AVALIAÇÃO
e-ISSN: 1982-5765 | Revista da Avaliação da Educação Superior
UNISO UNICAMP

Article

Information and communication technologies in the teaching of Physical Therapy, Occupational Therapy and Speech Therapy during the COVID-19 pandemic

Tecnologias da informação e comunicação no ensino da Fisioterapia, Terapia Ocupacional e Fonoaudiologia durante a pandemia de COVID-19

Tecnologías de información y comunicación en la enseñanza de Fisioterapia, Terapia Ocupacional y Logopedia durante la pandemia del COVID-19

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Abstract: Concerns related to the use of technologies in higher education are recurrent in several countries and areas of knowledge. This exploratory cross-sectional study mapped uses and perceptions of information and communication technologies in teaching Physical Therapy, Occupational Therapy and Speech Therapy during the COVID-19 pandemic in Brazil, using an online questionnaire. The study included 87 academics from Speech Therapy, Physiotherapy and Occupational Therapy courses. With regard to the institutional support received during the pandemic for the use of information and communication technologies in the teaching-learning process, 84 participants manifested themselves, of which 13 (15.5%) declared that this support was poor; 40 (47.6%) that the support was fair, 23 (27.4%) that the support was good, and 8 (9.5%) that the support was excellent. Thematic analysis of 87 responses observed the predominance of three themes: positive perceptions about the use of technologies, perceptions related to adversities in the use of technologies and perceptions related to strategies to improve the use of information and communication technologies in the teaching-learning process, highlighting the perceptions related to adversities. It was noted that remote teaching has disadvantages derived from the potential lack of preparation of the academic community for the use of technologies, as well as specificities related to the field of health, such as the necessary student-patient relationship. Thus, the use of information and communication technologies in teaching these areas demands in-depth attention from higher education institutions and the academic community for the adoption, training and evaluation of innovations.

Keywords: health education; information and communication technologies; institutional support.

DOI: http://dx.doi.org/10.1590/S1414-40772023000100020

Received on: 06/01/2023 | Approved on: 22/06/2023 | Reviewed on: 04/08/2023

AVALIAÇÃO
e-ISSN: 1982-5765 | Revista da Avaliação da Educação Superior

Resumo: Preocupações relacionadas ao uso de tecnologias no ensino superior são recorrentes em vários países e áreas do conhecimento. Este estudo transversal exploratório mapeou usos e percepções sobre as tecnologias da informação e comunicação no ensino de Fisioterapia, Terapia Ocupacional e Fonoaudiologia durante a pandemia de COVID-19, no Brasil, por meio de um questionário online. Participaram do estudo 87 acadêmicos vinculados a cursos de Fonoaudiologia, Fisioterapia e Terapia Ocupacional. No que concerne ao apoio institucional recebido durante a pandemia para o uso de tecnologias de informação e comunicação no processo de ensino-aprendizagem, 84 participantes se manifestaram, dos quais 13 (15,5%) declararam que este apoio foi ruim; 40 (47,6%) que o apoio foi regular, 23 (27,4%) que o apoio foi bom e 8 (9,5%) que o apoio foi ótimo. A análise temática de 87 respostas observou a predominância de três temas: percepções positivas sobre o uso de tecnologias, percepções relacionadas às adversidades no uso de tecnologias e percepções relacionadas às estratégias para aperfeiçoar o uso das tecnologias de informação e comunicação no processo de ensino-aprendizagem, havendo destaque para as percepções sobre adversidades. Notou-se que o ensino remoto possui desvantagens derivadas do potencial despreparo da comunidade acadêmica para o uso de tecnologias, bem como especificidades relacionadas ao campo da saúde como a necessária relação aluno-paciente. Assim, os usos de tecnologias da informação e comunicação no ensino destas áreas demandam atenção aprofundada das instituições de ensino superior e comunidade acadêmica para a adoção, treinamento e avaliação de inovações.

Palavras-chave: educação em saúde; tecnologias da informação e comunicação; suporte institucional.

