JCEPT
JOURNAL OF CLINICAL EDUCATION
IN PHYSICAL THERAPY

ORIGINAL RESEARCH ARTICLE

Doctor of Physical Therapy students' clinical reasoning readiness and confidence treating with telehealth: a United States survey

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Abstract

***Purpose*:** Telehealth has an emerging footprint on entry-level physical therapy programs. Students' readiness for clinical reasoning with virtual versus traditional face-to-face treatment remains unknown. The purpose of this study was to evaluate Doctor of Physical Therapy (DPT) students' preparedness for clinical experiences with and without telehealth.

***Methods*:** A descriptive and exploratory cross-sectional survey was employed, with a voluntary convenience sample of 211 second- and third-year university DPT students during Fall 2020 clinical experiences. Descriptive and inferential statistics evaluated differences in DPT students' (1) Physical Therapist Self-Efficacy (PTSE) scale scores, (2) confidence with treating initial and subsequent same-patient visits, and (3) final Clinical Performance Instrument (CPI) clinical reasoning and summative scores during clinical experiences with and without telehealth.

***Results*:** Telehealth availability was 40.3%, with 16.6% of DPT students reporting participation. Most students reported being comfortable (39.3%) or neutral (32.2%) using telehealth. DPT students' confidence level using telehealth to treat was 74% on initial and 97% on subsequent same-patient visits. Mean PTSE scores were significantly lower during clinical experiences with telehealth (13.1) compared to traditional experiences (15.1) (P <.001) and for integrated (second-year) (14.1) compared to terminal (third-year) clinical experiences (15.5) (P <.001). For traditional experiences, weak positive associations were demonstrated between PTSE and CPI scores. There were no significant differences for CPI scores between telehealth and traditional experiences.

***Conclusion*:** While entry-level DPT programs continue to establish best practice for telehealth education, current trends in academic curriculum seem to prepare students' clinical reasoning readiness for clinical experiences. The PTSE could be used to identify outlier students requiring additional mentoring during traditional and telehealth clinical experiences.

Keywords: *clinical performance*; *COVID-19*; *telehealth*; *virtual*

Received: 3 July 2021; revised: 13 October 2021; accepted: 15 March 2022; Published: 7 June 2022

According to the American Physical Therapy Association (APTA) adopted Vision 2020, clinical reasoning in physical therapy practice is essential for Doctor of Physical Therapy (DPT) students to promote and bridge practice competency.[1,2] The ability of DPT students to derive and regulate a clinical decision is dependent on the students' beliefs or perceptions of how well they can execute courses of action required to deal with prospective situations, that is, self-efficacy.[3,4] Self-efficacy plays an essential role in how entry-level DPT students think, act, and behave. Understanding DPT students' beliefs and perceptions that comprise clinical reasoning self-efficacy becomes important during clinical experiences where knowledge, skills, and professional behavior applications affect clinical reasoning.[5]

Citation: Journal of Clinical Education in Physical Therapy 2022, **4**: 8537 - http://dx.doi.org/10.52214/jcept.v4.8537

Shift to telehealth in physical therapy practice

The COVID-19 pandemic transformed elements of the DPT students' clinical experience from traditional face-to-face to remote telehealth treatment.[6,7] While telehealth appears to have a future footprint on the profession, gaps remain in knowledge about DPT students' beliefs and perceptions in clinical reasoning self-efficacy, and confidence using telehealth during clinical experiences.[8,9]

Clinical reasoning during clinical experiences

Self-efficacy is an accurate predictor of behavior, and performance has a stronger association with achievement than either past experiences or outcome expectancies.[10,11] The DPT students' beliefs and perceptions in self-efficacy play an important role in fostering positive patient–practitioner interaction during clinical experiences.[12] The key to a successful clinical experience is the ability and self-efficacy to adapt to changing conditions in the clinic.

Recognizing student beliefs and perceptions that facilitate clinical reasoning self-efficacy during clinical experiences with and without telehealth may guide entry-level physical therapist program educational strategies to promote telehealth clinical performance.[13] Understanding if differences exist in DPT students' clinical reasoning self-efficacy between second-year (6-week) integrated clinical experiences housed within a didactic curriculum and third-year (12-week) terminal clinical experiences at the completion of the didactic curriculum may provide direction for curricular decision-making.

