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The Clinical Reasoning Assessment Tool for Learning from Standardized Patient Experiences: A Pilot Study

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Abstract

Purpose: Clinical reasoning (CR) is the ability to integrate the knowledge of diagnoses with the use of supporting theories to create effective, client-centered interventions. One means of teaching CR to rehabilitation students is using standardized patient (SP) experiences. The relationship between faculty and student CR ratings after SP experiences has not been researched. The purpose of the study was to determine if there would be correlations between physical therapy (PT) and occupational therapy (OT) student and faculty ratings of CR skills after an SP experience. Method: The Clinical Reasoning Assessment Tool (CRAT) was used by students to self-reflect on their CR performance after an SP experience and compared to their respective faculty ratings. The CRAT includes three subsections: content knowledge, procedural knowledge, and conceptual reasoning, each with a visual analog scale. Correlations between students' self-assessment of CR and faculty reviews were analyzed using Spearman's rho correlations. Results: Seventeen PT and seventeen OT students participated. Spearman's rho correlation coefficients for the PT students and their faculty were: content knowledge (r=.180; p=.488), procedural knowledge (r=.697; p=.002), and conceptual reasoning (r=.258; p=.317). Spearman's rho correlation coefficients for the OT students and their faculty were: content knowledge (r=.103; p=.693), procedural knowledge (r=.676; p=.003), and conceptual reasoning (r=.505; p=.039). Conclusions: Neither PT nor OT student ratings was a statistically significant correlation in content knowledge ratings in relation to respective faculty ratings. Both PT and OT student procedural knowledge rating correlations with faculty were strong and statistically significant. PT student and faculty ratings were not significantly correlated in conceptual reasoning compared to faculty; however, OT students and faculty ratings were strong, had positive correlations, and were statistically significant. Further research is needed to assess students' CR development longitudinally across curricula.

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ABSTRACT
Purpose: Clinical reasoning (CR) is the ability to integrate the knowledge of diagnoses with the use of supporting theories to create effective, client-centered interventions. One means of teaching CR to rehabilitation students is using standardized patient (SP) experiences. The relationship between faculty and student CR ratings after SP experiences has not been researched. The purpose of the study was to determine if there would be correlations between physical therapy (PT) and occupational therapy (OT) student and faculty ratings of CR skills after an SP experience. **Method:** The Clinical Reasoning Assessment Tool (CRAT) was used by students to self-reflect on their CR performance after an SP experience and compared to their respective faculty ratings. The CRAT includes three subsections: content knowledge, procedural knowledge, and conceptual reasoning, each with a visual analog scale. Correlations between students' self-assessment of CR and faculty reviews were analyzed using Spearman's rho correlations. **Results:** Seventeen PT and seventeen OT students participated. Spearman's rho correlation coefficients for the PT students and their faculty were: content knowledge ($r=.180$; $p=.488$), procedural knowledge ($r=.697$; $p=.002$), and conceptual reasoning ($r=.258$; $p=.317$). Spearman's rho correlation coefficients for the OT students and their faculty were: content knowledge ($r=.103$; $p=.693$), procedural knowledge ($r=.676$; $p=.003$), and conceptual reasoning ($r=.505$; $p=.039$). **Conclusions:** Neither PT nor OT student ratings was a statistically significant correlation in content knowledge ratings in relation to respective faculty ratings. Both PT and OT student procedural knowledge rating correlations with faculty were strong and statistically significant. PT student and faculty ratings were not significantly correlated in conceptual reasoning compared to faculty; however, OT students and faculty ratings were strong, had positive correlations, and were statistically significant. Further research is needed to assess students' CR development longitudinally across curricula.

