related interruptions. Data from this group were collected from February 18 to March 17, 2015.

The study received approval from the Medical Ethics Committee of the Republic of Slovenia (document number: 0120-105/2022/6).

2. Data collection and measurement instrument

A quantitative study approach with a survey was conducted. The survey was distributed electronically via the social network Facebook and the online application 1KA to students who met the inclusion criteria. Before completing the questionnaire, participants were given an introduction in which they were assured that their participation was voluntary and that their data would be kept strictly confidential. The survey consisted of two parts. The first part included open-ended demographic questions and additional closed-ended questions for the COVID-19 online group about the amount of face-to-face teaching time at FHS UL and in clinical settings during all three years of their studies. Response options were provided as “entirely”, “more than half time”, “half time” and “less than half time”. The second part of the survey comprised self-assessment of the competences defined in the Bachelor's degree programme in Physiotherapy at FHS UL¹. All cohorts responded to the same standardized survey instrument, which included self-assessment of 13 core competencies, metrics assessing perceived competencies and items aligned with national qualification frameworks (SQF/EQF). No variations in survey content were introduced across cohorts. The language and format remained consistent to ensure comparability.

¹ <https://www.zf.uni-lj.si/si/studenti/studijski-programi/1-stopnja/1-stopnja-fizioterapija>

In the questionnaire, the competences were introduced as: “Competences refer to a set of knowledge, skills, attitudes and behaviours that students are expected to acquire and demonstrate by the end of their educational programme. They are designed to ensure that graduates are prepared to meet the demands of their chosen professions and to engage as informed and effective individuals”. The questions were closed-ended, asking graduates to rate how well they believed they acquired the listed competences at FHS UL (through lectures, seminars, and lab exercises) and in clinical settings (through clinical practice). Response options were provided on a five-point Likert scale ranging from 1 to 5, where 1 – not at all, 2 – little, 3 – moderately, 4 – well, 5 – very well.

3. Statistical analysis

The data were analysed using IBM SPSS Statistics 22 (IBM Corporation, USA). Descriptive statistics were used to present demographic data with mean values, standard deviations and frequency distributions. The differences in competences acquired at FHS UL and in the clinical setting between the COVID-19 online and pre-COVID-19 groups were calculated using Student’s t-test for independent samples. Means, standard deviations, confidence intervals and Cohen’s d were calculated for the scores of the competences acquired. Cohen’s d – effect size, indicate the magnitude of the difference between the groups and is interpreted as follows: 0.2 - small effect size, 0.5 - medium effect size, 0.8 - large effect size. The level of statistical significance was set at $p \leq 0.05$.

Results

1. Participants

The survey was sent to 78 graduates of the COVID-19 online group, 50 of whom completed and returned the survey (response rate = 64%). It was also sent to 118 graduates of the pre-COVID-19 group, 53 of whom completed and returned the survey (response rate = 45%). The demographic characteristics of the respondents are presented in Table 1.

Table 1: Demographic characteristics of respondents

Group	N	Mean Age in years (SD)	N (%) Gender	Total N
COVID-19 online	50	23.36 (0.85)	12 (24.0%) M 38 (76.0%) F	50
Pre-COVID-19	53	23.80 (1.20)	8 (15.1%) M 45 (84.9%) F	53

N – number, SD – standard deviation, M – male, F – female.

2. Amount of face-to-face teaching time

In the first year of study in the COVID-19 online group, 98% (n= 49) of students reported that their study programme took place entirely face-to-face at the FHS UL and in a clinical setting.

In the second year of study, 54% (n= 27) of students stated that they completed half of their study programme face-to-face and 2% (n=1) of students stated that they completed their studies entirely face-to-face at FHS UL. Practical training took place entirely face-to-face in the clinical environment for 38% (n=19) of students.