There is a lack of knowledge in understanding DPT students' comfort with technology-based clinical experiences. Students may display less clinical reasoning self-efficacy and confidence while using telehealth. While simulation and other forms of virtual technology have gained traction in entry-level physical therapist education programs, there is little research to support best practice teaching telehealth.[5,13] Querying DPT students' beliefs and perceptions about telehealth may help the profession identify factors to promote clinical reasoning self-efficacy, confidence, and performance during a clinical experience.[14]

Physical Therapist Self-Efficacy scale

The era of telehealth poses new challenges to students' self-efficacy and confidence levels during clinical experiences. The 5-item Physical Therapist Self-Efficacy (PTSE) scale measures clinical reasoning self-efficacy and was validated in reference to the New General Self-Efficacy Scale.[15,16] The PTSE use may increase understanding of DPT students' clinical reasoning self-efficacy during clinical experiences with and without telehealth.[17] Self-efficacy is considered an independent factor for DPT student performance in clinical settings.[18] Accurate self-efficacy measurement has been successful in predicting nursing students' clinical performance.[19] However, the association of DPT students' clinical reasoning self-efficacy with clinical performance during clinical experiences with and without telehealth remains unknown.

In the United States, the APTA Clinical Performance Instrument (CPI) is commonly used as a valid and reliable tool for clinical instructors to rate DPT student clinical performance.[20,21] While the relationship between DPT student learning style and the CPI has been assessed, a gap in understanding the association between PTSE and CPI performance remains.[22]

Evaluating the relationship between DPT student PTSE and CPI performance ratings across primary clinical practice areas, settings, and clinical experience levels may provide useful information to guide academic decision-making to promote DPT students' clinical reasoning self-efficacy using telehealth. To date, DPT students' clinical reasoning readiness and confidence level during clinical experiences with and without telehealth remain unknown. This study provides preliminary data on telehealth availability and DPT students' clinical reasoning self-efficacy and confidence during clinical experiences with and without telehealth, and their relationship with clinical performance.

Methods

Design

A descriptive and exploratory cross-sectional design survey was devised. The Institutional Review Boards of two collaborating universities approved exempt status for this research project to investigate DPT students from one single multi-campus university during Fall 2020 clinical experiences (IRB #: L20-211).

Subjects

A web survey instrument link was sent to 725 second- and third-year DPT students' email addresses from a large multi-campus university under investigation during Fall 2020 clinical experiences. Respondents first read the survey description and had the opportunity to provide informed consent and access the survey. Only DPT students on integrated clinical experiences (second year of didactic curriculum) or terminal clinical experiences (third year of didactic curriculum) were included. DPT students who were not on clinical experiences were excluded from participation.

Procedures

We developed an electronic survey questionnaire using concepts from published studies on physical therapy self-efficacy and embedded the five-item PTSE scale to

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assess DPT students' clinical reasoning self-efficacy (Appendix 1).[15,17] Three experts knowledgeable in survey methodology and publication records reviewed the survey. A graduating cohort of DPT students (n = 30) from the primary investigator's institution pilot tested the survey for question clarity, feasibility, and reliability.

Surveys were administered after the midterm during Fall 2020 clinical experiences and completed anonymously via SurveyMonkey software (www.surveymonkey.com). Respondents received no incentives for participation. A university research assistant linked the anonymous survey data with final Fall 2020 CPI clinical reasoning (1-item) and summative (18-item) scores from the APTA PT CPI-web for all respondents.[20,21,23] Personal identifying information was removed from all data prior to being handled by the primary investigator for data analysis. The Strengthening the Reporting of Observational Studies in Epidemiology checklist (STROBE) was completed (Appendix 2).[24]

Each participant could respond to a maximum of 28 questions. The survey began with demographic questions and inquired about comfort using telehealth technology during clinical experiences. Next, DPT students rated how confident they treated patients during initial and subsequent visits during traditional treatment without telehealth. Then, the five-item PTSE scale using a 5-point Likert scale ('strongly disagree' to 'strongly agree') asked participants to rate their clinical reasoning self-efficacy during their clinical experiences.[15] If the participants responded that they had examined or treated patients using telehealth, they proceeded to the final section. If they indicated they did not examine or treat patients using telehealth, their survey ended.

