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Feasibility of an online clinical assessment of competence in physiotherapy students

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ABSTRACT

Introduction: The aim of this study was to investigate the feasibility of an online clinical competency assessment for use with physiotherapy students as an alternative option to a traditional in-person assessment.

Methods: A mixed methods approach was used where student competency was evaluated by experienced assessors in both an in-person and an online assessment, and semi-structured interviews were conducted with all participants. Participants' experiences and student competency outcomes were explored to evaluate the feasibility of the online assessment in terms of Implementation, Practicality, Acceptability and Demand.

Results: Participants described the online assessment as feasible in terms of both practicality and implementation. However, some concerns were raised by the assessors regarding the ability of the online assessment to capture "hands-on" skills, environment management skills and risk management skills. Competency outcomes of the online assessment were acceptable with over 80% of students received the same outcome on both assessments.

Conclusion: These findings suggest that an online assessment is a feasible method for evaluating clinical competence in physiotherapy students. However, certain challenges need to be addressed and further validation completed to ensure successful implementation. Ensuring the feasibility of online methods for assessing clinical competence has important implications for the future use of online assessment in health professional education.

Introduction

The assessment of clinical competence is a fundamental component of health professional education. Clinical competence is often referred to as the ability of an individual to apply skills, knowledge, judgment and personal attributes to practice safely and effectively in a particular clinical role (Yanhua and Watson, 2011). An assessment of clinical competency attempts to evaluate an individual's performance of this set of abilities, typically allowing judgment of the progress a learner has made toward acquiring standards or skill levels while simultaneously facilitating their learning (Boud and Dochy, 2010). In physiotherapy and other health professions, clinical competence is assessed using a variety of methods, including OSCEs (Objective Structured Clinical Examination), standardized case-based assessments (e.g., an encounter with a standardized patient) and assessment of case-based learning on placement. These types of assessments are considered reliable and valid in the assessment of clinical skills (Khan, Gaunt,

Ramachandran, and Pushkar, 2013; Patrício, Julião, Fareleira, and Carneiro, 2013; Petrusa, 2002; Wass, Van der Vleuten, Shatzer, and Jones, 2001). Hence, many accrediting bodies utilize these types of assessments of clinical competence in a high-stakes environment to determine "entry to practice" skill levels (Australian Physiotherapy Council, 2023; Federation of State Boards of Physical Therapy, 2021; National Council of State Boards of Nursing, 2023). However, the challenge with these methods of assessing clinical competence is that they typically require the subject, assessors, and patients to be physically co-located.

Assessments of clinical competence were impacted dramatically by the COVID-19 pandemic, especially those requiring in person interaction (Kumar et al., 2021; Pokhrel and Chhetri, 2021). To minimize the spread of COVID-19, the implementation of physical distancing became a crucial preventive measure, resulting in the cancellation of assessment pathways undertaken by many accrediting bodies to determine clinical

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competence. As these types of in-person assessments are commonly employed in high-stakes contexts, such as university evaluations of graduating students and accrediting bodies assessments of competency, they play a critical role in the process of granting registration to new healthcare professionals entering the workforce. Hence, the need for assessment formats that did not require in-person interaction grew in response to the COVID-19 pandemic, and this demand was particularly evident for accreditation and exit examinations (Tognon, Grudzinskas, and Chipchase, 2021).

Using technology to shift these assessments into an online format was an obvious solution, drawing on methodologies investigated in previously established online assessments of clinical competence (Cantone, Palmer, Dodson, and Biagioli, 2019; Gupta et al., 2020; Palmer et al., 2015). For example, accreditation authorities in dentistry, medicine, and nursing were able to change their exit OSCEs from in-person to online, hybrid, video or telehealth encounters (Boursicot et al., 2020; Boyle et al., 2020; Heal et al., 2022; Khalaf, El-Kishawi, Moufti, and Al Kawas, 2020). This transition was supported by a recent systematic review that found remote clinical assessments were viable and provided an alternative method for assessing many clinical skills (Kunutsor et al., 2022). However, the review also noted that in some instances, particularly when used to evaluate practical "hands-on" clinical skills, the online format was limited compared to traditional in-person assessments. While the move to online education and assessment of clinical competence was necessary during the COVID-19 pandemic, further detailed exploration of this approach is now required, specifically within physiotherapy, to continue to investigate its potential as a more flexible and future proof mode of assessment.

Recognizing this gap in evidence, the purpose of this study was to evaluate the feasibility of a new format of online standardized simulated case-based assessment of physiotherapy clinical competence (online examination) in relation to a current in-person standardized simulated case-based clinical assessment (in-person examination).