In the third year of study, one student stated that he/she completed his/her studies entirely in the face-to-face at the FHS UL. 56% (n=28) of the students stated that half of their studies took place face-to-face at FHS UL. 34% (n=17) of students indicated that practical training in various clinical settings was entirely face-to-face, 52% (n=26) of students indicated that more than half of the time was face-to-face and 6% (n=3) of students indicated that they studied less than half of the time face-to-face.

For the pre-COVID-19 group, the study programme was conducted completely face-to-face at the FHS UL and in clinical settings for all students.

4. Self-assessment of acquired competences

When comparing all self-assessed competences between the COVID-19 online and pre-COVID-19 groups, the analyses showed that although there were slight differences between the groups, these differences were not statistically significant and had only small effect sizes (Table 2).

Table 2: Self-assessment of all acquired competencies

Category	Group	Mean (SD)	95% CI	t	p	Cohen's d
All competences acquired at FHS UL + clinical environment	COVID-19 online	3.45 (1.08)	3.06 - 3.84	-0.56	0.58	-0.14
	Pre-COVID-19	3.58 (0.68)	3.34 - 3.82			
All competences acquired at FHS UL	COVID-19 online	3.06 (1.11)	2.66 - 3.46	-1.44	0.06	-0.37
	Pre-COVID-19	3.41 (0.74)	3.15 - 3.67			
All competences acquired in clinical environment	COVID-19 online	3.84 (0.90)	3.52 - 4.16	0.49	0.63	0.13
	Pre-COVID-19	3.74 (0.68)	3.50 - 3.98			

SD - standard deviation, CI - confidence interval

The average self-assessed scores of the individual competence acquired at the FHS UL, were lower in the COVID-19 online group than in the pre-COVID-19 group, except for two competences (Q10 and Q11; Table 3). Overall, the pre-COVID-19 group generally scored higher. For three competences (Q2, Q4 and Q13; Table 3), the differences were statistically significant ($p = 0.002, 0.005, 0.010$ for Q13, Q2, Q4, respectively) compared to the pre-COVID-19 group (Table 3). The negative signs show that the COVID-19 group rated their competencies lower than the pre-COVID-19 group. An effect size in this ranges suggests a modest difference between the groups.

Table 3: The comparison of the self-assessed individual competences acquired at the FHS UL between the two groups of respondents

Individual competence acquired at FHS UL	COVID-19 online group Average (SD) 95% CI	Pre-COVID-19 group Average (SD) 95% CI	t	Cohen's d	p
Q 1. Ability to apply theoretical knowledge in developing, maintaining, and restoring movement and functional abilities in individuals with limited or impaired movement due to illness or injury across all age groups	3.04 (0.83) 2.80 - 3.28	3.38 (1.00) 3.10 - 3.66	-1.84	-0.37	0.066
Q 2. Ability to analyse and solve professional problems using knowledge, skills, behaviour, and ethical values	2.70 (1.02) 2.41 - 2.99	3.31 (1.09) 3.01 - 3.61	-2.95	-0.58	0.005*
Q 3. Ability to connect evidence-based theory and integrate it into practice	2.96 (1.01) 2.67 - 3.25	3.21 (1.06) 2.92 - 3.50	-1.22	-0.24	0.226
Q 4. Ability to develop critical and self-critical judgment in planning, implementing, and evaluating the physiotherapy process	2.82 (0.92) 2.56 - 3.08	3.34 (1.04) 3.05 - 3.63	-2.68	-0.53	0.010*
Q 5. Knowledge, understanding, and consideration of indications and contraindications, as well as adverse effects of	3.42 (1.13) 3.10 - 3.74	3.75 (0.98) 3.48 - 4.02	-1.55	-0.31	0.121