The final section in the survey questioned the number of telehealth visits participated in with less than 50% direct clinical instructor supervision. Next, participants rated their confidence treating patients during initial and subsequent visits using telehealth. Finally, the five-item PTSE scale was repeated asking participants to rate their clinical reasoning self-efficacy using telehealth during their clinical experiences.

Data analysis

Data were analyzed using Excel version 2016 and SPSS version 26.0. Descriptive statistics summarized the distribution, central tendency, and dispersion of responses. Wilcoxon signed-rank tests evaluated the difference in DPT students' repeat measure PTSE scores during clinical experiences with and without telehealth. Mann–Whitney U tests evaluated the difference in DPT students' PTSE scores between integrated and terminal clinical experiences. Spearman rho correlation assessed the strength of the correlation between DPT students' PTSE and CPI scores (clinical reasoning and summative). Significance was set at $\alpha = .05$. Scores from the five-item PTSE scale questions provided a total clinical reasoning self-efficacy variable ranging from 0 if they reported 'strongly disagree' to 20 if they reported 'strongly agree' on the clinical reasoning questions. These items had a Cronbach's alpha coefficient of .87 with, and .80 without telehealth, demonstrating good internal consistency.[25]

Results

Demographics including PTSE and CPI scores of survey respondents

A total of 211 DPT students (67% female) completed the survey (response rate = 29.1%). The largest proportion of respondents reported their primary area of clinical practice as orthopedics (82.4%) and primary clinical practice setting as outpatient clinic (85.8%).

The PTSE score ranges from 0 to 20. Respondents' mean PTSE score for clinical experiences without telehealth was 15.1, and the mean for PTSE with telehealth 13.1 (Fig. 1). The mean student PTSE score for integrated clinical experiences was 14.1, compared to 15.5 for terminal clinical experiences. The CPI score ranges from 1 to 21, with 17 indicating entry-level and 21 beyond entry-level performance. The mean student clinical reasoning score was 16.4, and

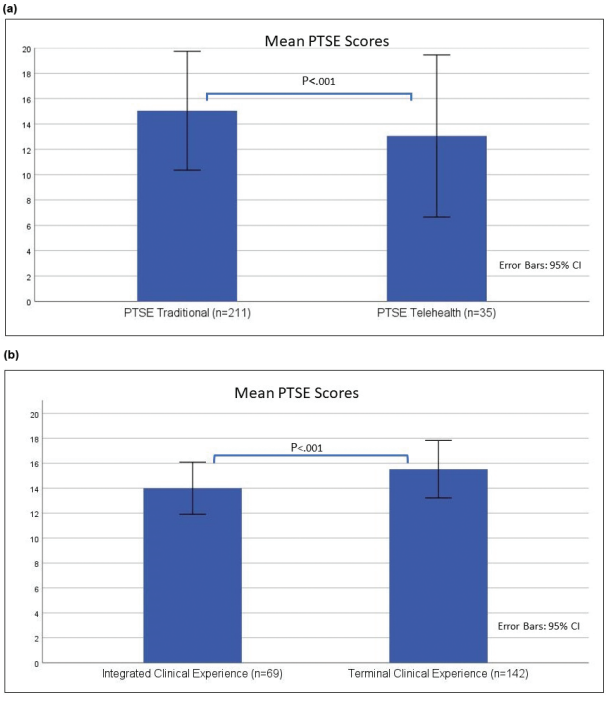

Fig. 1. (a) Physical Therapist Self-Efficacy (PTSE) Scores for DPT Student Traditional (Mean = 15.1; SD 2.3) and Telehealth Clinical Experiences Mean (Mean = 13.1; SD 3.2) ($P < .001$). (b) Physical Therapist Self-Efficacy (PTSE) Scores for DPT Student Integrated (Mean = 14.0; SD 2.1) and Terminal Clinical Experiences (Mean = 15.5; SD 2.3).

