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ORIGINAL RESEARCH REPORTS

Student Perceptions of Distance Learning Using Synchronous Videoconferencing in a Campus-Based Physical Therapist Education Program

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Abstract

Purpose: **The embrace of technology-mediated learning environments for physical therapist education has perpetuated a natural shift toward blended online and hybrid learning environments. Yet understanding how students in graduate level physical therapy programs perceive distance learning remains unexamined. The purpose of this study was to examine students' perspectives of a distance learning (DL) course delivered via synchronous videoconferencing within a traditional campus-based doctor of physical therapy (DPT) program.**

Method: **A convenience sample of 150 first year DPT students was collected. All students were present on-campus in Pocatello, and Meridian, Idaho. The instructor was located on-campus in Meridian. Student perceptions were examined using a survey given on the first, and last days of a clinical kinesiology course. The survey consisted of favorable and unfavorable questions regarding the use of DL each rated on a five-point Likert scale. Descriptive statistics and tests of two proportions with z-scores were used to analyze survey results.**

Results: **Most students preferred traditional in-person learning environments (74.5%). Students reported difficulty contributing to in-class discussions, with the percentage increasing from baseline compared to the end of the course (Δ10.1% $z = -2.14$, $p = 0.03$). Many students (57.8%) disagreed with the idea that DL negatively impacts grades.**

Discussion: **Contemplation of the pre and post changes of students' responses to the survey seem to indicate: 1) students can adapt to DL, even when not preferred, and most do not believe it negatively impacts their grade 2) students do not consider the technology a barrier to their learning and some learned to enjoy it 3) learning strategies must adjust when the instructor and students are physically distant. Further research is warranted to better understand the skills necessary to effectively engage students in synchronous videoconference formats.**

Keywords: Videoconferencing, Distance learning, Student perceptions, Physical therapy education, Technology

1. Introduction

The use of technology to enhance teaching and learning in higher education continues to advance exponentially across disciplines, including entry-level health professions [1]. Technology-mediated environments provide instructors with opportunities to design learner-centered experiences for effective and efficient learning [2].

Distance learning is a broad term that describes any learning where the instructor and the student are not physically present in the same location. Greenberg defines distance learning as "a planned teaching/learning experience that uses a wide spectrum of technologies to reach learners at a distance" [3]. There are various instructional methods for distance learning but Teaster and Blieszner indicate that the primary distinction for distance learning is that the learner and the teacher are separate in space and possibly time [4]. Distance learning using real-time videoconferencing technology provides increased convenience for

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instructors to teach more students than can be accommodated in traditional classrooms [5]. This technology can be helpful when physical building space is limited and when cohorts are located on separate physical campuses [6,7].

Distance learning via synchronous videoconferencing has been utilized effectively in healthcare programs including surgery [8], emergency medicine [9], internal medicine [10], pharmacology [7,11], nursing [12], general medicine [13,14], and dentistry [15]. Yet, a majority of physical therapy programs in the United States continue to utilize traditional face-to-face methods for content delivery [16]. Due to increasing costs of physical therapy education and limited educational space, several programs are moving to distance learning platforms [17]. For technology-mediated environments to have the desired effect, it is imperative that physical therapy programs in the United States provide appropriate technology for training that also prepares students for successful practice in remote settings made possible by technological advancements.

Necessary modifications in teaching and learning brought about by the COVID-19 pandemic will likely compel physical therapy programs to embrace technology more readily [18]. For student preparation and future remote practice, distance learning is a natural fit. As physical therapy education more fully embraces and innovates with technology, especially distance learning technologies, it is necessary for educators to explore appropriate choices that provide evidence of efficacy and positive impacts [19,20].

Literature on best practices in physical therapy education using distance learning is currently lacking [21]. There are at present seven doctor of physical therapy programs in the United States utilizing distance learning via synchronous videoconferencing technology to link host and satellite campuses for content delivery [16]. Few studies exist in the literature that provide student perspectives of synchronous videoconferencing in physical therapy education with regard to learning outcomes [22–24]. To our knowledge there are no studies that involve students in graduate courses in a program accredited by the Commission on Accreditation in Physical Therapy Education (CAPTE), which is the current standard for physical therapist education in the U.S.