Methods

A prospective mixed methods approach was adopted to investigate aim of this feasibility study, where feasibility was determined a priori to consist of 4 domains: (i) Implementation (e.g. can the online examination be implemented as planned), (ii) Practicality (e.g. can the online examination be conducted within participants and examination constraints), (iii) Acceptability (e.g. how do the intended recipients of the online examination respond to the online examination), and (iv) Demand (e.g. is there sufficient demand for the online examination) (Bowen et al., 2009). Physiotherapy students completed two examinations of clinical competency (one online and one in-person) while being assessed as either competent or not competent by qualified physiotherapists using a standardized assessment form. Both student and assessor participants completed semi-structured interviews where their experiences and perspectives on the examinations were explored. Given that the focus of the domains of feasibility requires an understanding of experiences, semi-structured interviews were used to explore the experiences and perspectives of the participants. In addition, a preliminary comparison of the outcomes (competent or not competent) between the in-person and online examination provided further information to evaluate the practicality and implementation of the online examination. Ethics approval was granted by Flinders University and La Trobe University (Project number 4683). All participants provided written informed consent.

Models of assessment

The in-person and online examinations were standardized simulated case-based assessments of clinical competence that were designed to assess physiotherapy competency using the same standardized assessment form. The in-person examination, used as the reference standard, is currently in use by the Australian Physiotherapy Council (APC) for evaluating "entry to practice" competency in overseas physiotherapists seeking registration to practice in Australia. The new online examination was developed using a cyclical process beginning with the initial idea of creating a high quality online clinical assessment similar to the current in-person examination (Hirokawa and Poole, 1996; Segal, 1982). A working group of five experts in the field of assessment in the health professions was established to workshop potential models of online assessments. The working group used their expert knowledge, previous experiences with assessments and historic in-person examination data to refine the model. Both examination formats followed the same protocol, requiring participants to assess and treat a patient using standardized case scenarios, with the patient at the center of the case study being portrayed by a trained actor.

In-person examination

Detailed case scenarios provided comprehensive guidance on the case for the actor and assessors, and case information was provided to the participant at the start of the examination. Following the provision of case

information to the participant a patient consultation was performed, lasting approximately 75 minutes. These cases were designed for participants to demonstrate skills in one of three practice areas defined as cardiorespiratory, musculoskeletal, and neurological physiotherapy. Examinations were observed and evaluated by two independent, trained assessors. Participants attended the APC simulation laboratory in Melbourne, Australia and were co-located in the clinical simulation laboratory with the patient (actor) and two assessors. The student participant interacted with the patient (actor) to complete a full assessment and treatment as per usual physiotherapy practice.

Online examination

The online examination followed the same format as the in-person examination regarding the provision of case scenario information, the time allocated to the examination, the discipline areas of assessment that were examined, and the presence of two assessors to examine the student performance. The only difference to the protocol described above was the location and resulting interaction. The patient (actor) was based in the APC simulation laboratory where a single camera-enabled smart device captured them and their environment. The student participant and assessors joined via teleconference meeting from a private location where they could see each other and the actor in the APC simulation laboratory. The student participant interacted with the patient (actor) as normal to complete the subjective assessment, physical assessment and treatment as normal, supplementing verbal description for any hands-on techniques.

Participants

Two groups of participants were recruited into this study: (i) physiotherapy student participants who completed the online and in-person examinations and (ii) assessor participants who evaluated the student participants for competence in both testing situations. Physiotherapy students from a range of year levels were recruited, as it was anticipated that they would represent a range of skill levels approaching "entry to practice" competency. This included students with minimal clinical experience to investigate the ability of the examination to detect a not competent performance.

Students

Students enrolled in "entry to practice" physiotherapy programs at Melbourne-based universities in early 2022 were invited to participate through e-mails, flyers and in-person information sessions at the university campus. Students enrolled in the first year of a bachelor's degree were excluded as they had yet to complete any learning experiences in a clinical environment and, therefore, reasoned unlikely to be able to perform the skills required. Students were provided with information booklets for both examinations as per standard APC protocol. Students were informed that their participation in this study was entirely voluntary, and their participation would have no impact on their physiotherapy studies.

Assessors

All assessors (registered physiotherapists) appointed and trained by the APC to provide in-person examinations were invited to participate as assessors in this study. Assessors available on the day of data collection and willing to train in the new procedure were recruited via e-mail. A member of the research team (BF) led a one-hour group training session with the assessors in the online examination procedure and provided assessors with a modified assessors manual.

Procedures

The order of assessments (in-person or online examination first) was randomized for each student, as well as the area of practice for both assessments (cardiorespiratory, musculoskeletal, neurological rehabilitation) using a computer-generated random number table. Students were aware of which area of practice they had been allocated to prior to the day of data collection but not the specific case scenario. Assessors were allocated to examinations as per the APC protocol. Assessors were also allocated to ensure they did not assess the same student twice to minimize measurement bias.

Data collection commenced at the beginning of the academic year (March and April 2022). Before completing the examinations of clinical competency, demographic information (age, sex, experience level, languages spoken) and a 5-point Likert scale rating of attitude ("extremely negative," "somewhat negative," "neither positive nor negative," "somewhat positive," "extremely positive") and experience with technology ("none at all," "a little," "a moderate amount," "a lot," "a great deal") were gathered from all participants.