Keywords: clinical reasoning; standardized patient; clinical simulation; physical therapy; occupational therapy; education

INTRODUCTION

Among healthcare professionals, clinical reasoning (CR) is the ability to integrate the knowledge of diagnoses with supporting theories to create effective, client-centered interventions.[1] Clinical reasoning involves the collaboration between patient and healthcare provider and the ability of the provider to reflect on case information combined with previously acquired knowledge. The concept of CR differs between health professions based on their scopes of practice; however, it is agreed upon that CR is an ever-evolving skill to guide decision-making processes across healthcare professions.[2]

Physical therapy utilizes knowledge of personal values through collaboration with the patient and evidence-based practice for CR to provide client-centered treatments and achieve positive patient outcomes.[3] Huhn et al found that in physical therapy (PT), CR integrates cognitive, psychomotor, and affective skills.[2] It is adaptive and iterative, creating a biopsychosocial approach to client management. Physical therapy students with developed CR skills do not need to reference PT standard procedures to make timely, client-focused informed decisions.[4]

Occupational therapy (OT) aims to identify patient values using interactive and conditional reasoning involving a phenomenological approach rather than more formal reasoning strategies that may be more common in other health professions.[1,5] Unsworth found that OTs with underdeveloped CR skills are less likely to identify occupational performance issues accurately and promptly.[6] Occupational therapists with developed CR skills provide a holistic client-centered approach through manipulating and grading activities to achieve their client's goals compared to therapists with underdeveloped skills.[6] It is evident that OT and PT students should develop a strong foundation of CR skills in the didactic portion of their education to apply during clinical experiences and in future practice to provide quality care for patients.[6]

Varied methods for teaching and assessing CR are utilized in rehabilitation science educational programs such as case studies, problem-based learning, standardized patients (SP), and clinical education experiences to develop and meet profession-specific CR standards before graduating and entering practice.[7-10] In particular, experiential learning with SPs allows students to practice an authentic interaction with an accurate representation of a patient they may experience.[8] These methods are used in both OT and PT curricula.

Reflection is essential in SP experiences as it provides an opportunity for students to examine their decision-making process after the simulation.[10] The reflective aspect allows a better understanding of the students' decision-making frame of reference and asks probing questions to allow the student to reflect further and self-identify areas for improvement.[10] Reflection enables students to continuously refine their CR skills for effective carryover into future practice.[10]

A systematic review conducted by Pritchard et al found that DPT students felt that SP experiences are beneficial for learning due to the realism combined with the structured feedback in debriefings; however, it is unclear if there are long-term benefits.[9] Johnston et al demonstrated that DPT students had difficulty determining all questions to ask and examination techniques to perform due to a lack of reflection during SP experiences.[11]

Herge et al determined that MSOT students reported better learning outcomes related to CR from active participation in clinical simulations.[12] Students can initiate their learning during clinical scenarios from start to finish, followed by reflection with their educator. Mackenzie et al indicated that simple observation of MSOT student performance during simulation was insufficient for evaluating CR.[13] Instead, facilitated debriefing is required to encourage student reflection on CR skills after simulations.[13]

Clinical reasoning abilities are essential in interprofessional practice to ensure optimal patient care. Johnson et al define interprofessional care as when more than one profession must collaborate and exchange knowledge to improve client health experience.[14] Clinical reasoning skills embedded within the Interprofessional Education Collaborative competencies emphasize safety and the client's best interest while collaborating in providing care.[15] Thus, each member contributes their unique background and prior experiences to assist CR guided decision-making.[2]

Upon examining interprofessional SP learning experiences with DPT and MSOT students, direct hands-on time with SPs was perceived as beneficial to learning and led to reports of improvement in self-efficacy.[16] Students enrolled in DPT and MSOT programs have expressed increased readiness for interprofessional care after SP experiences when participating in collaborative treatment.[17] DPT and MSOT students value interprofessional education (IPE) in SP collaborative experiences as they facilitate role clarity.[18]

Thomas et al found that DPT and MSOT students felt more prepared after interprofessional SP acute care experiences, whereas clinical instructors perceived that students were more confident.[19] Student problem-solving, critical thinking, and collaboration skills may be enhanced when SP experiences are more complex such as acute care experiences.[19] Research examining student CR development in interprofessional SP experiences could not be identified.