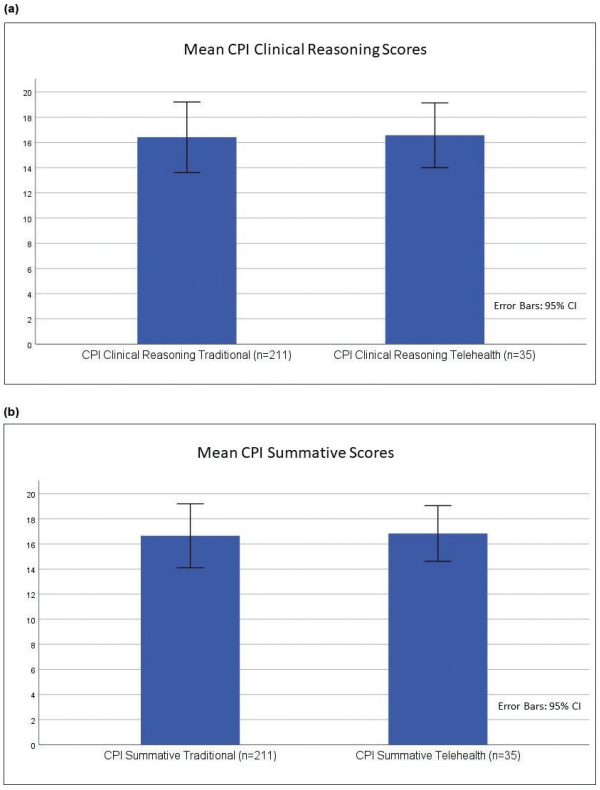

Fig. 2. (a) Clinical Reasoning Clinical Performance Instrument (CPI) scores for DPT student Traditional (Mean = 16.4; SD 2.8) and Telehealth (Mean = 16.6; SD 2.3) Clinical Experiences. (b) Summative Clinical Performance Instrument (CPI) scores for DPT student Traditional (Mean = 16.7; SD 2.5) and Telehealth (Mean = 16.8; SD 2.2) Clinical Experiences.

the summative mean CPI score 16.7.[23] Students participating in telehealth had a mean clinical reasoning score of 16.6 and a summative mean CPI score of 16.8 (Fig. 2). Table 1 displays respondents' demographic characteristics.

Telehealth prevalence

Of the 211 DPT student respondents, 40.3% reported telehealth was available at their clinical site. Overall, 16.6% of DPT students reported they directly examined or treated patients using telehealth. At sites offering telehealth, 41.7% used it to examine or treat patients. Of those, 20% participated in 10 or more telehealth visits with less than 50% of direct clinical instructor supervision. Though, most respondents (42.9%) reported participating in one or fewer telehealth visits with less than 50% of direct clinical instructor supervision.

Overall, 39.3% of respondents either strongly agreed (7.1%) or agreed (32.2%) to be comfortable using telehealth technology during clinical experiences, 32.2% neither agreed nor disagreed, while only 22.3% disagreed, or 6.2% strongly disagreed (Fig. 3). DPT students' confidence level in using telehealth to treat was 74% on initial and 97% on subsequent patient visits.

Table 1. Demographic data of respondents (n = 211)

Characteristic	Count (%)
Age in years, [SD]	27.3 [3.6]*
Gender	
Female	142 (67.3)
Male	69 (32.7)
Program type	
Residential	187 (88.6)
Flexible	24 (11.4)
Year of curriculum	
Second (integrated clinical experience)	69 (32.7)
Third (terminal clinical experience I/II)	142 (67.3)
Race/ethnicity	
American Indian or Alaskan Native	2 (1.0)
Asian/Pacific Islander	35 (16.6)
Black or African American	18 (8.5)
Hispanic	21 (10)
White Caucasian	121 (57.3)
Prefer not to answer	8 (3.8)
Multiple ethnicity / other	6 (2.8)
Academic GPA [SD; range]	3.40–3.49 [2.8; 2.50–3.99]*
Area of clinical practice	
Orthopedics	174 (82.5)
Neurorehabilitation	16 (7.6)
Other	21 (10)
Practice setting	
Outpatient clinic	181 (85.8)
Home health	1 (.5)
Skilled nursing facility	1 (.5)
Inpatient hospital	12 (5.7)
Inpatient rehabilitation facility	10 (4.7)
Other	6 (2.8)

*Represents mean and standard deviation.

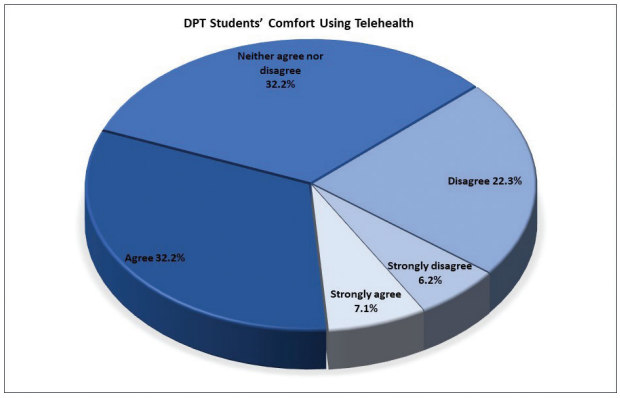

Fig. 3. DPT students' perceived comfort using telehealth.

Citation: Journal of Clinical Education in Physical Therapy 2022, **4**: 8537 - http://dx.doi.org/10.52214/jcept.v4.8537

Table 2. Analysis of differences between PTSE and CPI scores during Traditional and Telehealth Clinical Experiences and Correlation of PTSE and CPI scores during Traditional Experiences

	Traditional (n = 35)			Telehealth (n = 35)			Wilcoxon Signed-Rank		
	Mean	SD	Md	Mean	SD	Md	z	r	p
PTSE	15.1	2.3	15	13.1	3.2	14	4.475	.53	< .001*
	Integrated (n = 69)			Terminal (n = 142)			Mann-Whitney U		
	Mean	SD	Md	Mean	SD	Md	U	z	p
PTSE	14.0	2.1	14	15.5	2.3	15	2,956	-4.752	< .001*
	Traditional (n = 211)			Telehealth (n = 35)					
CPI	Mean	SD	Md	Mean	SD	Md			
Clinical Reasoning	16.4	2.8	17	16.6	2.6	17	2,965	-.357	.721
Summative	16.7	2.5	17	16.8	2.2	17.2	2,878	-.614	.539

PTSE	Traditional		Spearman Rho		
	n	mean		r(df)	p
CPI Clinical Reasoning	211	16.4	PTSE	.23 (209)	< .001*
CPI Summative	211	16.7	PTSE	.22 (209)	< .001*

*P < 0.05, achieved statistical significance

Clinical experiences with and without telehealth

Wilcoxon signed-rank test revealed lower PTSE scores for DPT students who compared participation in telehealth with traditional treatment $z = -4.475$, $n = 35$, $P < .001$, effect size $r = .53$ (Table 2). The mean rank on the PTSE was less for treatment with telehealth (Mean = 13.1; Md = 14.0; SD = 3.20) than traditional treatment without telehealth (Mean = 15.1; Md = 15.0; SD = 2.34) (Table 2).

Mann–Whitney U tests revealed no significant difference in the CPI clinical reasoning score for treatment with telehealth (Md = 17.0; $n = 35$) and traditional treatment without telehealth (Md = 17; $n = 211$), $U = 2{,}965$, $z = -.357$, $P = .721$, effect size $r = .07$. Mann-Whitney U tests also revealed no significant difference in the CPI summative score for treatment with telehealth (Md = 17.2; $n = 35$) and traditional treatment without telehealth (Md = 17.0; $n = 211$), $U = 2{,}878$, $z = -.614$, $P = .539$, effect size $r = .04$ (Table 2).

Terminal clinical experience compared to the integrated clinical experience

Mann–Whitney U tests revealed higher DPT students' PTSE scores during traditional treatment with terminal (Md = 15.0; IQR: 14,17; $n = 142$) compared with integrated clinical experiences (Md = 14.0; IQR: 13,15; $n = 69$), $U = 2{,}956$, $z = -4.752$, $P < .001$, effect size $r = .33$ (Table 2).

Association between PTSE and CPI scores

Spearman rho analysis found a weak positive correlation between the PTSE without telehealth, compared with the CPI clinical reasoning score, $r(209) = .23$, $P < .001$, and CPI summative score, $r(209) = .22$, $P < .002$ (Table 2).

Discussion

To our knowledge, this study was the first to investigate DPT students' telehealth use prevalence during clinical experiences across selected primary clinical areas and practice settings in the United States. This study found high telehealth availability (40.3%) among clinical sites during DPT students' clinical experiences. Although telehealth availability was high, one in six DPT students reported that they examined and/or treated patients using telehealth. Querying clinical instructors during DPT students' clinical experiences may prove beneficial to identify perceived barriers and facilitators affecting student participation in telehealth.

The external validity of our findings was adequate as our sample was representative of DPT students from the United States. Our sample gender proportion (67.3% female) compared with the 2019–20 Commission on Accreditation in Physical Therapy (CAPTE) Program Data report (61.4% female). Age did not differ significantly between DPT students with ($n = 35$, Md = 27.0) and without telehealth ($n = 211$, Md = 26.0) $P = .247$. Also, the curriculum length of full-time clinical experiences (30 weeks) was comparable with full-time clinical experiences of other DPT programs (mean = 35.8 weeks).[26] Our response rate (29.1%) was higher than the minimal recommended college student survey response rate range (20–25%) to allow for increased confidence in survey estimates.[27] As we invited the entire multi-campus population of second- and third-year university DPT students during clinical experiences to participate in the survey, rather than a sample, we believe that our response rate was sufficient to draw reasonable conclusions.

This study was the first to evaluate DPT students' clinical reasoning readiness during clinical experiences with and without telehealth. Lower clinical reasoning self-efficacy existed during clinical experiences with telehealth ($\overline{X} = 13.1$; Md = 14) compared with that without telehealth ($\overline{X} = 15.1$; Md = 15).[28] Future research should evaluate the PTSE scale score minimal

clinically important difference. The majority of DPT students were either comfortable (39.3.%) or neutral (32.2%) using telehealth technology, and comfort improved providing telehealth treatment with reported confidence 74% on initial and 97% on subsequent same-patient visits.

Previous research suggests that DPT students' clinical reasoning self-efficacy is higher among final third-year students than second-year students, suggesting experiential maturation and supporting standard timing for clinical experience placements during entry-level DPT programs.[15] Similarly, the present study found a higher clinical reasoning self-efficacy for terminal clinical experiences. There was no significant difference in clinical reasoning self-efficacy using telehealth between integrated and terminal clinical experiences. Due to the low response rate for those who participated in direct telehealth, it is difficult to generalize these findings. Further research should investigate the causative effects of telehealth-specific education on clinical reasoning self-efficacy to identify factors to promote academic strategy in curricula.

This study was the first to investigate the relationship between DPT students' clinical reasoning self-efficacy from the PTSE with CPI clinical instructor ratings of students. We found a weak positive relationship between DPT students' clinical reasoning self-efficacy on the PTSE with traditional treatment and clinical performance on both the CPI clinical reasoning and CPI summative scores. Future research to validate whether the PTSE and CPI assess different constructs may prove beneficial, as administering both may help identify factors contributing to DPT students' clinical reasoning readiness and clinical performance. Finally, despite lower DPT students' clinical reasoning self-efficacy using telehealth, current trends in academic preparation were supported as telehealth clinical performance remained strong across years of the curriculum.

Limitations

There are several limitations of this study. The study was cross-sectional and did not intend to infer any causality from the educational process. Due to the study period during Fall 2020 of the COVID-19 pandemic, our survey had a disproportionately high number of orthopedic primary care area and outpatient clinical practice settings' responses, which may impact the study's overall generalizability. Finally, the external validity of the results may be in question because it remains unknown what telehealth availability will remain after the COVID-19 pandemic.[29] We recommend replicating the study with a larger sample size to confirm the validity of our results.

Implications for practice

Our findings support PTSE and CPI use to assess different clinical reasoning constructs with further validation warranted. Students should demonstrate clinical reasoning competencies before entering clinical experiences.[30] Use of the PTSE tool may identify students with lower clinical reasoning self-efficacy and provide remediation opportunities before and during clinical experiences.

With future growth of telehealth in physical therapy expected, we recommend that academic institutions thread telehealth-specific educational strategies to promote comfort with technology and the evolution of clinical reasoning with telehealth clinical experiences throughout the curriculum. This study underscores the importance of academic and clinical educators' appreciation of DPT student's perceptions that contribute to clinical reasoning self-efficacy during clinical experiences with and without telehealth. Although we found students with lower clinical reasoning self-efficacy using telehealth, clinical performance, and student confidence remained strong, reflecting preparation across years of the curriculum.

Conclusion

Investigating telehealth utilization by DPT students across the United States may guide academic curricula in best practice to facilitate clinical readiness. The DPT students' clinical reasoning self-efficacy is lower using telehealth during clinical experiences. Despite lower clinical reasoning self-efficacy using telehealth, students appeared to be confident and prepared for clinical experiences during the era of telehealth. The majority of DPT students were comfortable using telehealth technology during clinical experiences. The results should raise confidence in the current trend of telehealth education in entry-level physical therapy programs in the United States.

Conflict of interest and funding

The authors have no conflict of interest and funding.

Ethics statement

IRB/Ethical Board approval and protocol number IRB #: L20-211.

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Appendix I.

Physical Therapist Self-Efficacy (PTSE) scale

Scale	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
PTSE					
I am confident that I know when to perform specific tests for physical therapist practice.					
I will know when it is time to refer a patient/cilent problem to another practitioner.					
In a general physical therapy context, I am confident that I would not miss primary medical disease.					
I believe that I can manage general physical therapy problems.					
In a general physical therapy context, when facing a difficult case, I am certain I can make the right management decisions.					

Appendix II.

Doctor of Physical Therapy students' clinical reasoning self-efficacy and confidence treating with telehealth: a United States survey

STROBE statement – checklist of items that should be included in reports of observational studies

	Item no.	Recommendation	Page no.	Relevant text from manuscript
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	(abstract)	
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	(abstract)	
Introduction				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	(Pages 1–2)	
Objectives	3	State-specific objectives, including any prespecified hypothesis	(Page 2)	
Methods				
Study design	4	Present key elements of study design early in the paper	(Pages 2–3)	
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	(Pages 2–3)	
Participants	6	(*a*) *Cohort study* – Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study* – Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study* – Give the eligibility criteria, and the sources and methods of selection of participants (*b*) *Cohort study* – For matched studies, give matching criteria and number of exposed and unexposed *Case-control study* – For matched studies, give matching criteria and the number of controls per case	(Page 3)	

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Appendix II. continued

STROBE statement – checklist of items that should be included in reports of observational studies

	Item no.	Recommendation	Page no.	Relevant text from manuscript
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	(Page 3)	
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	(Page 3)	
Bias	9	Describe any efforts to address potential sources of bias	(N/A)	
Study size	10	Explain how the study size was arrived at	(Pages 2–3)	
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	(Pages 2–3)	
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	(Page 3)	
		(*b*) Describe any methods used to examine subgroups and interactions	(Page 3)	
		(*c*) Explain how missing data were addressed	(N/A)	
		(*d*) *Cohort study* – If applicable, explain how loss to follow-up was addressed *Case-control study* – If applicable, explain how matching of cases and controls was addressed *Cross-sectional study* – If applicable, describe analytical methods taking account of sampling strategy		
		(e) Describe any sensitivity analyses	(N/A)	
Results				
Participants	13*	(a) Report numbers of individuals at each stage of study – for example, numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	(Page 3)	
		(b) Give reasons for non-participation at each stage	(N/A)	
		(c) Consider use of a flow diagram	(N/A)	
Descriptive data	14*	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	(Page 3)	
		(b) Indicate the number of participants with missing data for each variable of interest	(N/A)	
		(c) *Cohort study* – Summarize follow-up time (e.g. average and total amount)		
Outcome data	15*	*Cohort study* – Report numbers of outcome events or summary measures over time *Case-control study* – Report numbers in each exposure category, or summary measures of exposure		
		Cross-sectional study – Report numbers of outcome events or summary measures	(Pages 3–5)	
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g. 95% confidence interval). Make clear which confounders were adjusted for and why they were included	(Pages 3–5)	
		(*b*) Report category boundaries when continuous variables were categorized	(N/A)	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	(N/A)	
Other analyses	17	Report other analyses done – for example, analyses of subgroups and interactions, and sensitivity analyses	(Pages 3–5)	
Discussion				
Key results	18	Summarize key results with reference to study objectives	(Page 5)	
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	(Page 6)	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	(Page 6)	

Appendix II. continued

STROBE statement – checklist of items that should be included in reports of observational studies

	Item no.	Recommendation	Page no.	Relevant text from manuscript
Generalizability	21	Discuss the generalizability (external validity) of the study results	(Pages 5–6)	
Other information				
Funding	22	Give the source of funding and the role of the funders for this study and, if applicable, for the original study on which this article is based	(N/A)	

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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