Individual competence acquired at FHS UL	COVID-19 online group Average (SD) 95% CI	Pre-COVID- 19 group Average (SD) 95% CI	t	Cohen's d	p
physiotherapy in specific professional problems					
Q 6. Ability to self-critically and critically judge, analyse, and evaluate physiotherapy procedures and one's own work	3.18 (1.00) 2.90 - 3.46	3.42 (0.96) 3.16 - 3.68	-1.21	-0.25	0.220
Q 7. Ability to communicate orally and in writing with colleagues and professionals from other disciplines (including in an international context)	2.74 (1.08) 2.43 - 3.05	3.13 (1.27) 2.78 - 3.48	-1.76	-0.33	0.099
Q 8. Ability to collaborate in an interdisciplinary team	2.78 (1.27) 2.42 - 3.14	3.15 (1.29) 2.79 - 3.51	-1.53	-0.29	0.149
Q 9. Ability to understand and use critical analysis and theory development and apply them to solve specific professional problems	3.06 (0.93) 2.80 - 3.32	3.13 (0.94) 2.87 - 3.39	-0.37	-0.07	0.706
Q 10. Ability to effectively promote physical activity across all life stages in the narrower and broader community	3.24 (1.33) 2.86 - 3.62	3.23 (1.15) 2.91 - 3.55	0.04	0.01	0.968
Q 11. Ability to search for new information in the literature in the field of physiotherapy and other sciences (medical, organizational sciences, informatics, and social sciences) and integrate them into physiotherapy	3.88 (0.87) 3.63 - 4.13	3.85 (0.95) 3.59 - 4.11	0.16	0.03	0.868
Q 12. Ability for independent learning in and responsibility for one's own learning and awareness of the importance of lifelong learning	3.88 (0.92) 3.62 - 4.14	4.00 (0.96) 3.74 - 4.26	-0.63	-0.13	0.520
Q 13. Ability to report new findings at professional meetings, in professional and popular publications, and in the media	3.14 (1.07) 2.84 - 3.44	3.85 (1.15) 3.53 - 4.17	-3.31	-0.64	0.002*

SD - standard deviation, CI - confidence interval, * statistically significant

The average self-assessed scores of the individual competencies acquired in the clinical environment were higher in the COVID-19 group compared to the pre-COVID-19 group for eight competences (Q2– Q4, Q7– Q11; Table 4), the difference was statistically significant ($p = 0.010$) only for one competence (Q13; Table 4).

Table 4: The comparison of self-assessed individual competences acquired in the clinical environment between the two groups of respondents

Individual competence acquired in the clinical environment	COVID-19 online group Average (SD) 95% CI	Pre-COVID-19 group Average (SD) 95% CI	t	Cohen's d	p
Q1. Ability to apply theoretical knowledge in developing, maintaining, and restoring movement and functional abilities in individuals with limited or impaired movement due to illness or injury across all age groups	4.00 (0,53) 3.85 - 4.15	4.02 (0,78) 3.81 - 4.23	-0.137	-0.03	0.879
Q 2. Ability to analyse and solve professional problems using knowledge, skills, behaviour, and ethical values	3.72 (0,78) 3.50 - 3.94	3.45 (0,93) 3.19 - 3.71	1.538	0.31	0.113
Q 3. Ability to connect evidence-based theory and integrate it into practice	3.80 (0,90) 3.54 - 4.06	3.60 (0,95) 3.34 - 3.86	1.067	0.22	0.275
Q 4. Ability to develop critical and self-critical judgment in planning, implementing, and evaluating the physiotherapy process	3.94 (0,77) 3.72 - 4.16	3.91 (0,86) 3.67 - 4.15	0.176	0.04	0,861 0.852
Q 5. Knowledge, understanding, and consideration of indications and contraindications, as well as adverse effects of physiotherapy in specific professional problems	3.92 (0,70) 3.72 - 4.12	3.96 (0,85) 3.73 - 4.19	-0.244	-0.05	0,808 0.794
Q 6. Ability to self-critically and critically judge, analyse, and evaluate physiotherapy procedures and one's own work	3.76 (0,96) 3.49 - 4.03	3.83 (0,91) 3.58 - 4.08	-0.365	-0.07	0,716 0.705
Q 7. Ability to communicate orally and in writing with colleagues and professionals from other disciplines (including in an international context)	3.78 (0,95) 3.51 - 4.05	3.49 (1,06) 3.20 - 3.78	1.461	0.29	0,147 0.146
8. Ability to collaborate in an interdisciplinary team	4.10 (0,91) 3.84 - 4.36	4.04 (1,12) 3.73 - 4.35	0.304	0.06	0,762 0.765
Q 9. Ability to understand and use critical analysis and theory development and apply them to solve specific professional problems	3.68 (0,79) 3.46 - 3.90	3.33 (1,11) 3.02 - 3.64	1.877	0.36	0,064 0.067
Q 10. Ability to effectively promote physical activity across all life stages in the narrower and broader community	3.80 (0,99) 3.52 - 4.08	3.72 (1,16) 3.40 - 4.04	0.386	0.07	0,700 0.707
Q 11. Ability to search for new information in the literature in the field of physiotherapy and other sciences (medical, organizational sciences, informatics, and social sciences) and integrate them into physiotherapy	3.62 (0,95) 3.35 - 3.89	3.51 (1,10) 3.21 - 3.81	0.584	0.11	0,584 0.588
Q 12. Ability for independent learning in and responsibility for one's own learning and awareness of the importance of lifelong learning	4.06 (0,74) 3.85 - 4.27	4.15 (1,04) 3.86 - 4.44	-0.504	-0.10	0,615 0.612
Q 13. Ability to report new findings at professional meetings, in professional and popular publications, and in the media	3.20 (1,05) 2.90 - 3.50	3.75 (1,08) 3.45 - 4.05	-2.671	-0.52	0,009* 0.010*