Debriefing after SP experiences is a critical component of the learning process as it provides a safe space for students to reflect on the experience. One way to facilitate these discussions is by utilizing clinical reasoning assessment tools. These tools provide objective feedback to students encouraging reflection upon their performance for continued development of CR skills.[10] Furze et al. suggest that CR encompasses critical thinking, the ability to apply knowledge, and positive patient rapport.[20-21] Using these constructs, the Clinical Reasoning Assessment Tool (CRAT) assesses content knowledge, procedural knowledge, and conceptual reasoning using a visual analog scale for each subscale (Appendix).[20-21]

Content knowledge is comprehending what comprises a broader concept of knowledge.[20-21] Procedural knowledge is the application of knowledge to a specific task.[20-21] Procedural knowledge consists of the student's performance of examination techniques. Conceptual knowledge is the ability to understand a concept and how that concept works.[20-21] McDevitt et al demonstrated that the CRAT could be useful in predicting procedural and conceptual reasoning over time within an entry-level PT curriculum.[22]

To date, the CRAT has only been utilized in DPT programs and does appear to show face validity in this context.[21-22] Reliability studies could not be identified. However, it is designed as a tool to facilitate reflection and discussion between faculty and students and thus may be beneficial to rehabilitation students in general by emphasizing individualized feedback. Despite the lack of research on the CRAT with MSOT students, it measures similar domains required for OT client evaluation despite differences in theoretical constructs between PT and OT disciplines.

Correlations between faculty and students' perceptions of their CR during an orthopedic interprofessional SP experience have not been studied. Therefore, this leads to the justification of the present study, which was to determine if there is a correlation between PT and OT students and faculty ratings of student CR skills after an orthopedic SP experience using the CRAT.

METHODS

The study was conducted at a small private liberal arts university in the northeastern U.S. in 2021, with the university's IRB agreeing to provide ethical oversight. The exploratory quantitative analysis examined Spearman rho correlation coefficients between student and faculty ratings on CRAT subscales, intending to gain insight into students' perceptions of their CR after participating in an interprofessional, orthopedic SP experience. Students enrolled in the DPT or MSOT program in their first year of study and at least 18 years were included.

The respective faculty member in each class recruited students by a classroom announcement and provided all participants with informed consent to include their data in the study analysis. Seventeen OT-PT student pairs were required to perform a co-assessment of an SP with a total knee replacement (TKR). The study was conducted during the seventh week of the second semester for the PT and OT participants.

The SP case mimicked a home care evaluation with student instructions to identify impairments of body structures, body functions, and functional limitations of a patient post-orthopedic surgery. The SP experiences were between 15 and 25 minutes and were video and audio recorded using a simulation recording system (VALT© Intelligent Video Solutions) for the faculty raters to review.[23] The SPs were trained actors who received detailed instructions on accurate case portrayal before the SP experience.

Instruments

Upon signing the informed consent, participants completed a demographic survey reporting their age, identified gender, and past clinical exposures. Before data collection, student participants and faculty raters were trained verbally in the use of the CRAT by the first author. The training consisted of verbatim instructions to the DPT and MSOT students about the proper use of the tool as a means of improving reliability. Pilot testing of the instrument with the sample was not completed. After the SP experience, the student participants completed VAS ratings of the three subscales of the CRAT (content knowledge, procedural knowledge, and conceptual reasoning) using a paper version of the CRAT. The student participants also entered comments in Qualtrics© based on guiding questions related to the SP case.[24] Faculty raters used these comments and video observations to assess the participants' CR using the CRAT VAS scale. The faculty raters were blinded to the student VAS ratings. There was a single OT faculty rater and a single PT faculty rater to minimize concerns related to reliability. The PT and OT faculty raters had not previously used the CRAT and received identical written training prior to use.

