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ORIGINAL RESEARCH

Examination of Telerehabilitation Knowledge, Awareness, and Opinions of Physical Therapy and Rehabilitation Students

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Abstract

Aim To encourage students and professionals to use telerehabilitation, it is critical to understand their perspectives on various aspects of using the service. This study aims to evaluate the awareness, knowledge, and opinions of physiotherapy and rehabilitation students about telerehabilitation.

Method In the cross-sectional survey, an electronic questionnaire was sent to 484 students studying at Manisa Celal Bayar University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation. To assess the student's awareness, knowledge, and opinions of telerehabilitation, a self-administered questionnaire which was created by researching the literature was sent to students that consisted of three sections: "baseline general characteristics," "knowledge and awareness categories," and "opinions" categories.

Results Only 322 students who completed questionnaires were received, giving a response rate of 66.5%.The median age of the students is 21. One hundred thirty students (40.4%) are aware of telerehabilitation. Most of the students (240; 74.5%) considered the COVID-19 pandemic had contributed to a greater understanding of the importance of telerehabilitation. More than half of the students (201; 66.2%) agreed that the place of telerehabilitation in the education curriculum should be increased. Two hundred thirty-three students (72.4%) reported that telerehabilitation practices will develop further in the future.

Conclusion The majority of the students stated that they were not aware of telerehabilitation due to the lack of lesson curriculum. Determining students' thoughts about telerehabilitation can also guide the future of telerehabilitation practices, the development of various strategies for the implementation of telerehabilitation, and the policies related to physiotherapy education.

Keywords Physiotherapy students · Telerehabilitation awareness · Telerehabilitation opinions

Introduction

Current demographic trends, including the tripling of the aging population and the increase in chronic diseases over the past 50 years, have increased pressure on healthcare systems around the world and their ability to provide quality care [1, 2]. The scarcity of healthcare resources has led to a search for new ways to organize healthcare delivery. In addition, the global spread of coronavirus disease (COVID-19), which has changed people's lives in many ways, and the adoption of various protective measures such as social distancing to minimize the risk of exposure, has also had an impact on health services. During the COVID-19 pandemic, when quarantine and various protective measures were put in place, access to outpatient rehabilitation clinics was minimized and treatment of non-urgent cases was postponed. As a result, almost all physical therapy services were discontinued. For all these reasons, the use of alternative health services such as telemedicine, which is defined as the use of telecommunications and virtual technology to provide health services including patient rehabilitation, has been promoted [3–5]. The World Confederation of Physical Therapy (WCPT) promoted the use of telerehabilitation during the COVID-19 pandemic [6]. Telerehabilitation

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allows patients who cannot access rehabilitation services in normal times and situations such as epidemics, disasters, pandemics, or due to their geographic, economic, or physical inadequacies to benefit from rehabilitation services [7]. Generally, telerehabilitation systems can be classified as image-based telerehabilitation, sensor-based telerehabilitation, and virtual reality–based telerehabilitation [8]. In virtual reality–based telerehabilitation systems, the patient's ability to perform the desired movements and motor responses in three-dimensional virtual environments by the computer in order to give is created. These created virtual environments can be displayed on the computer screen and also can be created as augmented reality, with virtual reality glasses and haptic (tactile) feedback devices. Rehabilitation professionals use these virtual environments that can be modified in line with the desired treatment goals [9]. Sometimes virtual reality and augmented reality are used as similar concepts. Virtual reality can be expressed as an environment in which computer-generated three-dimensional encounters in games, the user is completely disconnected from the world when he-she enters this environment. On the other hand, augmented reality, with the real-world data and images that can be added to real-world images, is an environment that allows real and virtual objects to be perceived together in the same environment. Augmented reality combines real and virtual, real-time interaction and three-dimensional imaging enabling technological systems [10].

The commitment, adaptability, and skills of clinicians and therapists play an important role in the sustainability of any rehabilitation program. Several studies have shed light on the perspectives and acceptance of students, clinicians, and healthcare providers regarding the use of telerehabilitation. Overall, these studies reported positive impressions and high satisfaction rates from clinicians and healthcare providers in terms of time, space, transportation, and cost [11–14]. Similarly, available systematic reviews indicate that telerehabilitation is acceptable from the patient's perspective [15, 16]. However, a promising future requires the continued development and use of new, innovative technologies that will transform existing practices and make telerehabilitation an integral part of healthcare [17]. To ensure the long-term use of such systems, it is imperative to understand the perspectives of healthcare providers and students in the implementation of telerehabilitation [18]. Students represent the next generation of a profession or discipline, and acceptance of telerehabilitation can be increased if potential physical therapists are aware of telerehabilitation and have a positive attitude toward its use. Although current technological developments are quite adequate for telerehabilitation applications, the main problem is to change the perspective of rehabilitation professionals and patients. In particular, giving telerehabilitation a higher priority in curricula and raising students' awareness of telerehabilitation could be beneficial in changing the view of future rehabilitation professionals. There are few studies in the literature that address the awareness and opinions of physical therapy and rehabilitation students about telerehabilitation. Little is known about whether physical therapy and rehabilitation students receive adequate basic education in telerehabilitation. The purpose of this study is to assess the knowledge, awareness, and opinions of physical therapy and rehabilitation students about telerehabilitation. The results of the present study may enable the development of various strategies for the implementation of telerehabilitation. They may also influence policy in the field of physical therapy education. In addition, the results of this study will contribute to the literature on the success and sustainability of telerehabilitation applications.

Methods

This study was designed as a cross-sectional study. Random sampling was conducted for the quantitative approach. Students of Manisa Celal Bayar University, Faculty of Health Sciences, Department of Physical Therapy and Rehabilitation, who volunteered to participate in the study, accessed the questionnaire, filled out completely, and sent it to us were included in the study. Inclusion criteria of the study: voluntary participation in the study; 2nd, 3rd, or 4th year of study in the Department of Physical Therapy and Rehabilitation of the Faculty of Health Sciences of the University; and the ability to read and understand Turkish. Exclusion criteria: study in a department other than the Faculty of Health Sciences, Department of Physical Therapy and Rehabilitation of the University. Before the study, approval was obtained from the Ethics Committee of Dokuz Eylul University for non-interventional research. In addition, the study complied with all rules to be followed under the Higher Education Institutions Scientific Research and Publication Ethics Directive.

The study used the application "Google Forms," and the form prepared with this application was sent to the students of the Department of Physical Therapy and Rehabilitation through a messaging and calling application (WhatsApp) developed for smartphones. Review of previous relevant research was used to develop the initial draft of the survey questionnaire. Some questions have been used and validated by another researcher [14]; some questions have been modified, some questions were created by the researchers, and pretested. Content validity was assessed by a group of experts including three physical therapist experts and two specialists in information and communication technologies. The first part of the questionnaire used for the study consists of three parts: The aim of the study and a general information text stating that participation in this study is voluntary, as well as the options "I would like to participate in this

study voluntarily" and "I do not want to participate in this study." Students who selected the "I would like to voluntarily participate in this study" option were allowed to proceed to the other parts of the form. The second part of the form asked students about sociodemographics (age, gender) and educational information (department, class, etc.). The third part asked the questions that came from the literature review on the level of awareness and opinions about telerehabilitation. Each of these questions contains 44 questions related to the concepts/parameters examined in this study. For most questions, options such as "I disagree, I am undecided, I agree" were created.

Data were analyzed using the program IBM SPSS 21 (SPSS Inc., Chicago, IL, USA). Descriptive statistics such as frequency and percentage were used to summarize the data. The chi-square test was used to evaluate the relationship between knowledge, awareness, and opinions with students' sociodemographic characteristics (internship status). The alpha level is 0.05.

Table 1 Demographic characteristics of students

Variables	*n*	%
Age (years)		
> 20	44	13.6
20–25	273	84.9
< 25	5	1.5
Gender		
Women	246	76.4
Men	76	23.6
Class		
2. class	81	25.2
3. class	101	31.4
4. class	140	43.5
Type of education		
Formal education	196	60.9
Secondary education	126	39.1
Internship status		
Internship	170	52.8
Non-internship	152	47.2

The results are presented as number (*n*) and percent (%)

Results

This study was conducted with students studying at Manisa Celal Bayar University, Faculty of Health Sciences, Department of Physical Therapy and Rehabilitation. A total of 484 2nd, 3rd, and 4th year students were contacted; 402 students volunteered to participate and 322 students fully completed the questionnaire. The average age of the students participating in the study was 21 years, 76% of the students were female, and 53% of the students completed internships (Table 1).

Most students (67%) were undecided about whether telerehabilitation and telemedicine were the same things. More than half of the students (62%) did not know that there are systems that allow online assessment methods such as goniometric measurement where the patient is touched. One hundred thirty students (40%) were aware of telerehabilitation systems while the main source of awareness of students about telerehabilitation platforms was the İnternet (41%) followed by lessons (27%). One hundred and twenty-eight students (67%) who were not aware of telerehabilitation stated that the reason they were not informed was the lack of a curriculum (Table 2).

Survey results show that 53% of internship students and 26% of non-internship students were aware of telerehabilitation applications. One hundred fifteen (67%) internship students and 67% of non-internship students indicated that the reason they were not aware of telerehabilitation applications was that they were not in the curriculum. Awareness of telerehabilitation appears to be higher among interns than non-interns (Table 3).

Forty-seven percent of students claimed that telerehabilitation and personal health services were not the same things, and 74.5% of students agreed that the COVID-19 pandemic provided a better understanding of the importance of telerehabilitation. More than 70% of the students thought that telerehabilitation will continue to develop in the future, and 75% of them thought that both the physician and the patient should be trained in technical skills. Two hundred forty-nine students (77%) reported that the disappearance of the therapeutic effect of touch in physical therapy is a disadvantage. Many students (56%) asserted that there is no difference between telerehabilitation and face-to-face examination and that telerehabilitation will not be used in older adults and children. More than half of the students (62%) agreed that the importance of telerehabilitation should be increased in the curricula and that postgraduate telecommunication can be structured as a separate department. Two hundred thirteen students (66%) claimed that they did not have enough training and knowledge about telerehabilitation technology and its application. One hundred thirty-nine students (43%) stated that the telerehabilitation system is easy to learn and apply. More than 70% of students agreed that patients should be evaluated after treatment to understand whether telerehabilitation is effective, and 73% of students asserted that face-to-face evaluations should be conducted without enrolling a patient in the telerehabilitation program. The majority of students agreed that the assessment and treatment method should be applied through a combination of telerehabilitation and in-person health services (Table 4).

When examining the opinions of students who completed an internship and students who did not complete

Table 2 Telerehabilitation knowledge and awareness of students

	***n* (322)**		**%**
Are you aware of telerehabilitation applications with video-conference systems, mobile applications, sensor technologies, and augmented virtual reality systems?			
Yes	130		40.4
No	192		59.6
If yes, where did you learn about telerehabilitation applications?			
Lesson	35		27.3
Seminar/congress/symposium	30		22.7
Internet	53		40.7
Hospital-internship-practice	12		9.3
If no, why do you think you are not aware of these telerehabilitation platforms?			
No courses/curriculum	128		66.6
Since it is not applied in practice	50		26.1
Technical issues	10		5.2
Other	4		2
	Disagree, *n* (%)	**Neutral, *n* (%)**	**Agree, *n* (%)**
Telehealth and telerehabilitation are the same	83 (25.8)	216 (67.1)	23 (7.1)
Telerehabilitation enables patients who cannot access rehabilitation due to geographic, economic, or physical disabilities to benefit from rehabilitation services	2 (0.6)	82 (25.5)	238 (73.9)
One of the most important advantages of telerehabilitation is that it eliminates the distance problem and saves time	4 (1.2)	76 (23.6)	242 (75.2)
Telerehabilitation services are also used to complement and improve the quality of existing rehabilitation services	10 (3.1)	100 (31.1)	212 (65.8)
Telerehabilitation applications can be used in terms of patient follow-up, since patients whose treatment is completed have problems in applying home exercises	5 (1.6)	68 (21.1)	249 (77.3)
Telerehabilitation is an important method that can be used in epidemics or other disasters	5 (1.6)	75 (23.3)	242 (75.2)
There are telerehabilitation applications developed for patients who cannot use technology well	19 (5.9)	219 (68)	84 (26.1)
Systems have been developed that allow online evaluation methods such as goniometric measurement, which are made by touching the patient	60 (18.6)	200 (62.1)	62 (19.3)
Telerehabilitation is an advantageous method that can be applied in "normal" times as well	24 (7.5)	136 (42.2)	162 (50.3)
Telerehabilitation enables the therapist, who has to go to the patient's home in home care services, to reach more patients in a day compared to traditional methods, with the reduced travel time	11 (3.4)	83 (25.89	228 (70.8)

The results are presented as number (*n*) and percent (%)

an internship regarding telerehabilitation, it was found that the opinions of the two groups were generally similar. More than half of the internship group (56.5%) and 43% of the non-internship group reported telerehabilitation was a beneficial method that could be used during "normal" times (*p*: 0.028). The majority of the internship group (81%) and 66% of the non-internship group believed that telerehabilitation methods have some disadvantages (*p*: 0.006). One hundred fourteen internship students (79%) of the internship group and 67% of the non-internship group agreed that face-to-face examinations should be performed without enrolling the patient in the telerehabilitation program (0.026) (Table 5).

Discussion

This study was conducted to determine the knowledge, awareness, and opinions of university students studying in the Department of Physical Therapy and Rehabilitation about telerehabilitation. Most students were unaware of the applications of telerehabilitation and indicated that this was because it was not included in the course/curriculum. The majority of students who were aware of telerehabilitation applications indicated that they learned about it through the İnternet. While most students completing an internship were aware of the telerehabilitation applications, most students not completing an internship were not.

Table 3 Telerehabilitation knowledge and awareness of internship and non-internship students

	Internship group, *n*: 170			**Non-ınternship group, *n*: 152**			***p***
Are you aware of telerehabilitation applications with video-conference systems, mobile applications, sensor technologies and augmented virtual reality systems?							
Yes	90 (52.9)			40 (26.3)			**0.000**
No	80 (47.1)			112 (73.7)			
If yes, where did you learn about telerehabilitation applications?							
Lesson	18 (20)			16 (40)			**0.043**
Seminar/congress/symposium	27 (30)			3 (7.5)			
Internet	37 (41.1)			16 (40)			
Hospital -internship-practice	8 (8.8)			5 (12.5)			
If not, why do you think you are not aware of these telerehabilitation platforms?							
No courses/curriculum	115 (67.6)			102 (67.1)			0.717
Since it is not applied in practice	47 (27.6)			40 (26.3)			
Technical issues	6 (3.6)			8 (5.3)			
Other	2 (1,1)			2 (1.3)			
	Disagree, *n* (%)	**Neutral, *n* (%)**	**Agree, *n* (%)**	**Disagree, *n* (%)**	**Neutral, *n* (%)**	**Agree, *n* (%)**	***P****
Telehealth and telerehabilitation are the same	59 (34.7)	99 (58.2)	12 (7.1)	24 (15.8)	117 (77)	11 (7.2)	**0.000**
Telerehabilitation enables patients who cannot access rehabilitation due to geographic, economic, or physical disabilities to benefit from rehabilitation services	1 (0.6)	34 (20)	135 (79.4)	1 (0.7)	48 (31.6)	103 (67.8)	0.058
One of the most important advantages of telerehabilitation is that it eliminates the distance problem and saves time	3 (1.8)	31 (18.2)	136 (80)	1 (0.7)	45 (29.6)	106 (69.7)	0.043
Telerehabilitation services are also used to complement and improve the quality of existing rehabilitation services	8 (4.7)	43 (25.3)	119 (70)	2 (1.3)	57 (37.5)	93 (61.2)	**0.021**
Telerehabilitation applications can be used in terms of patient follow-up, since patients whose treatment is completed have problems in applying home exercises	4 (2.4)	30 (17.6)	136 (80)	1 (0.7)	38 (25)	113 (74.3)	0.144
Telerehabilitation is an important method that can be used in epidemics or other disasters	4 (2.4)	33 (19.4)	133 (78.2)	1 (0.7)	42 (27.6)	109 (71.7)	0.118
There are telerehabilitation applications developed for patients who cannot use technology well	11 (6.5)	117 (68.8)	42 (24.7)	8 (5.3)	102 (67.1)	42 (27.6)	0.780
Systems have been developed that allow online evaluation methods such as goniometric measurement, which are made by touching the patient	41 (24.1)	93 (54.7)	36 (21.2)	19 (12.5)	107 (70.4)	26 (17.1)	**0.008**
Telerehabilitation is an advantageous method that can be applied in "normal" times as well	14 (8.2)	60 (35.3)	96 (56.5)	10 (6.6)	76 (50)	66 (43.4)	**0.028**
Telerehabilitation enables the therapist, who has to go to the patient's home in home care services, to reach more patients in a day compared to traditional methods, with the reduced travel time	9 (5.3)	41 (24.1)	120 (70.69	2 (1.3)	60 (39.5)	90 (59.2)	**0.003**

The results are presented as number (*n*) and percent (%)

*Chi-square test, $p < 0.05$

Table 4 Opinions of students about telerehabilitation

	Disagree, *n* (%)	Neutral, *n* (%)	Agree, *n* (%)
I think that the services provided through telerehabilitation systems are the same as face-to-face services	150 (46.6)	136 (42.2)	36 (11.2)
I think the COVID-19 pandemic has mediated a greater understanding of the importance of telerehabilitation	5 (1.6)	77 (23.9)	240 (74.5)
I think that telerehabilitation practices have some disadvantages	3 (0.9)	80 (24.8)	239 (74.2)
I think that image-based telerehabilitation technologies are one of the most effective methods that can be used for remote diagnosis, treatment and patient follow-up for physiotherapists	54 (16.8)	129 (40.1)	139 (43.2)
In the near future, I think telerehabilitation will develop further in parallel with the developments in technologies such as biosensors, smartphones and smart homes	4 (1.2)	85 (26.4)	233 (72.4)
I think that both clinicians and patients should receive training in terms of technical knowledge in telerehabilitation applications	2 (0.6)	69 (21.4)	242 (75.2)
I think that evaluations made with telerehabilitation applications do not give the same results as face-to-face evaluations	14 (4.3)	127 (39.4)	181 (56.2)
I think that infrastructure deficiencies such as Internet connection speed can also cause problems in telerehabilitation applications	7 (2.2)	53 (16.5)	201 (62.4)
I think that the disappearance of the therapeutic effect of touch in physiotherapy is a disadvantage in telerehabilitation applications	3 (0.9)	70 (21.7)	249 (77.3)
I think that telerehabilitation cannot be applied in the elderly population	77 (23.9)	162 (50.3)	83 (25.8)
I think that telerehabilitation cannot be applied in the pediatric population	84 (26.1)	164 (50.9)	74 (23)
I think that the place of telerehabilitation in education curricula should be increased	17 (5.3)	104 (32.3)	201 (62.4)
At the postgraduate level, I think telerehabilitation can be structured as a separate specialization	29 (9)	133 (41.3)	160 (49.7)
I think it is important to explain the telerehabilitation practices to the patients and to shape the perspectives of the patients	5 (1.6)	77 (23.9)	240 (74.5)
I think that patients will feel more comfortable being treated with Telerehabilitation	41 (12.7)	185 (57.5)	96 (29.8)
I think that patients should be evaluated after treatment in order to understand that telerehabilitation is effective	1 (0.3)	66 (20.5)	255 (79.2)
I think that I do not have enough education and knowledge about telerehabilitation technology and its application	10 (3.1)	99 (30.7)	213 (66.1)
I find the telerehabilitation system easy to learn and use	20 (6.2)	163 (50.6)	139 (43.2)
I think telerehabilitation is an effective method	23 (7.1)	150 (46.6)	149 (46.3)
I think that the use of telerehabilitation can lead to savings in health expenditures	11 (3.4)	101 (31.4)	210 (65.2)
I think that face-to-face evaluation should be done without taking a patient into a telerehabilitation program	6 (1.9)	80 (24.8)	236 (73.3)
I think that some of the face-to-face evaluations (questionnaire, six-minute walk test, etc.) can be done online with telerehabilitation	32 (9.9)	138 (42.9)	152 (47.2)
I think that there will be no difference between doing the posture analysis face-to-face and online video	124 (38.5)	146 (45.3)	52 (16.1)
I think there will be no difference between giving exercise prescriptions to the patient for telerehabilitation, online or face-to-face	114 (35.4)	139 (43.2)	69 (21.4)
I think that telerehabilitation should be applied widely in clinics	31 (9.6)	161 (50)	130 (40.4)
I think that in order for a patient to be included in the telerehabilitation program, the patient should be able to use mobile technologies at a good level	14 (4.3)	86 (26.7)	222 (68.9)
I think that there should be a difference in the treatment fee between taking the patient for treatment face to face and receiving treatment with telerehabilitation	39 (12.1)	146 (45.3)	137 (42.5)
I think that entering the patient's home environment with telerehabilitation will negatively affect the privacy of the patient	117 (36.3)	152 (47.2)	53 (26.5)
I think that entering the patient's home environment with telerehabilitation will provide an advantage for the patient (for situations such as making domestic arrangements, etc.)	9 (2.8)	119 (37)	194 (60.2)
What do you think is the best practice when evaluating a patient?			
Face-to-face assessment only	110 (34.2)		
Implementation of assessment as telerehabilitation only	10 (3.1)		
Hybrid (face-to-face + telerehabilitation) implementation of assessment	202 (62.7)		
Which practice do you think is best when creating a patient's treatment program?			

Table 4 (continued)

	Disagree, *n* (%)	Neutral, *n* (%)	Agree, *n* (%)
Only face-to-face practice of the rehabilitation program	63 (19.6)		
Implementation of the rehabilitation program only in the form of telerehabilitation	7 (2.2)		
Hybrid (face-to-face + telerehabilitation) implementation of the rehabilitation program	252 (78.3)		

The results are presented as number (*n*) and percent (%)

In our study, the majority of students claimed that they did not have enough education and knowledge about telerehabilitation technology and its application. Similarly, many students claimed that the prominence of telerehabilitation in the educational curriculum should be increased and that telerehabilitation could be structured as a separate specialization at the graduate level. In another study conducted with physical therapy students, it was found that in agreement with our study, most of students thought that telerehabilitation should be included in the school curriculum to prepare and equip them for clinical practice after graduation as the world is moving toward the technological world [11]. According to a study of nursing students in another healthcare specialty in Poland, 69% of students were in favor of telehealth-telenursing being included in the curriculum [19]. It seems unreasonable to expect telehealth practice to be routinely applied when health professionals are not familiar with various basic concepts, principles, and practices in academic education before entering the profession. For this reason, a comprehensive program to develop knowledge in telehealth-telerehabilitation should be introduced in the health-related departments of universities [20]. Such a change will support the clinical applications of telemedicine, strengthen the educational infrastructure of physical therapy students, and provide them with ample opportunities to increase their knowledge of health-related computer communication technologies [20]. Specific training for therapists in telerehabilitation practices is recommended both for the initial comfort of the therapist and to offset frustrations that may arise from unfamiliarity with the technology and modality [21]. In our study, most students considered that both clinicians and patients should receive training in the technical knowledge of telerehabilitation applications. Apart from being familiarized with these technologies through training on telecommunication technologies, therapists need to develop new verbal skills, especially in new topics, such as clear explanations and instructions, since face-to-face practice is not possible in the rehabilitation process. The competence of the therapist is crucial to the success of the telerehabilitation program [21]. It has been stated that all healthcare professionals and students in the community, including physiotherapy students, should be equipped with the right skills to take advantage of the benefits that technology can bring to the workforce [22]. A report from the Australian Physiotherapy Association states that the future of telerehabilitation depends on the education of physiotherapists in the appropriate use of technology for telerehabilitation [23]. Therefore, in accordance with the opinions of the participants in this study, the inclusion of courses on telerehabilitation in university curricula and the education of physical therapy students in the field of telerehabilitation through training on various platforms such as workshops and seminars can bring about the development in the field of telerehabilitation.

The findings of this study revealed that most students agreed that the performance of face-to-face and telerehabilitation is not the same, that assessments performed with telerehabilitation applications do not provide the same results as face-to-face assessments, and that the omission of the therapeutic effect of touch in physical therapy is a disadvantage of telerehabilitation applications. Touching the patient in physical therapy is very important for treatment, and the lack of hand contact is considered a disadvantage for the use of telerehabilitation [24]. Although there are sophisticated telerehabilitation systems such as the Australian eHABTM system, which combines real-time videoconferencing and accurate remote diagnosis compatible with the results of traditional face-to-face interventions, no adequate alternative for hands-on skills has been found [8, 25].

The students reported that the COVID-19 pandemic created a better understanding of the importance of telerehabilitation and that telerehabilitation will continue to evolve in the near future. During the quarantine period of COVID-19, there seems to be an urgent need to introduce telemedicine or telerehabilitation, especially in some health facilities [26]. In some countries, for example, in the National College Hospital, which was transformed into a COVID-19 center in the Philippines, telerehabilitation was included in the service, education, and research areas of the Department of Rehabilitation Medicine of the Philippines General Hospital. Barriers to telerehabilitation that existed prior to COVID-19 were abruptly removed through the creation of awareness, technical resources, online training in telemedicine, policies, and data security measures. Barriers include the difficulty of physicians and therapists in assessing and treating various cases through telerehabilitation, the lack of technical knowledge, and the willingness of patients and rehabilitation providers to interact in a secure telemedicine environment [27]. This field can advance by developing strategies to overcome these barriers to the telemedicine system.

Table 5 Opinions of internship and non-internship students about telerehabilitation

	İnternship group, *n*: 170			Non-internship group, *n*: 152			
	Disagree, *n* (%)	Neutral, *n* (%)	Agree, *n* (%)	Disagree, *n* (%)	Neutral, *n* (%)	Agree, *n* (%)	*p*
I think that the services provided through telerehabilitation systems are the same as face-to-face services	97 (57.1)	54 (31.8)	19 (11.2)	53 (34.9)	82 (53.9)	17 (11.2)	**0.000**
I think the COVID-19 pandemic has mediated a greater understanding of the importance of telerehabilitation	3 (1.8)	34 (20)	133 (78.2)	2 (1.3)	43 (28.3)	107 (70.4)	0.215
I think that telerehabilitation practices have some disadvantages	2 (1.2)	30 (17.6)	138 (81.2)	1 (0.7)	50 (32.9)	101 (66.4)	**0.006**
I think that image-based telerehabilitation technologies are one of the most effective methods that can be used for remote diagnosis, treatment and patient follow-up for physiotherapists	9 (5.3)	59 (34.7)	102 (60)	5 (3.3)	68 (44.7)	79 (52)	0.157
In the near future, I think telerehabilitation will develop further in parallel with the developments in technologies such as biosensors, smartphones and smart homes	30 (17.6)	61 (35.9)	79 (46.5)	24 (15.8)	68 (44.7)	60 (39.5)	0.266
I think that both clinicians and patients should receive training in terms of technical knowledge in telerehabilitation applications	2 (1.2)	39 (22.9)	129 (75.9)	2 (1.3)	46 (30.3)	104 (68.4)	0.323
I think that evaluations made with telerehabilitation applications do not give the same results as face-to-face evaluations	2 (1.2)	30 (17.6)	138 (81.2)	-	39 (25.7)	113 (74.3)	0.097
I think that infrastructure deficiencies such as Internet connection speed can also cause problems in telerehabilitation applications	8 (4.7)	39 (22.9)	123 (72.4)	3 (2)	44 (28.9)	105 (69.1)	0.223
I think that the disappearance of the therapeutic effect of touch in physiotherapy is a disadvantage in telerehabilitation applications	5 (2.9)	22 (12.9)	143 (84.1)	2 (1.3)	31 (20.4)	119 (78.3)	0.134
I think that telerehabilitation cannot be applied in the elderly population	2 (1.2)	31 (18.2)	137 (80.6)	1 (0.7)	39 (25.7)	112 (73.7)	0.252
I think that telerehabilitation cannot be applied in the pediatric population	51 (30)	71 (41.8)	48 (28.2)	26 (17.1)	91 (59.9)	35 (23)	**0.003**
I think that the place of telerehabilitation in education curricula should be increased	50 (29.4)	79 (46.5)	41 (24.1)	34 (22.4)	85 (55.9)	33 (21.7)	0.209
At the postgraduate level, I think telerehabilitation can be structured as a separate specialization	11 (6.5)	50 (29.4)	109 (64.1)	6 (3.9)	54 (35.5)	92 (60.5)	0.357
I think it is important to explain the telerehabilitation practices to the patients and to shape the perspectives of the patients	23 (13.5)	60 (35.3)	87 (51.2)	6 (3.9)	73 (48)	73 (48)	**0.003**
I think that patients will feel more comfortable being treated with Telerehabilitation	4 (2.4)	34 (20)	132 (77.6)	1 (0.7)	43 (28.3)	108 (71.1)	0.119

Table 5 (continued)

	İnternship group, *n*: 170			Non-internship group, *n*: 152			
	Disagree, *n* (%)	Neutral, *n* (%)	Agree, *n* (%)	Disagree, *n* (%)	Neutral, *n* (%)	Agree, *n* (%)	*p*
I think that patients should be evaluated after treatment in order to understand that telerehabilitation is effective	22 (12.9)	95 (55.9)	53 (31.2)	19 (12.5)	90 (59.2)	43 (28.3)	0.822
I think that I do not have enough education and knowledge about telerehabilitation technology and its application	1 (0.6)	30 (17.6)	139 (81.8)	-	36 (23.7)	116 (76.3)	0.270
I find the telerehabilitation system easy to learn and use	8 (4.7)	50 (29.4)	112 (65.9)	2 (1.3)	49 (32.2)	101 (66.4)	0.204
I think telerehabilitation is an effective method	13 (7.6)	77 (45.3)	80 (47.1)	7 (4.6)	86 (56.6)	59 (38.8)	0.107
I think that the use of telerehabilitation can lead to savings in health expenditures	13 (7.6)	74 (43.5)	83 (43.8)	10 (66)	76 (50)	66 (43.4)	0.508
I think that face-to-face evaluation should be done without taking a patient into a telerehabilitation program	1 (0.6)	35 (20.6)	134 (78.8)	5 (3.3)	45 (29.6)	102 (67.1)	**0.026**
I think that some of the face-to-face evaluations (questionnaire, six-minute walk test, etc.) can be done online with telerehabilitation	18 (10.6)	64 (37.6)	88 (51.8)	14 (9.2)	74 (48.7)	64 (42.1)	0.134
I think that there will be no difference between doing the posture analysis face-to-face and online video	65 (38.2)	76 (44.7)	29 (17.1)	59 (38.8)	70 (46.1)	23 (15.1)	0.894
I think there will be no difference between giving exercise prescriptions to the patient for telerehabilitation, online or face-to-face	61 (35.9)	76 (44.7)	33 (19.4)	53 (34.9)	63 (41.6)	36 (23.7)	0.636
I think that telerehabilitation should be applied widely in clinics	18 (10.6)	75 (44.1)	77 (45.3)	13 (8.6)	86 (56.6)	53 (34.9)	0.082
I think that in order for a patient to be included in the telerehabilitation program, the patient should be able to use mobile technologies at a good level	11 (6.5)	117 (68.8)	42 (24.7)	8 (5.3)	102 (67.1)	42 (27.6)	0.105
I think that there should be a difference in the treatment fee between taking the patient for treatment face to face and receiving treatment with telerehabilitation	20 (11.8)	72 (42.4)	78 (45.9)	19 (12.5)	74 (48.7)	59 (38.8)	0.430
I think that entering the patient's home environment with telerehabilitation will negatively affect the privacy of the patient	72 (42.4)	71 (41.8)	27 (15.9)	45 (29.6)	81 (53.3)	26 (17.1)	0.052
I think that entering the patient's home environment with telerehabilitation will provide an advantage for the patient (for situations such as making domestic arrangements, etc.)	8 (4.7)	48 (28.2)	114 (67.1)	1 (0.7)	71 (46.7)	80 (52.6)	**0.001**
What do you think is the best practice when evaluating a patient?							

Table 5 (continued)

	İnternship group, *n*: 170			Non-internship group, *n*: 152			
	Disagree, *n* (%)	Neutral, *n* (%)	Agree, *n* (%)	Disagree, *n* (%)	Neutral, *n* (%)	Agree, *n* (%)	*p*
Face-to-face assessment only	69 (40.6)			41 (27)			**0.032**
Implementation of assessment as telerehabilitation only	4 (2.4)			6 (3.9)			
Hybrid (face-to-face + telerehabilitation) implementation of assessment	97 (57.1)			105 (69.1)			
Which practice do you think is best when creating a patient's treatment program?							
Only face-to-face practice of the rehabilitation program	33 (19.4)			30 (19.7)			0.862
Implementation of the rehabilitation program only in the form of telerehabilitation	3 (1.8)			4 (2.6)			
Hybrid (face-to-face + telerehabilitation) implementation of the rehabilitation program	134 (78.8)			118 (77.6)			

The results are presented as number (*n*) and percent (%)

*Chi-square test, $p < 0.05$

In a study conducted with physical therapy students, it was found that awareness of telerehabilitation comes from social media and online education platforms rather than the classroom, and most students do not see telerehabilitation being used in clinical practice. In our study, although most students indicated that they were aware of the use of telerehabilitation via the Internet, very few of them indicated that it was being used in clinical practice. This conclusion suggests that clinicians have not yet adopted telerehabilitation. This is consistent with a previous report stating that professional portability and training are common barriers to telehealth [17].

In addition, few of the students thought that the services and exercise specifications delivered via telerehabilitation systems were the same as in-person services, and most students thought that patients should be evaluated after treatment to understand that telerehabilitation was effective. This negative attitude toward the acceptance of telerehabilitation may be due to the familiar nature of physical therapy services. Physical therapy is largely viewed as a type of healthcare where the patient is present in person, and the elimination of this physical contact through the use of telerehabilitation may seem to many to be a "lower" physical therapy service. Concurrent efforts to use telerehabilitation and education, as well as evidence-based positive outcomes, may allay these fears. In addition, when examining the clinical practicum status of students with telerehabilitation awareness, it was found that students who completed a practicum had higher awareness and more positive thoughts about telerehabilitation than students who did not complete a practicum. Students who complete a clinical practicum are likely to be more knowledgeable about telerehabilitation due to their level of education and clinical experience. One of the most striking findings of our study was that most students thought that the combination (hybrid) of telerehabilitation and face-to-face services was the most effective service in an assessment and treatment program. This may provide direction for future applications. Thus, the therapeutic effect of touch cannot be lost, continuity of treatment can be ensured, and face-to-face assessment and treatment can be supported by telerehabilitation.

Conclusion

In the development of telerehabilitation and its correct and effective practice, students studying in these departments, training, course, and curriculum content as clinicians, physicians, and physical therapists are also very important. In our study, most of the students stated that they were not aware of the applications of telerehabilitation due to the lack of curriculum. Identifying students' thoughts about telerehabilitation and barriers to telerehabilitation may be important for the future of telerehabilitation practice, the development of various strategies for telerehabilitation implementation, and policy related to physical therapy education.

Author Contribution MBS: contributed to idea, concept, design, data collection process, literature review, writing, editing. ÖÇT: contributed to idea, concept, design, analysis, critical review, consulting, editing. All authors have read and approved the article.

Declarations

Ethical Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of University Dokuz Eylül (2021/21.07).

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Conflict of Interest The authors declare no competing interests.

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