SD standard deviation, CI - confidence intervals, * statistically significant

Discussion

The primary objective of this study was to evaluate how physiotherapy students at the Faculty of Health Sciences, University of Ljubljana (FHS UL), self-assessed the competencies they acquired during the COVID-19 pandemic. Additionally, we sought to compare these self-assessments with those of graduates who completed their studies before the pandemic. The competencies explored in our survey align with the World Physiotherapy guidelines, which outline the essential skills expected of physiotherapists entering the workforce post-graduation (WCPT, 2020; WP 2012, 2022). These competencies encompass several critical areas, including general skills, physiotherapy assessment, and the implementation of the physiotherapy process. Moreover, they cover professionalism, health promotion, research, self-directed learning, teaching, and an understanding of the significance of lifelong learning. The survey also addressed the promotion of the physiotherapist's role within the healthcare system's function and structure. Through this study, we aim to provide insights into how the pandemic has impacted the development of these vital competencies in emerging physiotherapists.

The average scores in the self-assessment of all competences acquired in a clinical setting were higher for our respondents in both groups than the scores in the self-assessment of competences acquired at the FHS UL. This indicates that the students acquired their competences more effectively through practical work in different work situations. Although the self-assessment of competences in the COVID-19 online group was lower than in the pre-COVID-19 group, but not statistically significant, this can probably be attributed to the fact that, despite the restrictions during the pandemic, students had the opportunity to perform a considerable number of clinical exercises in a practical setting, which allowed them to apply their theoretical knowledge, gain practical experience and develop essential skills necessary for their professional growth in a real healthcare environment. As a result, students did not lack practical skills and experiential learning, which had a significant impact on their understanding of the subject matter, as confirmed by other authors (Salim Kazi Hakim et al., 2021; Chesterton et al., 2022). However, it is important to note that these results are based on the students' self-perception, which was collected in a survey. While this perspective provides valuable insight into students' confidence in their competences, it does not capture objective performance data. Future research should incorporate complementary metrics — such

as the exact number and duration of clinical trainings attended, frequency of placements and assessment protocols — to provide a more comprehensive assessment. In addition, detailed contextual information on changes to the curriculum, assessment methods and guidelines for clinical placements at the FHS UL during the pandemic would help to clarify how the institutional adjustments may have influenced students' learning experiences.

Learning through direct experience and reflection on these experiences is crucial for the development of competences. During clinical practice, students are involved in real-life scenarios that provide a deeper and broader understanding of the complexity of the workplace and allow students to apply theoretical knowledge to different practical situations and improve their problem-solving skills. In addition, students can more easily compare their competences with the requirements of the work process and the competence level of other, more experienced employees (Korpi et al., 2017). However, this does not mean that the role of educational institutions and curricula is neglected, as all the fundamentals of practical work, the “heart” of the profession — the knowledge of the structure and functioning of human movement and the therapeutic tools to maintain and restore functional abilities — are still acquired by students in the educational institution. The structured and comprehensive education provided by the educational institutions is essential for equipping students with the necessary theoretical knowledge and initial skills that they can then refine and expand upon through experiential learning in clinical settings.

The average scores of the self-assessment of all competences acquired at the FHS UL were lower for most competences for respondents in our COVID-19 online group compared to respondents in the pre-COVID-19 group. This result was to be expected as students had to adapt unexpectedly and quickly to the online delivery of theoretical content as well as the acquisition of certain practical skills that normally take place in the faculty's laboratory facilities. Although e-learning has now become an indispensable part of education, combining pedagogical, computer-based and communicative knowledge, and is constantly evolving (George et al., 2017), authors have reported negative experiences with e-learning among physiotherapy students during the COVID-19 pandemic. Students were anxious, stressed (Sahu, 2020), felt overloaded (Händel et al., 2020) and had less motivation to learn (Chesterton et al., 2022). They value face-to-face learning as it provides social support and allows feedback from peers and teachers (Salim

Kazi Hakim et al., 2021). While students were reasonably open to online lectures, they were very opposed to not being able to acquire practical skills directly and in person. In their opinion, e-learning should encourage the development of healthy study habits, such as scheduled time to study, physical exercise and other activities that reduce stress (Sahu, 2020; Niranjana, 2020).

When analysing the scores for the individual competences, the students in both groups in our study at the FHS UL acquired low to moderate competences in the areas of developing critical and self-critical judgement, planning, implementing and evaluating the physiotherapy process and competences in professionalism. Professionalism in this context refers to the ability to analyse and solve professional problems by applying knowledge, skills and behaviours and adhering to ethical values (WCPT, 2020). Acquiring these competences in a supervised environment — such as classrooms, laboratory exercises and simulations — is crucial in education, as such situations approximate the real working environment. However, these situations do not predict actual acquisition of skills and success in clinical practice (Brosky & Scott, 2007; Timmerberg et al., 2022). The clinical environment or workplace is the place where a person develops their knowledge and skills and where their competence can also be assessed (Cate & Billett, 2014).

According to self-assessment, our students in the COVID-19 online group have acquired the ability to apply theoretical knowledge about the development, maintenance and recovery of movement and functional abilities just as well as the pre-Covid group. This was also observed in the self-assessment of the ability to search for and integrate new information from the literature in the field of physiotherapy and related disciplines (medicine, organisational, computer and social sciences). During the pandemic, FHS UL transitioned the lectures to an online-only format and students had to adapt to new teaching and learning methods; the transition had to be quick and efficient (Sahu, 2020). It seems that our COVID-19 online group students' adaptation to the virtual learning environment emphasises their resilience and ability to overcome unprecedented challenges. The study of Kamarianos et al. (2020) confirmed that in a given situation, being a student (Generation Z), thus digitally much more literate than previous generations, helped considerably in overcoming the difficulties of the transition from onsite to online learning. This observation is supported by findings from other authors (Aristovnik et al., 2021), who have similarly noted the efficacy of online learning during the pandemic.

The ability to learn independently and take responsibility for their own learning, as well as an awareness of the importance of lifelong learning, were competences that the students in both groups felt they had acquired well at FHS UL and in the clinical environment. Taking responsibility for one's own learning was crucial during the COVID-19 pandemic. Studying from home usually requires more self-discipline and motivation to follow online classes, especially in the initial period when students are getting used to the new system. Compared with traditional in-class lectures, faculty have less control over online teaching, and students are more likely to "skip the class". Therefore, the progress of online teaching and its learning effectiveness largely depend on students' high-level of self-discipline (Bao, 2020). The mechanism of self-discipline in online learning is self-directed and online courses require a high degree of self-control (Zhu et al., 2022). On the other hand, lecturers who are not familiar with the new teaching method might overload their students with study materials and assignments which evokes a feeling of work overload and thus a higher level of stress (Händel et al., 2020). Lecturers should therefore pay careful attention to the balance between online teaching and self-study when planning and organising the teaching and learning process (Aristovnik et al., 2021).

Limitation of the study

Our study had some limitations. The first is the measurement instrument – a questionnaire usually used for self-assessment of the observed research question, in our case acquired competences. Braun et al. (2011) point out an important limitation of studies that rely heavily on self-assessments: the inherent subjectivity and potential inaccuracies in participants' assessment of their own abilities. This discrepancy becomes particularly clear when comparing students' responses to the surveys with the competences they acquired, as emphasised by Korpi et al. (2017). The discrepancy between perceived and actual competences suggests that students' self-reported knowledge and skills do not correlate strongly with objective measures determined by standardised tests or institutional assessment methods (Humburg & van der Velden, 2015). Despite this discrepancy, Braun et al. (2011) find that students' self-assessments are positively related to their academic motivation, learning behaviour and overall

academic success, suggesting that perceptions of competence may play a crucial role in educational outcomes, regardless of actual knowledge levels.

Secondly, the scope of our study was limited to a single institution, which limits the generalisability of our findings to the entire population of physiotherapy graduates in Slovenia during the COVID-19 pandemic. The characteristics of the institution and its students may not reflect those of other educational institutions, making it difficult to apply our findings broadly. Therefore, to gain a more comprehensive understanding of how physiotherapy students in Slovenia self-assessed their acquired competences during the pandemic, further research should be conducted at a variety of educational institutions offering physiotherapy programmes. Such studies would provide valuable insights into possible differences and similarities in students' experiences and self-assessments in different contexts enhancing the overall understanding of the impact of the pandemic on physiotherapy education in Slovenia.

Primary takeaways from the study

The main results show that there were no statistically significant differences in self-assessed overall skills between the pre-pandemic and pandemic cohorts. This suggests that despite the disruption caused by COVID-19, the adjustments in teaching and clinical training — particularly the shift to blended learning and online learning — did not have a negative impact on the perceived development of key professional competences. Graduates from both groups reported greater confidence in the competences acquired through clinical practise than those acquired through academic teaching. This emphasises the crucial role of practical learning in skills development. Although the pandemic cohort rated their academic learning experiences slightly lower, this did not result in a significant deficit in overall competence. Our results underline the potential effectiveness of blended learning models in physiotherapy education and suggest that the curricula are resilient in times of crisis. However, the study relied on self-reported data reflecting personal perceptions rather than objective performance. To strengthen future research, the inclusion of complementary objective indicators — such as clinical training hours, evaluation results and institutional data on curriculum adjustments — is recommended. In conclusion, the study supports the continued integration of virtual and hybrid learning environments while emphasizing the need to

preserve access to clinical placements to maintain the quality of competency-based health education.

Policy implications

Virtual teaching for physiotherapy students has enabled physiotherapy education to continue despite the effects of the pandemic. The COVID-19 outbreak has provided faculties with the perfect opportunity to develop and further the application and effectiveness of virtual learning for physiotherapy students. Physiotherapy faculties should embrace the transition to virtual teaching and continue to develop web-based materials and resources with increased student interactivity, to ensure that the most effective and suitable teaching is delivered. Overall, while the COVID-19 pandemic posed significant challenges to physiotherapy education, it also accelerated the adoption of innovative teaching methods and highlighted the need for flexible and resilient educational frameworks.

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