The CRAT subcategories are scored on a 10-point VAS with the following scoring: beginner (0 - 2.50 mm), intermediate (2.5 - 5.0 mm), competent (5.0 - 7.5 mm), and proficient (7.5 - 10.0 mm). Content knowledge "identifies appropriate foundational knowledge and information related to the International Classification of Functioning, Disability, and Health (ICF) Framework and is the knowledge the [student] brings to the case, not the knowledge the patient brings/shares. In addition, this is just identifying the facts and not the interpretation of this information."[20-21]

Procedural knowledge is the ability to determine the appropriate test, measure, or intervention and psychomotor performance of that skill.[20-21] Lastly, Furze et al defined conceptual reasoning as the "cognitive and metacognitive skills-data analysis and self-awareness/reflection [entailing] the interrelationship and synthesis of information upon which judgment is made utilizing reflection and self-awareness."[20-21] Qualitative research has demonstrated that DPT faculty find the CRAT to foster understanding of CR, facilitate CR through discussion and self-reflection, and to assess the learner's level of CR.[22]

Data Analysis

An a priori power analysis calculated a sample size of 40 participants; thus, completing a pilot study was justified. SPSS Statistics package (SPSS Version 26.0; IBM Corp., Armonk, NY) analyzed demographics and CRAT scores.[26] Statistical significance was set at Type I error of 5%. Age differences between OT and PT groups were examined with a non-parametric Mann-Whitney U. Demographic characteristics in OT and PT students with nominal data were examined with Chi-square tests and ratio data differences with an independent t-test. Spearman rho correlations were used to analyze correlations between the participant and individual faculty member rater VAS scores on the three subscales of the CRAT. Non-parametric statistical analysis was chosen based on the ordinal level data of the scale and small sample size.

RESULTS

Thirty-four rehabilitation science students participated in the study with the data of seventeen OT-PT student pairs included in the analysis. In demographic data outlined in Table 1, the mean age of the total participants was 23.67(3.65) years; 25 were female participants (73.53%). Most participants (91.17%) had clinical exposure before matriculation into their respective entry-level graduate programs. There were no differences in age, gender, or prior clinical exposure, between the OT and PT groups.

Table 1. Demographic Characteristics of Participants

	OT (n = 17) n (%) or M(SD)	PT (n = 17) n (%) or M(SD)	Total (n = 34) n (%) or M(SD)	Significance (*p*)
Age (years)	23.88(4.81)	23.47(2.07)	23.76(3.65)	0.634
Gender				0.052
Female	15 (88.24%)	10 (58.82%)	25 (73.53%)	
Male	2 (11.76%)	7 (41.18%)	9 (26.47%)	
Prior Clinical Exposure				0.070
Yes	14 (82.35%)	17 (100%)	31 (91.17%)	
No	3 (21.43%)	0 (0%)	3 (8.82%)	

Note. OT = occupational therapy; PT = physical therapy; M = mean; SD = standard deviation

Faculty and participant VAS rating means with standard deviations in millimeters on the three subscales of the CRAT are reported for the PT participants (Table 2) and OT participants (Table 3). Spearman rho coefficients and p values are reported for PT participants in Table 2 and OT participants in Table 3.

Table 2. Physical Therapy Data of the Clinical Reasoning Assessment Tool (n=17)

CRAT Category	Participants M(SD)	Faculty M(SD)	Correlation (*r*)	Significance (*p*)
Content Knowledge	3.457 (1.574)	4.096 (1.126)	.180	.488
Procedural Knowledge	3.311 (1.720)	3.768 (1.079)	.679	.002**
Conceptual Reasoning	3.269 (1.716)	4.326 (0.825)	.258	.317

Note. M = mean; SD = standard deviation; Mean in mm

Table 3. Occupational Therapy Data of the Clinical Reasoning Assessment Tool (n=17)