Students completed an online and an in-person examination in the same practice area within ten days. Both examinations were completed within a fortnight of each other to minimize any learning effect; as the students were completing university studies, there was a potential risk they could gain new skills that may substantially alter their clinical competence.

Performance of competency for both the in-person and online examinations was evaluated using the protocols developed and implemented by the APC in their standard assessment of physiotherapy competence. In this protocol, two independent assessors used the standardized assessment form to determine the student as either "competent" or "not competent" on each of eight domains (Appendix 1). The eight domains relate to key clinical competences, such as conduct a safe assessment, create a plan, interpret findings and evaluate effectiveness, required of "entry to practice" level physiotherapists in Australia (Physiotherapy Board of Australia & Physiotherapy Board of New Zealand, 2015). Following the examination, the two assessors discussed any disparities and reached an agreed score for each domain and an outcome (competent or not competent) for the examination, which was recorded on the final moderated standardized assessment form. To obtain a competent outcome for the examination, the student needed to be evaluated as competent in all domains.

Within one week of the second examination, semi-structured open-ended interviews were conducted via Zoom, with the format chosen allowing for flexibility and depth of insight (DiCicco-Bloom and Crabtree, 2006; Qu and Dumay, 2011). The interviews were completed in the week following the participant's last examination at a mutually convenient time and explored participants' perceptions around the Implementation, Practicality, Acceptability and Demand of the online assessment. The interviews lasted between 20 to 40 minutes and were audio recorded on two devices in case one failed. The research team piloted the interview before finalization, and one researcher (BF) completed all interviews. BF kept a reflective journal and completed regular debriefs with other research team members throughout this process.

Data analysis

Students and assessors were provided with a unique identifier that ensured the matching of demographic data to examination results, and de-identified data were used in the analysis.

Semi-structured interviews

All interviews were conducted by a single interviewer. All interviews were transcribed using digital transcription services. Transcripts were checked by the research team against the audio recordings for accuracy and then sent back to participants for comment or correction. Nine participants responded, six replied with no changes, two provided minor grammatical corrections, and one provided clarifications of the statements that were included in the analysis.

Thematic analysis at a predominantly semantic level was used as the flexibility of this approach facilitated a range of theoretical perspectives and orientations (Braun and Clarke, 2006; Terry, Hayfield, Clarke, and Braun, 2017). First, a deductive approach was used to investigate the domains of feasibility related to Implementation, Practicality, Acceptability, and Demand, as identified a priori from the literature (Bowen et al., 2009). Second, an inductive approach was used to investigate any additional themes. The analysis followed the predefined steps of initial familiarization, generating initial codes, searching for themes by collating codes, reviewing themes against the codes and entire data set, and defining and finalizing themes (Braun and Clarke, 2006; Braun, Clarke, and Weate, 2016; Terry, Hayfield, Clarke, and Braun, 2017). Finally, before finalizing the themes, they were reviewed against the entire data set multiple times until no new themes were generated (Terry, Hayfield, Clarke, and Braun, 2017). One researcher (BF) conducted the initial steps from initial familiarization to searching for themes from codes with regular team meetings to discuss codes and workshop themes. All researchers were involved in the final steps of reviewing and finalizing the themes. Finalized themes were sent back to a random 10% of participants for validation (Jackson, Drummond, and Camara, 2007).

Outcomes of assessments

As an additional step to evaluate the feasibility domains of Implementation and Practicality, the outcomes of student performance/competency were compared between the online and in-person examinations. Each student participant was rated as either competent or not competent by the assessors for each of the online and in-person examinations. A descriptive analysis was conducted where the number of students who were determined as competent or not competent on each assessment was reported, as well as the proportions of students who had the same outcome on each assessment (passed both or failed both) or different outcomes on each assessment (passed one and failed one).

Results

Demographics

Students

Seventeen physiotherapy students were recruited, with an average age of 24.3 (SD = 3.91) years, of whom 70.6% were female, and 70.6% spoke more than one language. Over half of the students reported "a lot" to "a great deal" of experience with technology, with no students reporting negative attitudes to technology or online examination

(Table 1). One additional student enrolled in the study but withdrew before data collection commenced with no reason provided; their data was not included in the analysis.

Assessors

A group of 13 assessors currently employed by the APC were recruited to complete the examinations. Three assessors completed only online examinations, four completed only in-person examinations and six completed both types of examinations. The assessors had an average age of 45.6 (SD = 11.4) years and had been an APC assessor for an average of 9 (SD = 5.5) years. Due to unforeseen circumstances related to the COVID-19 pandemic, one member of the research team was an assessor for two in-person examinations; their de-identified data is included in this group. Assessors generally had a lower attitude toward remote assessments, with 23.1% reporting a negative attitude (Table 1).

Semi-structured interviews

Deductive themes

Using key areas of focus from feasibility literature to guide the deductive analysis of the interviews, several themes were identified (Bowen et al., 2009). These are summarized in Tables 2 and 3. Overall, participants were positive about the online examination regarding Implementation and Practicality. However, participants had mixed attitudes around its Acceptability and Demand. Student participants largely felt that the online examination was acceptable to use, and there was a demand within the profession. In contrast, most assessors had concerns relating to the need and ongoing use of the online examination, and overall, had a lower level of satisfaction relating to the online examination.

Inductive themes

Further themes were found through inductive analysis, that expand on the findings in the above deductive themes, particularly relating to Acceptability. These inductive themes focus on how the assessors and students perceived the online examination. The themes are detailed below, with quotes included supporting these findings.

Realistic environment. Assessors expressed a belief that to assess competence, there needs to be an element of a realistic environment and this was necessary to either support or challenge performance. Assessors reasoned that cues from the environment could help trigger students to perform the automatic tasks (e.g., hand hygiene, checking bed brakes) and provide prompts regarding performance expectations.

> they are missing a lot of the visual cues that you get from actually being face to face with somebody. And that can be to their detriment. - Assessor 10

Assessors described that a realistic environment creates challenges for the candidate to test their performance in a three-dimensional way and that moving the assessment online reduced the realism offered by the in-person environment.

> I feel like every time we take a step back, going from a real patient to simulation then simulation to online I feel you lose something in that. - Assessor 7

Table 1. Participant's demographics.

Characteristics	Students (n = 17)	Assessors (n = 13)	
Age (years), mean (SD)	24.3 (3.91)	45.6 (11.4)	
Gender, n (%)			
Female	12 (70.6)	13 (100)	
Male	5 (29.4)	0 (0)	
Experience level	Students= n (%)	Assessors= mean (SD)	
2nd year undergraduate	2 (11.8)	Years as physiotherapist	21.9 (10.8)
3rd year undergraduate	7 (41.2)	Years as assessor	9 (5.5)
4th year undergraduate	5 (29.4)		
1st year masters	1 (5.9)		
2nd year masters	2 (11.8)		
Experience with remote technology, n (%)			
None at all/A little	1 (5.9)	2 (15.4)	
A moderate amount	5 (29.4)	4 (30.7)	
A lot/A great deal	11 (64.7)	7 (53.8)	
Attitude toward technology, n (%)			
Extremely negative/Somewhat negative	0 (0)	0 (0)	
Neither positive nor negative	3 (17.6)	2 (15.4)	
Somewhat positive/Extremely positive	14 (82.4)	11 (84.6)	
Attitude toward remote assessment, n (%)			
Extremely negative/Somewhat negative	0 (0)	3 (23.1)	
Neither positive nor negative	6 (35.3)	4 (30.7)	
Somewhat positive/Extremely positive	11 (64.7)	6 (46.2)	

Table 2. Feasibility themes with consensus.

Area of focus	Deductive analysis cues	Themes	Supporting quotes
Implementation	Was the assessment able to be completed without major deviation from procedure?	Online examination protocol works well	*It ran smoothly, and it was very reassuring. It was very clear the roles of the two assessors. So no, I think that was that was all good. -Assessor 6*
	Were any additional resources/ assistance required to implement the assessment?	Protocol works without addition or assistance	*I think it did work quite well. - Student 7*
Practicality	How did participants feel about the time taken?	Time to complete assessment is appropriate length	*No, I don't think that time was an issue, I finished early.- Student 32*
	How did participants feel about the resources required to complete the assessment?	Resources for assessment are appropriate	*Yeah, it was practical, we use them [Zoom meeting] all the time at work and waiting rooms and all that kind of stuff. So, it's very practical, very easy. - Assessor 11*
	How did participants in the study feel about the workload/skills set required?	Skill and workload requirements are appropriate	*If I can do it basically anyone can. I am not that IT savvy. - Assessor 7*

Table 3. Feasibility themes without consensus.

Area of focus	Deductive analysis cues	Themes	Supporting quotes
Acceptability	Do participants feel the assessment is ready for use? Were they satisfied with the model?	Conflicting views on satisfaction with the assessment • Assessors felt adjustments would be required before it could be used into the future. • Students mostly satisfied with model and saw it working into the future	*I don't think it can be implemented to assess whether somebody is competent to practice in Australia at the new grad level. Yeah, I, I wouldn't discount it. At this stage. I think there is some potential to tweak the model and have it potentially be appropriate but that would need obviously further trials. – Assessor 10* *it's such a great way to increase accessibility, especially in the world as it is today. – Student 19*
Demand	Do participants see a need for this type of assessment?	Mixed feelings about the need for this assessment. • Students felt it was way of the future. • Assessors felt that the current practice suffice	*I don't feel that its [online assessment] something we a really looking for, yet. – Assessor 12* *I think the need for this is huge … because of the technology, developing involving the online assessment isn't just a trend. Yeah, like other assessments, like language assessment, many other things have started to provide online versions as well. -Student 6*

Risk Management skills. Assessors described that the online format reduced their capacity to assess how a candidate would react in the moment to an environmental risk or hazard and felt that this was essential to capturing clinical competence.

> They say I'll stand in a position where I'm close enough to provide support in case you know, the patient isn't balanced or whatever. And it's like, yeah, but would you like, where would you actually be? Where would your hands actually be? And what is your response time like if that patient trips or stumbles? - Assessor 10

Hands-on skills. All assessors expressed the view that physiotherapy is a hands-on profession and, as such, clinical competence should be assessed in a format so that hands-on skills could be clearly visualized. Assessors also held a strong belief that the student's ability to describe and explain a technique would not necessarily correlate to their ability to perform that same technique in person.

> I feel aspects of physiotherapy need to be hands on. A candidate can describe it to us, but you still need to see it. - Assessor 9

> I just, I felt that I wasn't really able to gauge the level of their competency because it's one thing to say they're going to do something and it's quite another to actually do it. - Assessor 12

Clinical knowledge and reasoning. The assessors stated that the online examination was equal to or better than the in-person examination to evaluate a student's clinical knowledge and reasoning skills most likely because of the requirement for more communication.

> in some ways because they're talking through a little bit more what they're doing sometimes, it was actually easy to work out what their thoughts processes were in a clinical reasoning. - Assessor 6

Challenges of online. The final theme highlights the perspectives of the students regarding their experience with the online examination. In contrast to the assessors, students reported the experience of the online examination as comparable to the in-person examination and felt confident demonstrating their clinical competence through this format.

> It felt pretty comparable … just to me like it felt like that [I] was doing the same thing.- Student 8

However, students did report that certain skills were more challenging to demonstrate online. Specifically, they described difficulties in recalling the appropriate actions and providing descriptions of these actions, as well as the challenge of establishing rapport with patients through online interactions.

> I couldn't remember all the things like I should have said about, you know, stopping, to check the brake or sanitizing my hands or kneeling on the floor while I'm testing her manual muscle testing. Yeah. I couldn't remember when I'm in the exam, . . . It's just natural things that we do in person, right. - Student 2

Outcomes of assessments

Seventeen students completed 34 examinations in the areas of cardiorespiratory ($n = 12$, 35.3%), musculoskeletal ($n = 12$, 35.3%), and neurological rehabilitation ($n = 10$, 29.4%). Of the 34 examinations, 29 (85.3%) had an outcome of not competent and 5 (14.7%) had an outcome of competent.

Fourteen students (82.4%) received the same outcome on both examinations, with only 3 students (17.6%) receiving a different outcome on each examination (i.e., passed one and failed one). As can be seen from Table 4, one student passed the in person and failed the online examination, while two students failed the in-person examination while passing the online.

Discussion

The change to assessment methods in response to the COVID-19 pandemic produced a solid foundation of work in the field of higher education and accreditation relating to online assessment of clinical competence. The rapid implementation of online assessments by universities and accrediting bodies allowed continued graduation of health professionals at a time when the healthcare workforce was under significant strain (Giri and Stewart, 2023; Kunutsor et al., 2022). Unfortunately, the limited opportunity to prepare for the shift meant that many studies investigating online assessment were conducted retrospectively and, therefore, were unable to control sources of bias or confounding variables (Boyle

et al., 2020; Felthun, Taylor, Shulruf, and Allen, 2021; Lara, Foster, Hawks, and Montgomery, 2020). To the authors' knowledge, this is the first published study to prospectively evaluate the feasibility of an online standardized simulated case-based assessment of physiotherapy clinical competence and to compare the assessment outcome to an in-person assessment. The findings of this study confirm the conclusions of existing literature that an online examination is feasible for use by assessors and students despite some limitations proposed by the assessors. The findings of the preliminary comparison also indicate that outcomes of an online examination of clinical competence are comparable to an in-person examination, with just over 80% of students receiving the same outcome in both examinations.

The findings from the semi-structured interviews investigating the feasibility of the online examination were overwhelmingly positive. Participants reported implementing the online examination with minimal assistance, minimal deviation from the planned procedure and no issues concerning the time, resources or skills required to complete the examination. These findings suggest that the online examination process was not complicated, which is particularly satisfying given that 40% (12 of 30) of participants reported moderate or low amounts of experience with technology. Previous studies involving online OSCEs and similar short-case style online assessments also reported positive feasibility from students and assessors (Cantone, Palmer, Dodson, and Biagioli, 2019; Chan et al., 2014; Donn, Scott, Binnie, and Bell, 2021; Mooney, Peyre, Clark, and Nofziger, 2020; Munshi, Alsughayyer, Alhaidar, and Alarfaj, 2020) with many highlighting that participants found online assessments to be an adequate alternative to in-person assessment (Chan et al., 2014; Donn, Scott, Binnie, and Bell, 2021; Mooney, Peyre, Clark, and Nofziger, 2020). This is reinforced by the perspectives of the students in our study, who found the overall experience of the online examination to be practical to implement and the format to be a potential alternative to the in-person examination.

The acceptability of, and demand for, the online examination varied between the participant groups in our study. While students readily embraced the online examination, assessors displayed a higher level of reluctance. The inductive themes present possible reasons for

Table 4. Cross-tabulation of student outcomes (competent/not-competent) in online versus in-person examinations.

		In-person		
		Competent	Not competent	Total
Online	Competent	1	2	3
	Not competent	1	13	14
	Total	2	15	17

assessors' hesitancy toward the online examination; specifically, that the online examination may have challenged the assessors' established beliefs regarding the content and scope of clinical competence assessments. These concerns may be genuine or merely perceptions held by the assessors, which could be alleviated if addressed by additional educational initiatives, collaborative efforts, and increased exposure to online examinations. When taken together, the themes overall suggest the application of the online examination is feasible but highlight the need for more inquiry into the root of the assessors' perceptions toward online assessment and how to address these.

The quantitative findings of this study also provide a preliminary indication that an online examination can detect similar determinations of clinical competence as an in-person examination. The findings are consistent with studies that have compared online to in-person OSCEs in a clinical profession. In these studies, there was no difference in failure rates between the online and in-person assessment formats (Lara, Foster, Hawks, and Montgomery, 2020) or between mean assessment scores (Arrogante et al., 2021; Chan et al., 2014; Chen et al., 2019; Gortney, Fava, Berti, and Stewart, 2022). The ability to distinguish not competent performance is often the primary focus of high-stakes assessments at "entry to practice" level in order to ensure the safety of the public (Physiotherapy Board of Australia & Physiotherapy Board of New Zealand, 2015). It is important to note that there was a high failure rate among the student participants of this study, and the similarity in outcome evaluations between formats suggests that the online examination method appropriately detected the majority of students who did not meet competence. These results are encouraging and provide support for a more robust/larger comparison between assessment formats.

Consideration must also be given to the possible explanations for the three students assessed to have different competency outcomes between the online and in-person assessment formats. These differences could stem from format disparities, individual factors, or simple chance occurrences. A potential format disparity is that during the in-person examination, assessors can move around the examination room, whereas the online examination provides only a single camera view. This reduces the information that is available to assessors to judge student performance in the online format. Another possibility may be the complexity of the cases utilized. Many studies conducted during the COVID-19 pandemic reported that the cases/tasks used online had reduced complexity to facilitate the format (Felthun, Taylor, Shulruf, and Allen, 2021;

Lawrence et al., 2020). Although the research team endeavored to ensure the cases were of comparable complexity, it is plausible that the online examination used simpler cases in contrast to the more intricate cases used in the in-person examination, potentially affecting student outcomes. Considering individual factors, students may feel less anxious and more comfortable using an online assessment away from the pressures of peer anxiety (Hytönen et al., 2021; Kakadia, Chen, and Ohyama, 2021; Mak, Krishnan, and Chuang, 2022). Additionally, students' preferences for learning and assessment formats vary and hence may impact their performance on non-preferred assessments. While important to consider these factors, it is crucial to note that this pertains to a small portion of the sample, and the observed differences may not necessarily represent a genuine finding.

This study adds to the growing body of research around the feasibility and validity of online assessments of clinical competence. This is the first study to prospectively evaluate an online standardized simulated case-based assessment of physiotherapy clinical competence and compare it to the performance of an in-person examination. The findings support the research across health professions worldwide that online assessment of clinical competence is a feasible alternative to in-person assessments. As health educators continue to adjust to the post COVID-19 world, the importance of establishing a feasible and valid online assessment of clinical competence continues to be a high priority.

Limitations

The high failure rate in our sample needs to be considered when interpreting the findings of this study. An important consideration in designing this study was that the online examination be able to detect not competent performance. Therefore, students with minimal clinical experience were sought as they were likely to have lower competence levels and test the ability of the online examination to detect non-competency. However, the failure rate in this study likely does not reflect the true distribution of scores typical to candidates of high-stakes clinical assessments when being evaluated for entry to the profession.

As previously discussed, the similarly high failure rate in both the online and in-person examinations has provided additional confidence that the online assessment can appropriately detect not competent performance. Conversely, this has provided minimal information about the ability of the online examination to appropriately detect competent performance. The

high failure rate may have also influenced the student experience of the clinical assessments and influenced their perception of the feasibility of this format as an alternative to the in-person examination. However, the impact of this appears minimal as students were largely supportive of the online examination.

Conclusion

The results of this study suggest that the online examination is a feasible method of assessing clinical competence. The online examination also appears to produce comparable measures of clinical competence (fail/pass) to an in-person examination. Further investigation is needed with a larger sample size to confirm the validity of the online examination. This study also adds insight into the perceptions of students and qualified physiotherapists concerning the use of online assessment methods. The contrasting opinions and perceptions present an avenue for further investigation into the potential perception regarding online assessment in the physiotherapy profession. This study also lays the groundwork for future research to validate the online examination in a larger cohort study.

Disclosure statement

In accordance with Taylor & Francis policy and the ethical obligation as a researcher, BF reports that they are completing an industry supported PhD in association with the APC, and authors DL and LC are affiliated with the APC. This has been disclosed fully to Taylor & Francis. Author JM has no competing interests to declare.

Funding

BF is completing an industry support PhD in association with the APC. The APC had no direct role in the design, analysis, or interpretation of the data.

Data availability statement

The data that support the findings of this study are available from the corresponding author, BF, upon reasonable request.

Author contributions

BF, JM, and LC were involved in the initial concept and data analysis, data interpretation, drafting and revising the manuscript. BF and DL were involved in the data collection. All authors read and approved the final manuscript.

Abbreviations

APC	Australian Physiotherapy Council
COVID-19	Corona Virus Disease 2019
OSCE	Objective Structured Clinical Exam
SD	Standard Deviation

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ATTACHMENTS/APPENDIX

Appendix 1: Assessment Form

ASSESSOR RECORDING FORM

AUSTRALIAN PHYSIOTHERAPY COUNCIL

Identification Details (to be completed by Administrator)			
Assessor ID		**Candidate ID**	

1A Collect Patient Information and Form a Preliminary Hypothesis	
1A.1	Collect patient information ☐ Obtained consent from the patient to conduct assessment ☐ Collected patient information and history ☐ Explored presenting signs and symptoms ☐ Obtained relevant measurable data (including supplementary information, for example radiological or pathological reports or reports from other service providers) ☐ Identified goals, values and expectations of the patient
1A.2*	Form a preliminary hypothesis ☐ Analysed the information collected ☐ Identified potential influencing presentations and hypothesised differential diagnoses ☐ Identified assessment needs including priority ☐ Checked the patient's needs against his/her scope of expertise

1B Design and Conduct a Safe Assessment	
1B.1	Design an assessment ☐ Prioritised and ordered assessment and included tests to measure impairment and activity limitation ☐ Identified potential problems and contraindications to assessment ☐ Selected tests and assessment instruments appropriate to the patient's presentation, and according to the reliability, validity, accuracy and availability of the tests
1B.2	Conduct an assessment ☐ Physical examination of appropriate depth and breadth (eg. relevant observational, manual and analytical testing, appropriate sequence for procedures, modifications according to patient response, completed in a timely manner) ☐ Modified assessment in recognition of factors such as patient's age, occupation, pain, co-morbidities, communication ability and the assessment environment ☐ Used tests and assessment instruments correctly ☐ Progressively interpreted findings as guide the nature and extent of the assessment ☐ Compared assessment findings against the preliminary hypothesis
1B.3	Safely assess ☐ Identified and assessed risks ☐ Made modifications to address risks for the patient and self

	2 Interpret and Analyse the Assessment Findings
2.1	Compare findings with 'normal' status of patient ☐ Identified normal status of the patient and compared the assessment findings against these ☐ Determined extent of pathology/disorder and discussed with the patient to develop a course of action
2.2*	Compare findings with what is expected for the condition, and include or exclude alternative diagnoses ☐ Defined clinical expectations of presenting condition including aetiology, signs, symptoms, clinical course; relationship of signs and symptoms to stage of disorder. ☐ Related symptoms to pathology/disorder ☐ Considered other features of the patient including patient environment, psychosocial and psychological elements when comparing presenting symptoms and expected clinical findings ☐ Compared actual and expected findings and considered differential diagnoses
2.3	Prioritise patient needs ☐ Identified problems and priorities in collaboration with the patient ☐ Identified presenting symptoms and interrelationships ☐ Considered possible sources/mechanisms of presenting symptoms and compared with preliminary diagnosis
2.4*	Re-evaluate as required to develop a justifiable and sustainable hypothesis ☐ Outlined in order of probability the differential diagnoses ☐ Refined diagnoses on appropriate tests performed ☐ Reinforced and negated clinic diagnostic hypotheses ☐ Reached justifiable conclusions and correlated with additional information to reach justifiable conclusions on Physiotherapy assessment findings ☐ Incorporated current scientific argument and clinical reasoning into the decision-making process
2.5*	Where indicated, identify areas that are outside their own skills and expertise and discuss appropriate referral ☐ Identified conditions not amendable to physiotherapy or are beyond own skills and knowledge ☐ Made appropriate referrals to other practitioners including physiotherapists, based on knowledge of presenting condition and management options

	3 Develop a Physiotherapy Intervention Plan
3.1*	Develop a logical rationale for physiotherapy intervention based on the assessment findings ☐ Identified significant features of the assessment findings and determined implications for the intervention ☐ Identified potential impact of patient lifestyle, culture, values and attitudes plus environment on a plan of intervention ☐ Developed rationale for intervention
3.2*	Set realistic short and long-term goals with the patient ☐ Provided appropriate education of the patient concerning the assessment findings ☐ Determined patient expectations ☐ Acknowledged the goals of referring practitioner ☐ Where appropriate, discussed the lack of intervention ☐ Established realistic goals in consultation with the patient ☐ Implemented strategies for modifying the goals developed with the patient
3.3	Select appropriate and effective interventions to address the patient problems that are identified ☐ Considered patient needs ☐ Considered indications, contraindications and risks associated ☐ Considered assessment findings from other providers ☐ Considered up to date, best evidence and followed best practice
3.4	Plan for possible contingencies that may affect the intervention plan ☐ Identified factors about the patient that may affect their motivation or ability to participate in the intervention ☐ Took appropriate precautionary action ☐ Developed a contingency plan ☐ Gave appropriate warnings to the patient ☐ Evaluated the environment to determine impediments to intervention
3.5	Prioritise the intervention plan in collaboration with the patient ☐ Established priorities ☐ Set realistic timeframes
3.6	Determine plan of evaluation using valid and reliable outcome measures ☐ Specified relevant evaluation procedures ☐ Selected suitable functional outcomes

4 Implement Safe and Effective Physiotherapy Interventions	
4.1	Obtain informed consent for the intervention ☐ Identified appropriate consent giver ☐ Ensured consent giver had sufficient understanding of the interventions including risks and benefits, realistic expectations ☐ Obtained consent
4.2	Prepare equipment and the treatment area ☐ Checked that appropriate equipment was selected and that it was safe and ready for operation ☐ Prepared the treatment area to maximise effectiveness, efficiency, safety and privacy of the patient
4.3	Implement safe and effective physiotherapy interventions for the patient and for the physiotherapist For the patient: ☐ Interventions were safe and effective ☐ Identified and managed risks to the patient ☐ Applied appropriate precautions ☐ Used appropriate mechanical equipment to assist in patient transfer and handling ☐ Implemented infection control ☐ Minimised distress to the patient; including understanding the effect of pain relief or other medications relevant to patient care during and after intervention, aspects of intervention that may impact on co morbidities ☐ Intervention was consistent with agreed program ☐ Used strategies to motivate the patient to participate: including communication throughout the intervention, gave accurate instructions and feedback related to performance ☐ Monitored the patient throughout the intervention and appropriate modifications were made for patient comfort and the patient's condition ☐ For the physiotherapist: ☐ Identified and managed risks to self ☐ Positioned self for safety and comfort ☐ Exhibited effective psychomotor skills
4.4	Where indicated, manage adverse events ☐ Identified potential adverse events, relevant precautions were taken ☐ Considered strategies for managing the therapist's personal safety ☐ Appropriately recognised, managed and reported
4.5	Provide strategies for patient self-management ☐ Gave the patient clear instructions and where necessary, demonstrated to the patient to ensure they understood the intervention ☐ In terms of defined goals, gave regular feedback on performance and progress ☐ Developed a realistic self-management program ☐ Used effective motivation strategies to encourage active participation by the patient
4.6	When indicated, implement health promotion activities ☐ Advocated self-management of health and wellbeing (includes early identification of disease, risk avoidance, principles of health care, health promotion and ergonomics) ☐ Where appropriate, made the patient aware of links to community networks

5 Evaluate the Effectiveness and Efficiency of Physiotherapy Intervention(s)	
5.1	Monitor the outcomes of the intervention ☐ Measured changes safely, accurately and appropriately (used specific and relevant outcomes)
5.2	Evaluate the outcomes of the intervention ☐ Determined the effectiveness and efficiency of intervention ☐ Determined relative contribution of change to function, health status etc ☐ Identified factors limiting or confounding effectiveness
5.3*	Determine modifications to the intervention Modifications to the intervention: ☐ were based on outcomes of intervention ☐ reflected changes in patient status, and ☐ were made in consultation with the patient ☐ Referral was made to other professionals as indicated by outcomes

6 Communicate Effectively	
6.1	Communicate effectively with the patient ☐ Established a rapport with the patient ☐ Adapted verbal and nonverbal communication to the needs and profile of the patient ☐ Communicated In a manner and environment that ensured confidentiality, privacy and sensitivity ☐ Discussed and agreed the goals, nature, purpose and expected outcomes of the physiotherapy intervention ☐ Employed appropriate strategies to address communication difficulties, eg. use of written communication, other technology or other persons
6.2	Demonstrate effective English language ability ☐ Demonstrated the ability to use the English language effectively when communicating with the patient (and any person acting as a consent giver or interpreter) and the assessors.

7 Risk Management Incidents
N/A if there was no incident requiring the management of risk **SAFETY ISSUE(S)** if significant safety issue(s) observed during assessment **ASSESSMENT DISCONTINUED** if the assessment was discontinued