The purpose of this investigation was to examine students' perspectives of a graduate level course delivered via synchronous videoconferencing in an on-campus doctor of physical therapy program. This investigation specifically sought to identify whether student perspectives of the synchronous videoconferencing format would be altered by their learning experience throughout the semester. We held two assumptions. First, students will compare their experience with their prior learning using traditional delivery methods. Second, the students' opinions will be transformed by the experience as the semester progresses.

2. Materials and methods

2.1. Setting

Surveys were administered electronically at Idaho State University (ISU) using Qualtrics© experience management software (Copywrite version 2022). The surveys were adapted from prior studies given in a similar educational setting [23,24]. In 2018, the ISU physical therapy program expanded from Pocatello, ID to Meridian, ID, extending physical therapist education to both urban and rural areas of the state. This educational model delivers synchronous video broadcasting of lectures and labs to students at both campuses, in a similar fashion to that described by Cook et al [25].

2.2. Participants

The anonymous survey was administered to first-semester students on the first and last days of the Clinical Kinesiology and Biomechanics course. The survey was given to cohorts during two consecutive years. All students in the corresponding cohorts were invited to participate. The study was approved by the ISU Institutional Review Board and electronic informed consent was obtained for each participant. Survey responses were stored on the Qualtrics servers backed by Transport Layer Security encryption.

2.3. Technology use

The ISU physical therapy program uses synchronous video conferencing and distance learning technologies for student instruction. Each classroom has a large screen with a projector and/or multiple high-definition video monitors to view the distant site and any shared content (e.g., a slide-show presentation). The instructor podium contains various audio/visual devices for the instructor to share resources and communicate with students at both sites. The instructor can see students at the remote site and interact with them in real-time using direct microphone connections. When a student presses a button on their microphone to speak, a camera automatically zooms in and features the student. There is at least one instructor

and possibly an assistant instructor at the remote site to assist or attend to students' needs. There is also a technician at each site to manage the technology, assist with classroom logistics, and record lectures. The intentionality of this synchronous instructional design ensures students have the same, if not, very similar learning experiences at each location.

2.4. Design

This investigation utilized a pre- and post-survey on students' perceptions of distance learning (DL). The survey asked for participants' biographic information and for responses to ten questions on a five-point Likert scale. Survey questions were purposefully directed using a mixture of prompts in favorable and unfavorable tones regarding the use of DL (Table 1).

The data analysis for this paper was generated using Qualtrics software, Copyright version 2022. Individual responses were analyzed using qualitative methods to determine the student's perceptions of distance learning in comparison to traditional classroom instruction. For ease of interpretation the five-point scale was reduced to a three-point scale (agree, neutral, disagree) for analysis [26]. The principal investigator used inductive analysis based on Strauss and Corbin [27], to identify patterns of meaning which were categorized into four schemes affecting the pedagogical experience: 1) The Learning Environment (questions 1–4); 2) The Learning Process (questions 5–7); 3) Comparison to Conventional Delivery Methods (questions 8 & 9); and 4) Impact on Grades (question 10). Descriptive statistics of survey responses were analyzed and tests of two proportions with z-scores were used to compare pre-and-post survey results.

Table 1. Survey questions provided to study participants. All statements were given with a 5-point Likert scale: Strongly disagree, disagree, neutral, agree, strongly agree.

Q1	Distance learning is fun and interesting
Q2	Distance learning does not offer any advantages to me
Q3	Distance learning requires significant changes in the learning process by the students
Q4	It is difficult to contribute to class discussions in a distance learning course
Q5	I believe that I can learn more or would learn more through distance learning material than through traditional in-person lectures
Q6	I prefer distance learning courses to traditional courses
Q7	Distance learning makes completion of course assignments difficult
Q8	Distance learning negatively impacts my grade
Q9	Distance learning technology is a significant detriment to my learning
Q10	I would benefit from more distance learning courses

3. Results

All one-hundred fifty students completed the pre-survey (21–42 years of age, 82 females and 68 males) and one-hundred forty-seven students (98%) completed the post-survey. Complete demographic information can be seen in Table 2. All survey responses are tabulated in Table 3. There were significant differences in the pre and post opinions of the students on several of the prompts.

3.1. The learning environment

Question prompt (QP) #1: DL is fun and interesting: At baseline 15.7% of students agreed with this statement. However, at the end of the semester the value increased to 29.3% (Δ13.6%, $z = -2.74$, $p = 0.006$) (Fig. 1).

QP#2: DL does not offer any advantages to me: Responses to this prompt were divided relatively evenly across the participants at the end of class. Approximately 1/3 of students agreed with the prompt, another 1/3 disagreed, and 1/3 felt neutral about the statement prompt. While no statistically significant changes occurred from baseline to the end of the semester, there was a non-significant trend toward disagreement: at baseline 26.7% of students disagreed, whereas at the end of the semester that number jumped to 34% (Δ7.3% $z = -1.39$, $p = 0.162$). Many of the previously neutral students on this issue ultimately came to appreciate some of the advantages of DL.

QP#3: It is difficult to contribute to class discussions in a DL course: At baseline, a high proportion of students responded in agreement with this prompt (44.3%). The proportion increased throughout the semester to include a majority of students expressing some degree of difficulty contributing to in-class discussions by the end of the course (54.4%) (Δ10.1% $z = -2.14$, $p = 0.03$).

Table 2. Participant demographics.

Age	26 (4.01)[a]
Sex	68 M, 82 F
Year graduated High School	2012 (4.00)[b]
Years of post-secondary education (post High school)	5.12 (1.44)[a]
Previous experience with *synchronous* distance or online education	20.8%
Previous experience with *asynchronous* distance or online education	81.3%

[a] Values are mean (std. deviation).
[b] Value is median (std. deviation).

Table 3. Student responses to question prompts from pre and post surveys, consolidated to three-point scale [26].

		Disagree	Neutral	Agree
Pre-Survey				
Q1	Distance learning is fun and interesting	30.0%	54.3%	15.7%
Q2	Distance learning does not offer any advantages to me	26.4%	37.9%	35.7%
Q3	Distance learning requires significant changes in the learning process by the students	24.3%	25.0%	50.7%
Q4	It is difficult to contribute to class discussions in a distance learning course	20.0%	35.7%	44.3%
Q5	I believe that I can learn more or would learn more through distance learning material than through traditional in-person lectures	75.7%	20.7%	3.6%
Q6	I prefer distance learning courses to traditional courses	77.9%	21.4%	0.7%
Q7	Distance learning makes completion of course assignments difficult	35.0%	42.1%	22.1%
Q8	Distance learning negatively impacts my grade	37.1%	50.7%	12.1%
Q9	Distance learning technology is a significant detriment to my learning	42.9%	41.4%	15.7%
Q10	I would benefit from more distance learning courses	47.1%	47.9%	5.0%
Post-Survey				
Q1	Distance learning is fun and interesting	29.3%	41.5%	29.3%
Q2	Distance learning does not offer any advantages to me	34.0%	30.6%	35.4%
Q3	Distance learning requires significant changes in the learning process by the students	38.4%	17.8%	43.8%
Q4	It is difficult to contribute to class discussions in a distance learning course	24.5%	21.1%	54.4%
Q5	I believe that I can learn more or would learn more through distance learning material than through traditional in-person lectures	73.5%	24.5%	2.0%
Q6	I prefer distance learning courses to traditional courses	74.1%	21.8%	4.1%
Q7	Distance learning makes completion of course assignments difficult	59.2%	23.1%	17.7%
Q8	Distance learning negatively impacts my grade	57.8%	27.2%	15.0%
Q9	Distance learning technology is a significant detriment to my learning	59.2%	24.5%	16.3%
Q10	I would benefit from more distance learning courses	49.0%	44.9%	6.1%

QP#4: I would benefit from more DL courses: The overwhelming majority of students either disagreed with this statement or responded impartially. Only 5.1% (at baseline) and 6.0% (at the end of the class) responded in favor of increasing the number of DL courses.

3.2. The learning process

QP#5: DL requires significant changes in the learning process: In response to this prompt given at baseline, the highest percentage of students (50.7%) felt that delivery via DL would cause a substantive change to the customary knowledge acquisition process. This sentiment remained high throughout the semester, with 43.8% of students acknowledging the same concerns at the end of the course. Indeed, when pre and post data were averaged, a high proportion of students (47.3%) indicated agreement with the need to change their learning styles to adapt to DL methods while just 31% disagreed with that prompt ($\Delta 16\%$, $z = -3.87$, $p = 0.00$) (Fig. 2).

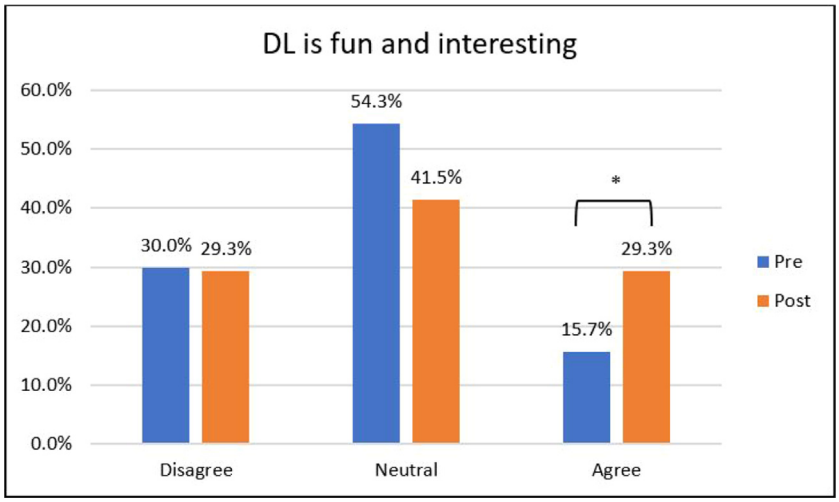

*Fig. 1. Student perceptions on the first (pre) and last (post) days of class, according to the following prompt: Distance learning (DL) is fun and interesting. *$p < 0.05$. DL = Distance learning.*

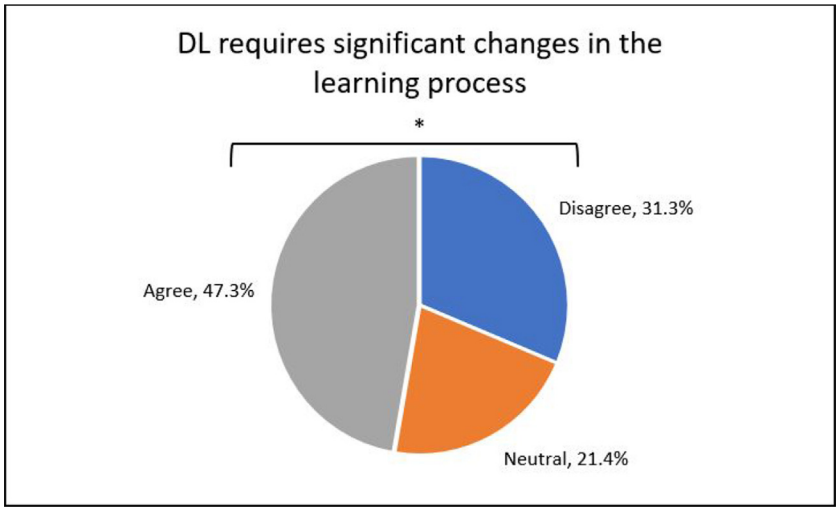

*Fig. 2. Averaged student perceptions across pre and post surveys, according to the following prompt: Distance learning (DL) requires significant changes in the learning process. *p < 0.001. DL = Distance learning.*

QP#6: DL makes completion of course assignments difficult: At baseline, the highest percentage of students responded impartially (neutral) to this prompt (42.1%), while 35% of students disagreed with the prompt. At the end of the term however, the preponderance of students expressed disagreement with the statement (59.2%), indicating a statistically significant repudiation of the idea that delivery via distance learning increased the difficulty of completing course assignments (Δ 24.2%, z = −4.10, p = 0.00).

QP#7: DL technology is a significant detriment to my learning: 59.2% of students disagreed with this statement at the end of the course. From baseline, this was an increase of 17% (z = −2.77, p = 0.006) (Fig. 3).

3.3. Comparison to Conventional Delivery Methods

QP#8: I believe that I can learn more or would learn more through DL delivery than through traditional in-person lectures: Students overwhelmingly believed, both before (75.7%) and after the length of the course (73.5%), that they could learn more from in-person lectures than from material taught through DL.

QP#9: I prefer DL courses to traditional courses: In like manner to the above, students consistently maintained an opinion favoring traditional teaching methods in place of DL delivery (77.9% before class started; 74.1% after class ended).

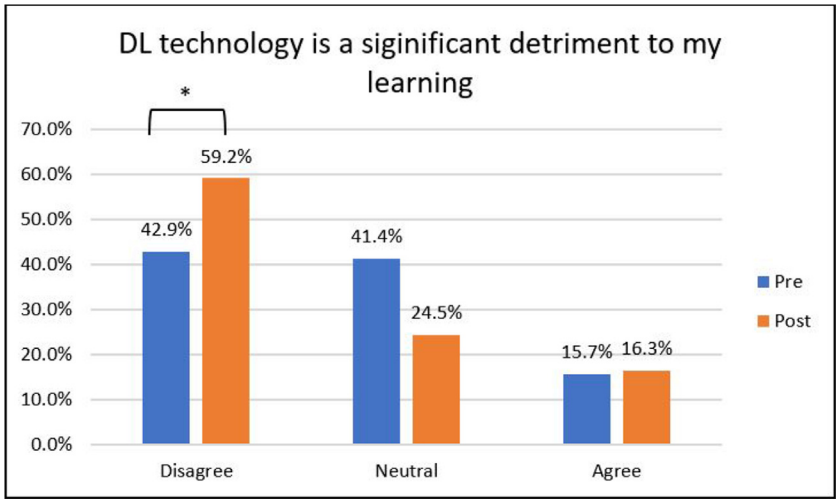

*Fig. 3. Student perceptions on the first (pre) and last (post) days of class, according to the following prompt: Distance learning (DL) is a significant detriment to my learning. *p < 0.05. DL = Distance learning.*

3.4. Impact on Grades

QP#10: DL negatively impacts my grade: 50% of students were impartial to this statement at baseline, while 12.1% agreed with it, and 37.1% disagreed with the prompt. There was a statistically significant shift in the proportion of students who disagreed with this statement from pre-to-post however, with the majority of students (57.8%) refuting the idea that DL negatively impacts grades by the end of the semester (Δ20.7%, $z = -3.51$, $p = 0.00$) (Fig. 4).

4. Discussion

Four themes emerged from this examination of student perceptions of distance learning: 1) students who are accustomed to traditional courses prefer in-person instruction, however they can develop an appreciation for DL; 2) although many found active participation in class more difficult, they did not believe DL was a barrier to their learning; 3) active learning strategies are needed when the instructor and students are physically distant; 4) students perceived a need to change their learning styles to adapt to DL delivery methods.

Students clearly have a different experience when learning through synchronous DL courses. Only 20% of this cohort had any experience with synchronous DL courses prior to this class. Accordingly, a large majority of students (>73%) felt they could learn better from in-person lectures than from material taught through DL. In addition, these students overwhelmingly indicated a preference for traditional, in-person lectures both before and after the course (average 76%, *QP#9*). These results are consistent with a meta-analysis in undergraduate education comparing distance education to traditional classrooms [28]. Maring et al., also found that 16% of students in a physical therapy program had previously taken a DL course, and just 17.4% of the cohort preferred distance learning [24].

Despite the preference for in-person instruction, students in this cohort demonstrated both a recognition of a need to change, and an ability to change their learning style to cope with a novel delivery method. Changes in learning styles have been seen in medical and pharmacy students in response to different models of delivery [29,30]. A majority of students in our cohort (57.8%) felt that DL had no negative impact on their grade. These results are consistent with prior studies demonstrating that students perform well in distance learning in other health professions programs, including physical therapy [25,31], occupational therapy [32], and nursing [33].

One of the significant challenges posed by DL is the physical distance — which creates an unperceived barrier — between the instructor and the student. While DL technology affords institutions the opportunity to reach more students [5], it also creates an increased transactional distance between students, instructors, and peers [34,35]. In our cohort, a majority of students indicated some degree of difficulty contributing to class discussions in the DL course (54.5%). Students often find it difficult to maintain focus in distance based programs [24]. Croft, Dalton and Grant conducted a study on student isolation in a distance learning program and determined that student isolation from peers was

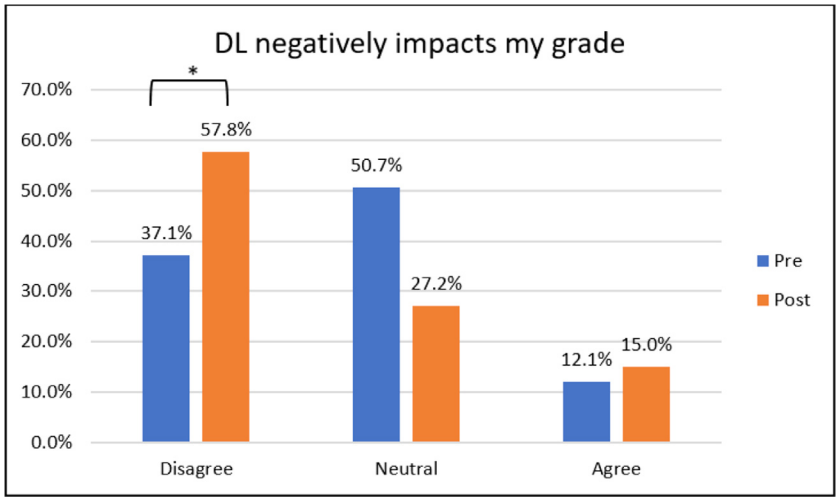

*Fig. 4. Student perceptions on the first (pre) and last (post) days of class, according to the following prompt: Distance learning (DL) negatively impacts my grade. *p < 0.001. DL = Distance learning.*

another impediment to their learning, and affected their learning experience negatively [36]. The study also concluded that the lack of interaction between students and instructors was detrimental to student learning.

Although student isolation was not a targeted item in this study, the element of participation and interaction is key in synchronous DL delivery. Our experience has taught us that instructors have to plan on how to engage students in the distant classroom and make them feel they are in the same learning environment. Instructors who teach with DL using blended learning and synchronous technologies need to emphasize learner-centered techniques with deliberate plans to actively engage students with effective formal and informal assessment practices that target desired learning outcomes [37]. Such learner-centered assessment may reside in not only what understanding is being measured but also how it is assessed in order to accurately gather evidence of learning [38]. Even for traditional face-to-face delivery, the method by which instructors facilitate understanding of learning content is critical to achieving desired learning outcomes.

4.1. COVID-19 impact and relevance

Although the pandemic environment was not a part of this study, its relevance sheds light on unintended consequences of the optimal use of technology for teaching and learning. Technology evolved so quickly with the impact of COVID-19 that many institutions and programs went straight to online teaching and learning, skipping through many essential steps [39]. Hodges et al. suggest that the creation of an effective online course may take up to 9 months to adequately develop [40]. A reasonable conclusion can be drawn that the exposure of instructors and students to this unique distance learning environment enabled this program to transition seamlessly under COVID-19, which would have been an otherwise potentially devastating event, as experienced by many institutions [39]. In other words, because the program was already using DL technology regularly, it was not as radical a change as it could have been when it moved to more online delivery due to the pandemic. Results from this study and lessons learned from the transition to distance learning due to COVID-19 protocols, suggest that previous experience with distance learning could assist with the transition to emergency remote teaching or fully hybrid education.

4.2. Limitations

One of the limitations of this study is that the sample of students was drawn from a single institution, in a mostly rural state, and therefore possesses a relatively low degree of external validity for some programs. The perceptions expressed in this survey are also derived from one course and are likely to be influenced by one instructor and the method of delivery. In this particular course, the pedagogical delivery method was primarily lecture, which is an inherently passive knowledge acquisition method. This method may have influenced some of the students' negative perceptions of distance learning, including the ability to contribute to class discussions (*QP#3*). The course director in this study taught using DL for just one year one prior to this study, therefore the general lack of student satisfaction in this study may also be a representation of the instructor's lack of experience with this delivery model. In addition, because the data were de-identified to protect students' identity, we did not have the ability to tie demographic questions such as prior experience with synchronous distance education, to individual survey responses. Finally, as a cross-sectional study the students' perceptions may be unique to that point in time, rather than an accumulation of experiences across the entire program of study as in a longitudinal study design.

5. Conclusion

What physical therapy programs plan to teach (curriculum) and how programs prepare the delivery of the curriculum (in-person, synchronous online, hybrid, etc.) may not be the same as what students *feel* about their learning experiences. To our knowledge this is the first study to examine student perceptions of distance learning using synchronous videoconferencing in a graduate course of a CAPTE approved physical therapy program. Small scale studies such as this, can provide a baseline determination of what it will take for students to succeed in distance learning environments. This study highlights the importance of understanding student perceptions of the learning environment and demonstrates that students can adapt to previously unpreferred learning models. This study also demonstrates the need to incorporate active learning strategies when the instructor and students are physically distant.

Ethical approval

Ethical approval has been granted by Idaho State University Institutional Review Board (IRB)

approval involving human subjects was provided by Idaho State University, #IRB-FY2018-190.

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References

[1] Liu Q, Peng W, Zhang F, Hu R, Li Y, Yan W. The effectiveness of blended learning in health professions: systematic Review and meta-analysis. J Med Internet Res 2016;18(1):e2. https://doi.org/10.2196/jmir.4807.
[2] Banas EJ, Emory WF. History and issues of distance learning. Publ Adm Q 1998;22(3):365–83.
[3] Greenberg G. Distance education technologies: best practices for K-12 settings. IEEE Technol Soc 1998;17(4):36–40. https://doi.org/10.1109/44.735862.
[4] Blieszner P, Teaster R. Promises and pitfalls of the interactive television approach to teaching adult development and aging. Educ Gerontol 1999;25(8):741–53. https://doi.org/10.1080/036012799267477.
[5] Bollag B, Overland MA. Developing countries turn to distance education. https://www.chronicle.com/article/developing-countries-turn-to-distance-education/. [Accessed 18 October 2022].
[6] King FB, Young MF, Drivere-Richmond K, Schrader PG. Defining distance learning and distance education. AACE Rev (AACE J) 2001;9(1):1–14.
[7] Moridani M. Asynchronous video streaming vs. synchronous videoconferencing for teaching a pharmacogenetic pharmacotherapy course. Am J Pharmaceut Educ 2007;71(1):16. https://doi.org/10.5688/aj710116.
[8] Ahmet A, Gamze K, Rustem M, Sezen KA. Is video-based education an effective method in surgical education? A systematic Review. J Surg Educ 2018;75(5):1150–8. https://doi.org/10.1016/j.jsurg.2018.01.014.
[9] Alnabelsi T, Al-Hussaini A, Owens D. Comparison of traditional face-to-face teaching with synchronous e-learning in otolaryngology emergencies teaching to medical undergraduates: a randomised controlled trial. Eur Arch Oto-Rhino-Laryngol 2015;272(3):759–63. https://doi.org/10.1007/s00405-014-3326-6.
[10] Bertsch TF, Callas PW, Rubin A, Caputo MP, Ricci MA. Effectiveness of lectures attended via interactive video conferencing versus in-person in preparing third-year internal medicine clerkship students for Clinical Practice Examinations (CPX). Teach Learn Med Winter 2007;19(1):4–8. https://doi.org/10.1080/10401330709336616.
[11] Buxton EC. Pharmacists' perception of synchronous versus asynchronous distance learning for continuing education programs. Am J Pharmaceut Educ 2014;78(1):8. https://doi.org/10.5688/ajpe7818.
[12] Carter LM, Heale Roberta. Teaching undergraduate nursing courses via videoconference: all that glitters is not gold. J Distance Educ 2010;24(2):109–15.
[13] Fritz JD, Treat R, Hueston WJ, Dodson L, Long RM. Medical student video use and summative exam performance during the first-year pre-clinical coursework and implications in distance education. Am J Dist Educ 2019;33(4):276–88. https://doi.org/10.1080/08923647.2019.1660123.
[14] Hortos K, Sefcik D, Wilson SG, McDaniel JT, Zemper E. Synchronous videoconferencing: impact on achievement of medical students. Teach Learn Med 2013;25(3):211–5. https://doi.org/10.1080/10401334.2013.797344.
[15] Kunin M, Julliard KN, Rodriguez TE. Comparing face-to-face, synchronous, and asynchronous learning: postgraduate dental resident preferences. J Dent Educ 2014;78(6):856–66.
[16] CAPTE. Accredited PT programs directory (key codes A5, E1). https://aptaapps.apta.org/accreditedschoolsdirectory/AllPrograms.aspx. [Accessed 13 January 2022].
[17] Shields RK, Dudley-Javoroski S. Physiotherapy education is a good financial investment, up to a certain level of student debt: an inter-professional economic analysis. J Physiother 2018;64(3):183–91. https://doi.org/10.1016/j.jphys.2018.05.009.
[18] Blackinton M. The future of DPT education post COVID-19. APTA magazine. Alexandria, VA: American Physical Therapy Association; 2021. p. 32–42.
[19] Guze PA. Using technology to meet the challenges of medical education. Trans Am Clin Climatol Assoc 2015;126:260–70.
[20] Volansky K. Physical therapist educators' perceptions of the benefits and challenges to teach "hands-on" skills in a blended environment. Q Rev Dist Educ 2019;20(3):11–29.
[21] Gagnon K, Young B, Bachman T, Longbottom T, Severin R, Walker MJ. Doctor of physical therapy education in a hybrid learning environment: reimagining the possibilities and navigating a "new normal". Phys Ther 2020;100(8):1268–77. https://doi.org/10.1093/ptj/pzaa096.
[22] Divanoglou A, Chance-Larsen K, Fleming J, Wolfe M. Physiotherapy student perspectives on synchronous dual-campus learning and teaching. Aust J Educ Technol 2018;34(3). https://doi.org/10.14742/ajet.3460.
[23] Jones A, Dean E, Hui-Chan C. Comparison of teaching and learning outcomes between video-linked, web-based, and classroom tutorials: an innovative international study of profession education in physical therapy. Comput Educ 2010;54:1193–201. https://doi.org/10.1016/j.compedu.2009.11.005.
[24] Maring J, Costello E, Plack M. Student outcomes in a pathophysiology course based on mode of delivery: distance versus traditional classroom learning. J Phys Ther Educ 2008;22:22–30. https://doi.org/10.1097/00001416-200801000-00005.
[25] Cook CE, Merrifield HH. Distance learning outcomes for Texas tech university's physical therapy program. J Phys Ther Educ 2003;17(1).
[26] Jeong HJ, Lee WC. The level of collapse we are allowed: comparison of different response scales in safety attitudes questionnaire. Biom Biostat Int J 2016;4(4):128–34. https://doi.org/10.15406/bbij.2016.04.00100.
[27] Corbin J, Strauss A. Basics of qualitative research. In: (3rd ed.): techniques and procedures for developing grounded theory. SAGE Publications; 2008.
[28] Allen M, Bourhis J, Burrell N, Mabry E. Comparing student satisfaction with distance education to traditional classrooms in higher education: a meta-analysis. Am J Dist Educ 2002;16(2):83–97.
[29] Gurpinar E, Bati H, Tetik C. Learning styles of medical students change in relation to time. Adv Physiol Educ 2011;35(3):307–11. https://doi.org/10.1152/advan.00047.2011.
[30] Novak S, Shah S, Wilson JP, Lawson KA, Salzman RD. Pharmacy students' learning styles before and after a problem-based learning experience. Am J Pharmaceut Educ 2006;70(4):74. https://doi.org/10.5688/aj700474.
[31] Veneri DA, Gannotti M. A comparison of student outcomes in a physical therapy neurologic rehabilitation course based on delivery mode: hybrid vs traditional. J Allied Health Winter 2014;43(4):e75–81.
[32] Jedlicka JS, Brown SW, Bunch AE, Jaffe LE. A comparison of distance education instructional methods in occupational therapy. J Allied Health 2002;31(4):247–51.
[33] Leasure AR, Davis L, Thievon SL. Comparison of student outcomes and preferences in a traditional vs. World Wide Web-based baccalaureate nursing research course. J Nurs Educ 2000;39(4):149–54.
[34] Moore M. The theory of transactional distance. In: Moore M, Diehl W, editors. Handbook of distance education. 4th ed. Routledge; 2018. chap. 3.
[35] Bolliger DU, Halupa C. Online student perceptions of engagement, transactional distance, and outcomes. Dist Educ 2018;39(3):299–316. https://doi.org/10.1080/01587919.2018.1476845.

[36] Croft N, Dalton A, Grant M. Overcoming isolation in distance learning: building a learning community through time and space. J Educ Built Environ 2010;5(1):27–64. https://doi.org/10.11120/jebe.2010.05010027.
[37] Fink LD. Creating significant learning experiences an integrated approach to designing college courses. Revised and updated edition. ed. Jossey-Bass. 2013. p. 1. online resource. Cover image, http://catalogimages.wiley.com/images/db/jimages/9781118124253.jpg.
[38] Lederman D. Advocates for student learning assessment say it's time for a different approach. High Educ. https://www.insidehighered.com/news/2019/04/17/advocates-student-learning-assessment-say-its-time-different-approach. [Accessed 13 January 2022].
[39] Ezarik M. How COVID-19 damaged student success. Inside higher. https://www.insidehighered.com/news/2021/06/21/what-worked-and-what-didn%E2%80%99t-college-students-learning-through-covid-19. [Accessed 13 January 2022].
[40] Hodges C, Moore S, Lockee B, Trust T, Bond A. The difference between emergency remote teaching and online learning. Educase Review. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning. [Accessed 13 January 2022].