CRAT Category	Participants M(SD)	Faculty M(SD)	Correlation (*r*)	Significance (*p*)
Content Knowledge	3.231 (1.212)	2.576 (1.556)	.103	.693
Procedural Knowledge	3.436 (1.418)	2.611 (1.251)	.676	.003**
Conceptual Reasoning	3.247 (1.440)	3.599 (1.052)	.505	.039**

Note. M = mean; SD = standard deviation; Mean in mm

DISCUSSION

Clinical reasoning represents the process in which therapists arrive at clinical decisions requiring the ability to identify crucial subjective and objective information and reflect on previously acquired knowledge.[27] The study aimed to determine if PT and OT participants and faculty ratings of CR skills after an SP experience were correlated. Due to the reflective nature of the CRAT, faculty can rate students using the tool, followed by a guided discussion on performance to reinforce current and new knowledge further. The qualitative work of McDevitt et al identified PT faculty perceptions that the CRAT's structure may facilitate dialogue with students and encourage self-reflection to further CR acquisition.[22]

The study design was based on Kolb's experiential learning cycle and Schon's reflective practice theory as a theoretical base to provide an interprofessional SP experience to first-year PT and OT students and the opportunity to reflect on their experience to improve their CR skills.[28-29] These adult learning theories share a common theme that learning is related to life experiences but digress how these experiences create learning opportunities.

Kolb's experiential learning relies on the premise that learners use a combination of concrete experience, reflective observation, abstract conceptualization, and active experimentation.[28] Kolb suggests that learning involves an integrative or holistic process of thinking, feeling, perceiving, and behaving toward the environment through interaction between the learner and the environment.[28] Schön's reflective practice encourages students to reflect on their performance at the moment or after activity as a result of reflection-on-action or reflection-in-action.[29] Schön emphasizes the explicit practice of reflection by requiring students to consider the implications of their actions during and after activities.[29]

This study's findings align with previous research conducted by Herge, stating that OT students report better learning outcomes related to CR from active participation in clinical simulations where they can initiate their learning through independent facilitation of a patient scenario from start to finish and later reflect on the experience with their educator.[12] It also aligned with the systemic review by Pritchard et al. that found that DPT students felt that SP experiences are beneficial when combined with structured feedback.[9]

Deveau et al found that nursing students often show cognitive biases in CR during clinical simulations. Cognitive bias can include overconfidence, rapid conclusions based on incomplete assessments, and confirmation bias based on recent clinical encounters.[31] Student biases, limited clinical experience, and developing knowledge levels can affect CR; therefore, feedback is essential from instructors to ensure the accuracy of student self-assessment when reflecting on performance.[32] Although this research examined nursing students, PT and OT students may show similar cognitive bias in CR. Theoretically, PT and OT students may demonstrate less cognitive bias by combining the CRAT for student self-reflection and faculty feedback.

Limitations

Limitations of this study include small sample size, possible inconsistency in training the SPs, and potential reliability concerns associated with the CRAT between the OT and PT faculty rater, as the OT rater generally rated the students lower and the PT rater generally rated the students higher. Examining multiple first-year PT and OT students from different programs and at different stages in curricula would be the next step for future research to improve generalizability. Research examining the qualitative component of the CRAT may further elucidate its usefulness as a reflective tool for learning CR.

CONCLUSIONS

The results encourage the expansion of CR education in rehabilitation science programs through interprofessional SP experiences incorporating the CRAT. Clinical reasoning is a vital component of healthcare curricula and requires a reflective element to be considered adequate. Although student and faculty ratings were not always strongly correlated, the CRAT could be a useful reflective tool in student CR education. Information from the CRAT may effectively facilitate feedback discussions between faculty and students to improve their clinical performance.