Resumen: Las preocupaciones relacionadas con el uso de las tecnologías en la educación superior son recurrentes en varios países y en todas las áreas del conocimiento. Este estudio transversal exploratorio mapeó usos y percepciones de las tecnologías de la información y la comunicación en la enseñanza de Fisioterapia, Terapia Ocupacional y Logopedia durante la pandemia de COVID-19 en Brasil, utilizando un cuestionario en línea. El estudio incluyó a 87 académicos vinculados a cursos de logopedia, fisioterapia y terapia ocupacional. En cuanto al apoyo institucional recibido durante la pandemia para el uso de las tecnologías de la información y la comunicación en el proceso de enseñanza aprendizaje, respondieron 84 participantes, de los cuales 13 (15,5%) declararon que este apoyo fue malo; 40 (47,6%) que el apoyo fue regular, 23 (27,4%) que el apoyo fue bueno y 8 (9,5%) que el apoyo fue excelente. El análisis temático de 87 respuestas observó el predominio de tres temas: percepciones positivas sobre el uso de las tecnologías, percepciones relacionadas con las adversidades en el uso de las tecnologías y percepciones relacionadas con las estrategias para mejorar el uso de las tecnologías de la información y la comunicación en el proceso de enseñanza-aprendizaje, destacando las percepciones de la adversidad. Se observó que la enseñanza a distancia tiene desventajas derivadas de la potencial falta de preparación de la comunidad académica para el uso de las tecnologías, así como especificidades relacionadas con el campo de la salud, como la necesaria relación estudiante-paciente. Por lo tanto, el uso de las tecnologías de la información y la comunicación en la enseñanza de estas áreas demanda una atención profunda de las instituciones de educación superior y la comunidad académica para la adopción, formación y evaluación de las innovaciones.

Palabras clave: educación para la salud; tecnologías de la información y la comunicación; apoyo institucional.

1 Introduction

Higher education technologies have been a matter of concern for a long time in several countries and different knowledge areas, including Physical Therapy, Occupational Therapy, and Speech Therapy. In these fields particularly, research on education has been approaching the following: students lacking the skills to use collaboration and sharing technologies, as well as those related to the creation and use of media and games, lack of confidence in relevant technologies for practice, including care-oriented technologies, devices, and specialized applications (HILLS *et al.*, 2016); limited information and technology skills, such as students having trouble defining the information they indeed need, and poor knowledge of the access to the database and trouble assessing the quality of the information sources used (OLIVEIRA; OLIVEIRA, 2019); students with limited skills to analyze and summarize clinical information during the data collection process of health care, which makes it hard to formulate a clinical question and provide its subsequent solution (MORUNO-MIRALLES *et al.*, 2020); possibilities of use of technological resources to improve the learning process of undergraduate students (KAYE, 2020); the preference of students regarding human interactions to solve academic doubts, followed by e-mail and chats on the Internet (ADRIANI *et al.*, 2020); and the importance of research-based teaching (HELGØY *et al.*, 2020).

Before the COVID-19 pandemic, the use of communication and information technologies in higher education programs in Physical Therapy, Occupational Therapy, and Speech Therapy was already studied by academics and society, but after the pandemic, these concerns increased and several studies were conducted trying to figure out the current technological transformations and respective impacts in the academic field.

Many studies have shown one aspect in particular: professors and students were not prepared to use the educational technology and tools that were crucial to keeping academic activities ongoing during the pandemic. Aristovnik *et al.* (2020) made a survey with over 30 thousand students, from 62 countries, and the results have shown that, throughout a few months only, the pandemic led to a radical change in the lives of people, and the faculty's support was one of the most important for students during that period. Conversely, the lack of computing skills and the perception of a workload relatively higher prevented students from having a superior performance when adapting to the "new normal". Galvão *et al.* (2021a), after a study conducted with 1172 Brazilian students and professors, proposed a series of recommendations based on the emergency remote education experience during the pandemic; among them, the importance of providing the proper training to the academic community on distance learning.

The focus should not be limited to the technological aspects; this capacity building must also be oriented to content adaptation and teaching and assessment methods. The unexpected transition in the teaching-learning process introduced challenges to overcome, such as problems accessing the Internet, physical distance between students and professors, and trouble staying focused on a virtual environment. Samelli *et al*. (2020) published a suggestion, showing that the challenges also came upon the professors since they had to adapt the content to be given and change the student's assessment dynamics. Similarly, Bulan and Lagria (2020), in a study conducted with professors and students of an Occupational Therapy program from a university in the Philippines, highlight that the contents have to be improved to be virtually transmitted, as well as the assessment methods under this same online setting, so that the program can be more accessible for both students and professors. Savkin, Bayrak, and Büker (2021), in a study conducted with 381 students of the Physical Therapy program from a university in Turkey, suggest that, in addition to the creation of a technological infrastructure, the development of a diversified educational model should include making texts and clinical skill-related videos available online, as well as examples of cases in video or illustrated, online clinical skill tests and assessment methods, and discussion forums. Other recommendations made by Galvão *et al*. (2021a) include: maintaining the online education setting, whenever the topics and conditions are favorable; including more interactive technological tools in virtual learning environments since both students and professors missed more interactive processes during the emergency remote education; and reviewing the academic activity load to release the pressure and overload of activities that were experienced by students and professors during the emergency remote studies. Bearing in mind that there was no time to plan for the transition from on-site education to distance learning during the pandemic, as well as all gaps observed at that time, it is necessary to conduct studies aiming at deepening the knowledge of the work process of professors, as it was observed in a cross-sectional study conducted with 313 Physical Therapy professors of Brazilian universities (MEDEIROS *et al*., 2021).

Social, economic, and demographic aspects definitely had an impact on the perception that the emergency education developed by information and communication technologies was not the same for everyone. Felter *et al*. (2021) explain the concept of social learning drivers and highlight their significance during the pandemic, including: a) Access to education and education quality, comprising the proper electronic devices to participate in the online learning process, access to Internet, and support services, such as restaurants and student housing; b) Access to quality health services by students, comprising health care insurance coverage, an access point for basic health care and proper referral, COVID-19 vaccination and preventive care, including access to masks, disinfectant for cleaning hands, and access to COVID-19 tests; c) Availability of public transport and number of people living in the same house; d) Economic stability; e) Social and community context, including access to information on COVID-19 dissemination and prevention.

The studies clearly express the impact of these factors. Among the recommendations made by Galvão *et al*. (2021a), one was a proposal of measures to be taken to improve the Internet connection and access to equipment for vulnerable groups of people or those who live far from urban areas. It should be noticed that a primary need is to have financial investments to purchase technology equipment for students and to establish partnerships between universities and telecommunications companies to ensure Internet access and reduce connectivity inequalities between students, which was observed in a reflection paper on the challenges faced in the Occupational Therapy programs (BORBA *et al*., 2020). Aristovnik *et al*. (2020) observed that social and demographic factors had a major role in the conception of students regarding the different aspects of academic work and personal life. Students with certain social and demographic characteristics (male, part-time, first semester, applied sciences, lower income, from Africa or Asia) were significantly less satisfied with their work/academic life during the crisis. As for female students in full-time undergraduate studies programs, and facing financial problems, this population was the most affected by the pandemic in terms of emotional life and personal circumstances.

The gender impact was also observed in other studies. Bermejo-Franco *et al*. (2022), in a study conducted with 151 students (78 were female) of the Physical Therapy program from a university in Spain, report that gender differences have been observed for the majority of domains assessed; the female participants had the poorest general perception levels regarding health, quality of life, depression symptoms, anxiety, stress, evasion, and psychological inflexibility, sleep quality, and loneliness, when compared to male students. Shahzad *et al*. (2021) conducted a study with 280 students from several universities in Malaysia and concluded that the female students had a better understanding and were more interested in the distance education dynamics when compared to male students, who had less interest in the virtual learning environments.

Finally, yet importantly, the psychological impact on professors and students due to this forced transition has to be observed. Aristovnik *et al*. (2020) observed that students had doubts and concerns about their professional future during the confinement period, and were also bored, anxious, and frustrated. A study conducted with 100 students of the Physical Therapy program from two universities in South Korea concluded that the COVID-19 pandemic also increased the risk of anxiety and depression among many students, particularly women (PARK; YEO; KIM, 2021). Ng *et al*. (2021) conducted a qualitative study with 28 students of the Physical Therapy program from a university in Australia, and observed that, during the pandemic, the students experienced extremely negative feelings, such as anxiety, stress, and low motivation to study, and that they continue to value the on-site learning since it offers social support and makes the feedback from peers and tutors more easily to obtain.

In view of the foregoing, it was observed that, during the pandemic setting, the lack of training for using educational tools and a series of economic, social, and psychological issues, such as availability of equipment, Internet connection, proper technological infrastructure for the emergency remote education, social isolation, and issues related to depression, anxiety and uncertainty were the ones that stood out the most. On the other hand, some authors raised the discussion on how to use information and communication technologies in the academic context in a more effective manner, even for future emergency situations.

This study aims at contributing to this scenario by mapping the perception of the use of information and communication technologies in Physical Therapy, Occupational Therapy, and Speech Therapy teaching during the COVID-19 pandemic in Brazil, in order to check if the points highlighted herein have been already approached by the national or international literature, or if there are matters to be discussed that have not yet been addressed in previous studies. It is further highlighted that the studies on the use of information and communication technologies for health field-related education are mostly dedicated to medicine and nursing; the specifics of Physical Therapy, Occupational Therapy, and Speech Therapy are less approached by the literature. Therefore, this study aims at contributing to reducing this gap.

2 Method

This paper scrutinizes the data analysis of a major study on the use of emergency remote education technologies during the COVID-19 pandemic, which had an impact on the entire healthcare field in Brazil. The focus of this study was the selection of data referring to the Physical Therapy, Occupational Therapy, and Speech Therapy fields. The choice was made out of the necessity of a better understanding of the specifics of the use of information and communication technologies in these programs during the COVID-19 pandemic in Brazil.

Following a mixed methods exploratory approach (qual + quan) (GALVÃO; PLUYE; RICARTE, 2017), the data were obtained by an online questionnaire containing: 1) Project data, informed consent form, and consent to participate in the project; 2) Structured questionnaire on the social and demographic profile of participants, with questions referring to age, sex, race, State they live, and Internet connectivity; 3) Structured questionnaire on the use of higher education technologies and institutional support during the pandemic; 4) Open question on the perception of the use of information and communication technologies in studies during the pandemic.

The REDCap platform, Version 9.5.0, was used to collect the data. This platform was developed and provided by Vanderbilt University (United States) and installed in a Brazilian public university server, therefore being available to the researchers of this study.

The demographic profile data were exported and their descriptive statistics analysis was carried out through the R software, version 4.2.1 2022. The qualitative data obtained from the open question were exported to the MAXQDA software and analyzed to verify potential emerging themes. These data were analyzed through reflexive thematic analysis, according to Braun and Clarke (2006). The reflexive thematic analysis is considered a crucial qualitative analysis method, which may be applied to a range of theory structures and research paradigms, being closely related to the research issue (BRAUN; CLARKE, 2006; BRAUN *et al.*, 2019). The thematic analysis had six phases, as follows: 1) being familiar with the data; 2) initial data generation; 3) searching for themes; 4) theme review; 5) definition and naming of themes, and 6) report preparation. The thematic analysis was carried out by two female researchers, in an isolated manner, to be subsequently consolidated by the group of researchers that were part of the research team (BRAUN *et al.*, 2019).

The study was approved by the independent review committee on human research, ensuring the privacy and confidentiality of participants, who were volunteers and received no monetary compensation to participate in the study.

The participants were recruited for five months, in 2020, and the focus was the five geographic regions of Brazil. Considering the social isolation period, the first recruitment strategy was sending invitations through social media, such as Facebook, Instagram, and Twitter. In this context, educational institutions were approached, as well as groups of students in undergraduate and graduate studies programs, and student unions; individual invitations were also made. For example, 597 invitations were made via Facebook to pages of Universities, University Centers, Schools, Academic Athletic Associations, Academic Leagues, and Student Unions related to the health area programs throughout Brazil. This recruitment process was carried out by 2 university professors, 1 PhD student (with scholarship), and 1 undergraduate student (scholarship). The second recruitment strategy was made through invitations sent via e-mail, with a greater focus on higher education institutions and professional boards. For example, 42 e-mails were sent to representatives of the Regional Boards of Physical Therapy and Occupational Therapy, and each was invited more than once. This second strategy was carried out by 5 university professors. Therefore, it may be stated that the disclosure work to recruit participants was intense.

As inclusion criteria, only participants over 18 years of age, whether Brazilian or foreigners, who self-declared being enrolled in a public or private higher education institution in Brazil, were considered.

Considering this moment in history and the exploratory methodology options, we have chosen a convenience sampling that was established based on the recruitment due date.

3 Results

Eighty-seven students of the Speech Therapy (n=11, 12.6%), Physical Therapy (n=53, 60.9%), and Occupational Therapy (n=23, 26.5%) programs from Brazilian institutions throughout the five regions of the country participated in the study, with the majority from the Southeast region (n=66, 75.9%). The demographic profile of the responders was as follows: 76 (87.4%) were women, 57 (65.5%) were White, and 72 (82.8%) studied in public institutions, with 63 (72.4%) from undergraduate studies programs, 9 (10.3%) from graduate studies programs, and 15 (17.3%) university professors.

Eighty-four participants gave their opinions on the institutional support received during the pandemic for the use of information and communication technologies in the teaching-learning process: 13 (15.5%) participants considered it poor; 40 (47.6%) regular; 23 (27.4%) good, and 8 (9.5%) great.

All participants stated that they used information and communication technologies in the teaching-learning process during the pandemic, from which 74 (85.1%) stated that they participated in learning virtual environments; 66 (75.9%) participated in videoconferences; 59 (67.8%) used video or audio platforms; 56 (64.4%) made searches on web search engines; 48 (55.2%) used cell phone applications; 45 (51.7%) participated in chats; 45 (51.7%) made researches on specialized databases; 44 (50%) participated in discussions forums; 41 (47.1%) used e-mails; 41 (47.1%) used social networks; 33 (37.9%) used web applications; and 8 (9.2%) used virtual simulations.

The starting question "What were your perceptions about the use of communication information technologies in the teaching-learning process during the COVID-19 pandemic?" was used as a basis for the qualitative analysis of data. These were the three predominant themes: 1) Positive perceptions about the use of information and communication technologies in the teaching-learning process during the pandemic; 2) Perceptions related to the adversities while using information and communication technologies in the teaching-learning process during the pandemic; and 3) Perceptions related to the strategies to improve the use of information and communication technologies in the teaching-learning process. The themes are introduced in this order and the transcriptions of the participants' speeches are included, with a brief description of their profiles.

3.1 Positive Perceptions

Twenty perceptions were identified from the research participants related to the positive aspects of the crisis imposed by the pandemic and the use of communication information technologies in the teaching-learning process.

These were the highlights related to this theme: an adaptive response of universities regarding the COVID-19 pandemic, which allowed the activities to be maintained through the emergency remote education process; the availability of resources and support material by the professors, which allowed the students to continue studying, with the possibility of consulting materials and watching video classes; the possibility of autonomy in the teaching-learning process due to the fact that, while studying in their houses, the students and professors were able to adjust the schedule of contents according to their commitments and interests.

> *Information technologies were crucial to keeping studying the subjects, having tests applied, submitting works, and participating in classes through videoconference (undergraduate studies program student, female, 21 years of age, parda [dark-skinned], Physical Therapy program, public institution).*
>
> *My perception about the use of the information technology has been great so that the process can continue during the pandemic (graduate studies program student, 32 years of age, White, Physical Therapy, public institution).*
>
> *The video classes are a crucial resource to keep the educational schedule ongoing (undergraduate studies program student, male, White, 20 years of age, Physical Therapy, public institution).*
>
> *The use of communication information technologies in the teaching and learning process made it possible to study the contents according to my rhythm (undergraduate studies program student, female, 21 years of age, White, Occupational Therapy, public institution).*
>
> *Generally speaking, technological resources may be an excellent way to supplement the educational process and many things may be explored to diversify and make the academic schedule more flexible (undergraduate studies program student, female, 25 years of age, White, Physical Therapy, public institution).*
>
> *My experience was positive because I did not have to go from one place to another every single day (undergraduate studies program, female, 19 years of age, parda, Physical Therapy, private institution).*

3.2 Adversity-Related Perceptions

Eighty-four perceptions have been identified on adversities related to the use of information and communication technologies in the teaching-learning process during the pandemic.

These were the highlights related to this theme: the gap in the teaching and learning process quality, mainly the lack of interaction between students and student-professor, as well as the challenges to understand the content taught and to have questions answered by the professors; overload of work submitted to students in the distance learning modality since several professors increased the load of work and tasks of the students; the superficiality of the emergency remote education since students reported that they felt like the class contents were only taught to have the current educational schedule completed, with professors not concerned if the students were indeed learning or if they had suggestions of possible changes in the way to teach the theme being studied; lack of technological resources so that both students and professors have access to online classes, with some points being brought out, such as the quality of the Internet network, overloaded learning platforms in periods with many accesses, and people who did not have one or more cell phones or PC in a house; lack of a proper environment to study, challenges to stay focused on the classes and keep a routine of studies while staying at home, as well as physical and emotional problems that can emerge from the high pressure while studying; professors facing challenges to use the technological resources; and damages to the student-patient relationship.

> *A general point to be observed in all subjects was that the interaction with the professor was damaged, and it compromises the process of having our questions answered. Sometimes, it was not easy to reach out to the professors (undergraduate studies program student, female, 20 years of age, White, Physical Therapy, public institution).*
>
> *The interaction with students is reduced on the Internet; it is not possible for everyone to check the other out and interact in the way we were used to. A conversation, a question, they often do not happen in the virtual environment (professor, female, White, 54 years of age, Occupational Therapy, public institution).*
>
> *The use of technologies made most professors believe they should increase the amount of work, and ended up overloading students (undergraduate studies program, 21 years of age, White, Occupational Therapy, public institution).*
>
> *I feel that the subjects are taught carelessly, with no concerns about their purposes, and so the quality really went down (undergraduate studies program student, 20 years of age, White, Physical Therapy, public institution).*
>
> *It is a very primitive method yet and it cannot match the quality of the on-site education. Boring classes. Lack of a better educational approach by the faculty (graduate studies program student, 23 years of age, female, White, Physical Therapy, public institution).*

The Internet of each student has different speeds, so the individual experiences are also different. Therefore, the use of technology in the teaching-learning scope is not the same for everyone (undergraduate studies program student, 19 years of age, female, parda, Speech Therapy, public institution).

I am not the only person at home all day; other people I live with are also here, so it affects my concentration. My concentration was also affected during the online activities due to the technology itself, which makes me easily distracted. I like studying alone, but some contents, even the ones that do not require a practice part, have been a challenge because they are only presented in an online manner (undergraduate studies program student, 25 years of age, female, White, Physical Therapy, public institution).

Several students started to experience anxiety crises over and over again, not to mention that they were physically tired from being on the PC all the time (undergraduate studies program students, female, 21 years of age, White, Occupational Therapy, public institution).

Not all professors received support to manage the platforms, and some of them are facing challenges related to it (undergraduate studies program student, 22 years of age, female, White, Physical Therapy, public institution).

Even though technologies are a support in the process to keep up with the contents, I am in the last year of my undergraduate program, which is based only on clinical practice...there are no remote classes that can replace the on-site clinical practice (undergraduate studies program student, female, 22 years of age, White, Speech Therapy, public institution).

3.3 Strategy-Related Perceptions

Ten strategy-related perceptions to be considered in the use of information and communication technologies in the teaching-learning process during the COVID-19 pandemic were identified, in order to improve the teaching-learning process quality. These were the highlights: suggestions for training professors and students in order to get better performance with the technology use; the need to ensure the dimensioning of technological resources in institutions, in order to meet the huge, simultaneous demand, and to make equipment available for student access; the need to reconsider the educational planning based on the use of technologies, including strategies to assess the effectiveness of the remote activities performed.

The institution almost had no concerns to know if all students had quality Internet access and even access to a PC, cell phone, or tablet to check the contents. [...] There is one thing to be discussed among the professors: are distance learning classes effective? Because there is no point in making students deliver tons of work that they request on the platforms if we learn nothing from the content taught (undergraduate studies program student, female, 18 years of age, White, Occupational Therapy, public institution).

Professors and students still have to receive more guidance on this new modality (graduate studies program student, female, 24 years of age, parda, Speech Therapy, public institution).

Capacity-building sessions need to be provided so that both professors and students can learn how to use these resources. Also, better training for professors on the use of determined technologies so that the learning goals can be reached (professor, female, 42 years of age, White, Physical Therapy, private institution).

The class system of the university does not support the number of students and the connection is often slow (undergraduate studies program student, female, 25 years of age, White, Physical Therapy, public institution).

4 Discussion and final remarks

The systematized quantitative and qualitative data on the use of information and communication technologies for teaching Occupational Therapy, Physical Therapy, and Speech Therapy during the COVID-19 pandemic are convergent and complementary (PLUYE; HONG, 2022). The quantitative data, for example, highlight the lack of institutional support during the pandemic, while the qualitative data reinforce the adversities experienced in that period.

It may be stated that the results found are aligned with the perceptions registered in the national and international literature, that is, the use of information and communication technologies in the teaching-learning process was not the same for all students and professors (ARISTOVNIK *et al.*, 2020; FELTER *et al.*, 2021). In particular, we have to highlight the predominance profile of the participants in this study: White women living in the Southeast Region of Brazil, even though the research was broadly disclosed throughout the country.

In this study, it was observed a benefit from the use of information and communication technologies to maintain the academic activities ongoing during the pandemic in Physical Therapy, Occupational Therapy, and Speech Therapy, according to some participants. However, regarding this use, there was poor institutional support and the adoption of more traditional technologies for remote education, such as learning virtual environments and video classes, audio and video platforms and research on web search engines, instead of more interactive and realistic ones, such as simulations, virtual reality, augmented reality, and telehealth.

The adversity-related perceptions of students were significantly more recurrent than the positive ones. The positive aspects observed include, on the one hand, an assessment that the solutions adopted were the only way to prevent the full disruption of activities and, on the other hand, characteristics that are broadly disclosed as remote education advantages, such as the flexibility of schedules, the flexibility of study rhythm,

and no commuting. As for the adversity-related perceptions, the assessments are more critical, such as reduced interactions, improvisation and lack of preparation to adopt the technologies used, increased workload and conditions that are often poor for the proper monitoring of activities.

The strategy-related perceptions to be considered in the use of information and communication technologies in the teaching-learning process during the pandemic were less recurrent than the positive and adversity-related ones, being focused on the methodology and technology capacity building of professors and students and on the quality of the Internet connection services. New technologies were not adopted, which may show the lack of repertoire in the use of technologies, unavailability of resources, and a gap of knowledge on the technological solutions applied to education, mainly in the Physical Therapy, Occupational Therapy, and Speech Therapy areas, which was also observed by Naidoo *et al.* (2022) and Khoza-Shangase *et al.* (2022).

No perceptions were identified either that defended remote education as a replacement for on-site education for the areas studied herein; this modality was understood as a possibility for crisis moments or for theory content only, as reported by other areas, such as Nursing (GALVÃO *et al.*, 2021b) and Medicine (GALVÃO *et al.*, 2022); it means that there is a preference for human interactions on-site, like it was before the pandemic (ADRIANI *et al.*, 2020).

It was observed that remote education, as presented herein, has advantages when compared to on-site education for several reasons, including potential lack of preparation from the academic community, lack of resources for a more expressive technological transition, as well as specifics related to the health care field, like the student-patient relationship, which is crucial.

The data found in this study provide evidence that the use of information and communication technologies for teaching Physical Therapy, Occupational Therapy, and Speech Therapy demands deeper attention from higher education institutions and the academic community, for the inclusion of innovations in the teaching-learning process, training for the teaching-learning process, training for the use of technologies and development of assessments on the higher education innovation of these areas.

Finally, based on the disclosure and recruitment processes carried out, it was expected a higher number of participants, which did not happen. Reflections on this decreased number of participants became hypotheses, as follows: 1) potential challenges accessing the Internet in that period; 2) health professionals as frontline workers during the pandemic, in which the priorities were more relevant to the human life; 3) decreased mental and/or physical health of the individual or their families; 4) lack of motivation to participate in a research study without an immediate reward; 5) lack of a closer relationship with the researchers. These hypotheses deserve to be better analyzed in future studies.

Tribute

We dedicate this study to Prof. Dr. Pierre Pluye from the Faculty of Medicine and Health Sciences of McGill University, in Canada. Prof. Pluye has been a great defender of the use of information and communication technologies in the health field, in processes to disseminate information and education; he also contributes to the use of mixed methods throughout the globe, particularly for us, the researchers of the School of Medicine of Ribeirão Preto, from the University of São Paulo, and the University of Campinas.

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Contribuição dos autores

Maria Cristiane Barbosa Galvão – Coordenadora do projeto, participou de todas as etapas do projeto. Realizou a revisão gramatical.

Ivan Luiz Marques Ricarte – Participação ativa em todas as etapas do projeto, especialmente, na análise dos dados quantitativos. Realizou a revisão gramatical e final.

Gabriela Rezende – Participação ativa na metodologia qualitativa, análise dos dados qualitativos e revisão da escrita.

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The translation was carried out by *Varendi Translation*.

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