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APPENDIX: CLINICAL REASONING ASSESSMENT TOOL (CRAT)

Content Knowledge **– identifies appropriate foundational knowledge and information related to the International Classification of Functioning, Disability, and Health (ICF) Framework. Content knowledge is the knowledge the resident brings to the case, not the knowledge the patient brings/shares. In addition, this is just the *identification of the facts and NOT the interpretation of this information.***

Sample behaviors to assess:

1) Identifies appropriate foundational knowledge integral to patient's health condition including biological and physical (anatomy, histology, physiology, kinesiology, and neuroscience).
2) Determines relevant ICF components as they relate to the patient case (identifies the patient's health condition, body structure and function limitations, activity limitations, participation restrictions, and personal and environmental factors.

VISUAL ANALOG SCALE (please mark)

Beginner	Intermediate	Competent	Proficient
Limited evidence of content and foundational knowledge and identification of patient-related ICF components	**Moderate** evidence of content and foundational knowledge and identification of patient-related ICF components	**Strong** evidence of content and foundational knowledge and identification of patient-related ICF components	**Comprehensive** evidence of content and foundational knowledge and identification of patient-related components

Comments:

Procedural Knowledge/Psychomotor Skill– **ability to determine appropriate test/measure/intervention and psychomotor performance of an intervention/test/skill.** (When to perform a skill, what skills to perform, and how to perform the skill)

Sample behaviors to assess:

1) Determines appropriate test/measure/intervention to perform
2) Demonstrates the ability to safely and effectively perform test/measure/intervention (Hand placement, patient positioning, palpation, force production, safety, use of equipment)
3) Incorporates effective communication strategies including verbal and nonverbal skills (can the resident ask the patient the right questions)

VISUAL ANALOG SCALE (please mark)

Beginner	Intermediate	Competent	Proficient
Limited accuracy in performing test/measures/interventions but can SAFELY perform these	**Moderate** accuracy in performing test/measures/interventions and can SAFELY perform these	**Strong** accuracy in performing intervention/test efficiently and effectively utilizing appropriate knowledge base, verbal and manual cues, and use of equipment to allow the patient to complete the test or fully participate in the intervention	**Efficiently** performs tests and interventions with skill and ease and able to build patient rapport during the exam and intervention

Comments:

Conceptual Reasoning **(Cognitive and Metacognitive Skills – data analysis and self- awareness/reflection)- entails the interrelationship and synthesis of information upon which judgment is made utilizing reflection and self-awareness.** (Making sense out of all of the information)

Sample behaviors to assess and questions to ask:

1. Appropriately justifies, modifies, or adapts test/measure or intervention based upon patient case.
2. Interprets exam findings appropriately including interpreting information from the patient (communication)
3. Applies and interprets patient information across all aspects of the ICF model to justify test/measure or intervention
4. Active listening
5. What additional information do you need to make decisions/judgments?
6. What would you do differently if you were able to do this examination again?

VISUAL ANALOG SCALE (please mark)

Beginner	**Intermediate**	**Competent**	**Proficient**
Justifies choice for a **few** tests and measures/interventions Able to identify some patient problems Interprets results of selected tests/measures	Justifies choice for **most** tests and measures/intervention Identifies relevant patient problems Generates a working hypothesis and begins to prioritize a patient problem list	Justifies choice for **all** tests and measure/intervention Prioritizes problem list and incorporates patient goals into plan of care Confirm/disprove working hypothesis and determines alternate hypothesis Synthesizes relevant patient data	Generates a hypothesis, understands patient perspective, and reasoning is a fluid, efficient, seamless process (demonstrates "reflection in action)

Comments:

Resident must meet or exceed *identified level (**Competent*** or ***Proficient**)* for satisfactory completion in the following areas (please check):

Content Knowledge: _____**Satisfactory** _____**Unsatisfactory**
Procedural Knowledge/Psychomotor Skill: _____**Satisfactory** _____**Unsatisfactory**
Conceptual Reasoning: _____**Satisfactory** _____**Unsatisfactory**

General Comments: