

Student and Clinical Educator Perspectives of Clinical Reasoning

by

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Keywords

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Situated cognition

Clinical educators



Abstract

Background: Clinical reasoning describes the thinking and decision-making process behind one's actions. Effective clinical reasoning should result in appropriate decision-making that leads to better clinical outcomes for the patient. The successful transfer of basic sciences – in other words, clinical knowledge – helps students develop clinical reasoning. However there are challenges translating academic theory into practical situations. Clinical educators play an important role in improving the development of clinical reasoning and identifying difficulties.

Aim: To explore student and clinical educator perspectives of clinical reasoning in the Physiotherapy Department of the University of the Western Cape. The objectives of the study were to: 1) explore the understanding of clinical reasoning among the physiotherapy students and the clinical educators, 2) explore the difficulties faced by students during the clinical reasoning process, and 3) explore the strategies used by clinical educators to develop clinical reasoning in the physiotherapy students.

Methods: Qualitative data was collected within an interpretivist paradigm using a cross-sectional study design. The study population comprised of third and fourth year undergraduate physiotherapy students enrolled at the University of the Western Cape, and clinical educators employed by the Physiotherapy Department. The study sample consisted of a diverse group of participants. Data was collected using one-on-one, semi-structured interviews with open-ended questions, which was then analysed thematically.

Results: Both participant groups had a similar understanding that clinical reasoning is a process that involves integrating gathered information to plan management of a patient.

Clinical educators use various strategies to improve clinical reasoning development in undergraduate physiotherapy students, including feedback, demonstration and discussion sessions. Clinical reasoning difficulties, as highlighted by the students, stemmed from negative clinical experiences during clinical rotations, difficulty with knowledge transfer and a theory–practice disconnect. These difficulties were also mentioned by the clinical educators. The nature of feedback was interpreted differently by the different participant groups. The undergraduate physiotherapy students perceived corrective feedback as negative critique.

Ethics: Ethics approval was granted by the Humanities and Social Sciences Research and Ethics Committee (HSSREC) of the University of the Western Cape. Permission to conduct the study was received from the Registrar of the University, and the Head of the Department of Physiotherapy. All information regarding the study participants was kept confidential. Data collected was stored on Dropbox which is password-protected. The data will be kept for at least five years following the conclusion of the study.

Definition of terms

Clinical educator – a staff member employed by a university who assists students in the clinical setting to gain the necessary knowledge, skills and attitudes to meet the standards defined by the university (Levett-Jones & Bourgeois, 2007).

Clinician/health professional – a member of a registered health profession involved in direct patient care (Hay-Smith, Brown, Anderson, & Treharne, 2016).

Knowledge transfer – using knowledge acquired in one context to solve a new problem in another context (Norman, 2009). In the context of this study, knowledge transfer refers to using knowledge acquired in the classroom to solve a problem in the clinical context.

Clinical reasoning – defined in this study as the decision-making process used by health professionals to generate clinical hypotheses during patient management (Higgs, 2008).

Theory–practice gap – a body of theory which does not fully account for what happens in clinical practice (Rolfe, 1993).

Interpretivist approach – a research approach used to study participants’ experiences which occur within a particular context, in this case the clinical context (Ritchie, Lewis, & Elam, 2003).

Situated cognition – suggests that clinical problem-solving is not only based on a student’s abilities to use knowledge, but also on the interaction between student, clinical educator and the clinical environment, demanding authenticity in learning, and encouragement of active student participation and peer contribution to improve clinical reasoning development (Durning & Artino, 2011).

Analytical thought process – a process of the dual process theory that is slow, “rational” and demands more thought (Norman, 2009).

Non-analytical thought process – one of the processes of the dual process theory that involves pattern recognition and is intuitive and fast (Norman, 2009a).

Clinical supervision –refers to a process whereby students regularly meet with an experienced supervisor to discuss and review skills, knowledge, and practice in order to assist in the development of skills in a given profession, which in this study, refers to physiotherapy (Best et al., 2014). In this thesis we will refer to “clinical supervision” as “clinical teaching”.



Declaration

I declare that this work entitled *Student and Clinical Educator Perspectives of Clinical Reasoning* is my own work. It has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Name: Jacqueline Hendricks

Date: November 2021

Signed

Hendricks



Witness:

D Hess

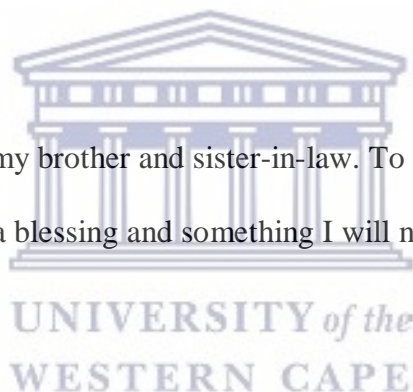
Mrs Danelle Hess

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When we were children, my mother would tell my brother and I to always remember where our help in life came from. Writing this thesis would not have been possible without the help of my heavenly Father who has given me the strength, wisdom and perseverance to achieve this milestone. For that I am humbled and I am thankful.

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To my extended family and friends, thank you for all the words of encouragement, thoughts and prayers. I am truly grateful to you all for your love and support.

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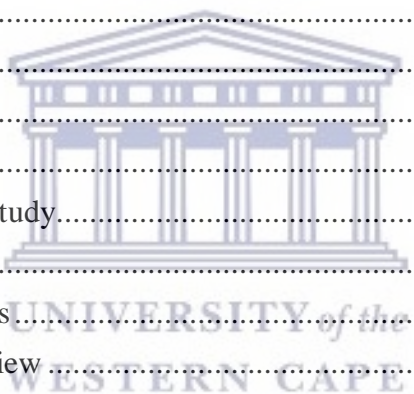
I hope I have made you proud. I love you always and always!

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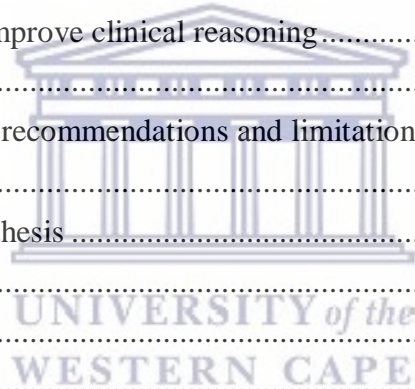


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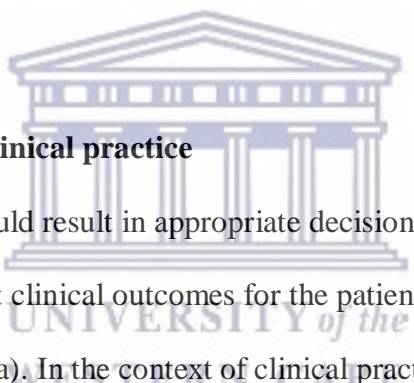
1 Chapter 1: Introduction

1.1 Introduction

This chapter provides background to the study, and outlines the research questions, objectives and overall aim of the study. It also provides context with regard to the concept of clinical reasoning in the clinical setting, the importance of developing this skill at an undergraduate level, and the role of the clinical educator in the development of student clinical reasoning skills.

1.2 Background

1.2.1 Clinical reasoning in clinical practice



Effective clinical reasoning should result in appropriate decision-making that leads to achieving effective and efficient clinical outcomes for the patient (Christensen et al., 2017; Rochmawati & Wiechula, 2010a). In the context of clinical practice, clinical reasoning is a thought process used during the clinical examination to solve a clinical problem (Karvonen, Paatelma, Laitinen-Väänänen, & Piirainen, 2017). The process of clinical reasoning is the ability to combine and apply different knowledge types (Anderson, Jane, 2006), synthesising information from the clinical assessment to formulate a diagnosis (Holdar, Wallin, & Heiwe, 2013), and allowing health professionals to take the best action in terms of patient care (Christensen et al., 2017). Clinical reasoning is therefore seen as the cognitive processes used by clinicians to formulate a diagnosis (Eva, 2005), an important skill in the training of a competent, effective physiotherapist (Furze et al., 2015). Often assumed as a globally understood concept (Gruppen, 2017), clinical reasoning is seen as a reflective process with

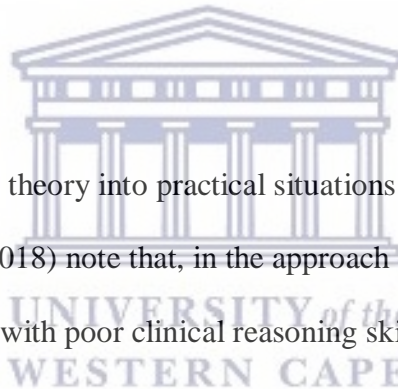
many interrelated levels including the patient's behaviour and goals (Jawaid, Bakhtiar, Masood, & Mehar, 2019).

Health professionals solve complex patient problems on a daily basis; to do so successfully, they must have the ability to think carefully through those problems (Barrett & Scott, 2018). Accordingly, the ability to make safe and accurate clinical decisions is the foundation of a competent health professional (Schuwirth, Durning, & King, 2020). In a study by van Aswegen et al. (2017), clinical reasoning and knowledge were found to be key concepts identified as an important minimum standard for clinical practice. In America, the American Physical Therapy Association (APTA) recognises clinical reasoning as a practice expectation (APTA, 2004). Similarly, in South Africa it is the responsibility of a qualified physiotherapist, as a first line practitioner, to be able to use their clinical reasoning to make a diagnosis (South African Society of Physiotherapy, 2014). This can explain why the development of clinical reasoning skills is considered fundamental to education in the health professions (Schuwirth et al., 2020).

1.2.2 Challenges in clinical reasoning development

Sound clinical reasoning development is a common goal of clinical education (Jessee, 2018). This development happens in the classroom and in the clinical setting. While the classroom environment provides students with mostly theoretical knowledge, the clinical environment provides opportunities to put theory into practice (Günay & Kılınç, 2018). The application of knowledge gained in one learning situation, applied to solving a problem in another situation, is commonly referred to as knowledge transfer (Norman, 2009). This transfer of knowledge in the clinical reasoning process is an essential component of health professionals' education

(Castillo et al., 2018). The fact that it is a challenging and complex process to learn, makes it best taught in the context of a clinical setting (Linn, Khaw, Kildea, & Tonkin, 2012). The clinical setting might be best suited because this is where students, who generally use an analytical approach (slow and deliberate decision-making) to clinically reason (Croskerry, Petrie, Reilly, & Tait, 2014), can use their theoretical knowledge to interpret their findings (Gummeson, Sundén, & Fex, 2018a). Although working in a team of professionals enhances students' learning experiences by giving them the opportunity to observe various approaches to clinical reasoning, students find difficulty connecting their pre-clinical knowledge and skills to practice in the clinical environment (Wijbenga, Bovend'Eerdt, & Driessen, 2018).



There are challenges translating theory into practical situations (Newton, Billett, Jolly, & Ockerby, 2009). Ricros et al. (2018) note that, in the approach of a group of midwifery teachers to identifying students with poor clinical reasoning skills, some of the major contributing factors to the students' clinical reasoning difficulties were lack of theoretical knowledge and difficulty putting knowledge into practice. Theoretical knowledge is a prerequisite for successful clinical reasoning (Schuwirth et al., 2020). Thomson et al. (2015) explains that this may be due to the fact that there is a difference between the management of academic environments and clinical environments. Knowledge at work (the clinical setting) and knowledge at university differ in structure, are differently obtained and are used for different purposes (Garraway, 2010). Audétat et al. (2017) highlights the main areas of clinical reasoning difficulty observed in students during supervision as being data interpretation, prioritisation of information, hypothesis generation, formulation of final diagnoses and treatment planning difficulties. It is important that clinical educators

understand these difficulties in order for steps to be taken to avoid minor difficulties becoming more serious (Audétat, Laurin, Dory, Charlin, & Nendaz, 2017a).

1.2.3 The role of clinical educators

Clinical reasoning skills are expected to develop in response to a variety of educational strategies, an example of which is professional supervision by clinical educators (Wihlborg, Edgren, Johansson, Sivberg, & Gummesson, 2019). Clinical educators perform an important role in the integration of basic science knowledge (Voges & Frantz, 2019). In the clinical setting, the clinical educator can facilitate the development of conceptual thinking by making visible their clinical reasoning process, in other words, explaining and describing the steps taken during their reasoning process, to help students understand their own thinking processes (Audétat, Laurin, Dory, Charlin, & Nendaz, 2017b; McMillan, 2010). Feedback from clinical educators and reflection enhances student learning in clinical reasoning, and physiotherapy students improve their clinical reasoning skills through gradually increasing practical experiences at clinical placements, being repetitively exposed to a variety of clinical patients (Nafea & Dennick, 2018). A study by Culyer et al. (2018), exploring evidence-based teaching strategies in the nursing faculty, found that reflection, case-based learning and problem-based learning were some of the top strategies used to facilitate the development of knowledge.

Clinical educators also play an important role in improving the development of clinical reasoning by identifying difficulties in health profession students (Audétat, Laurin, Dory, Charlin, & Nendaz, 2017a). However, it is challenging for clinical educators to assess the student's approach to clinical reasoning (Modi, Anshu, Gupta, & Singh, 2015). Although

various strategies have been suggested to improve clinical reasoning in the different health care professions (Culyer, Jatulis, Cannistraci, & Brownell, 2018; Dowson, 2019; Nafea & Dennick, 2018), more research is required to determine potential barriers and facilitators with regard to student clinical reasoning development in the clinical setting (Hunter & Arthur, 2016). Encouraging the development of clinical reasoning skills is therefore important within the physiotherapy profession (Gard, Nyboe, & Gyllensten, 2020).

1.3 Problem statement

The following problem statement is built on the argument developed throughout this chapter thus far:

Physiotherapists use clinical reasoning in order to manage their patients. But undergraduate physiotherapy students tend to have difficulty with clinical reasoning, which could arise from using the knowledge developed in the classroom context, in a clinical setting. Understanding the perspectives of clinical reasoning of both the students and the clinical educators and gaining insight into current supervisor practices could assist with designing strategies to develop clinical reasoning in undergraduate physiotherapy students.

1.4 Research question

What are the undergraduate physiotherapy student and clinical educator perspectives of clinical reasoning at the University of the Western Cape?

1.4.1 Research sub-questions

- a) What is the understanding of clinical reasoning in students and clinical educators?

- b) What are the difficulties experienced by undergraduate physiotherapy students during the clinical reasoning process?
- c) What strategies do clinical educators use to help undergraduate physiotherapy students develop clinical reasoning skills?

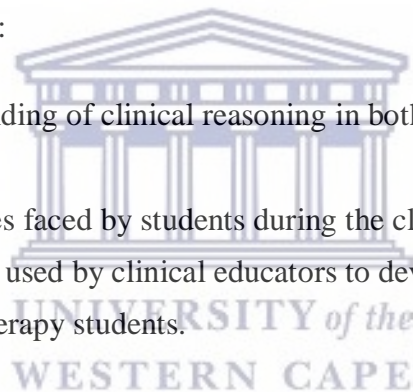
1.5 Aim of the study

The aim of the study is to explore student and clinical educator perspectives on clinical reasoning at the University of the Western Cape.

1.6 Objectives

The objectives of this study are:

- a) to explore the understanding of clinical reasoning in both students and clinical educators;
- b) to explore the difficulties faced by students during the clinical reasoning process;
- c) to explore the strategies used by clinical educators to develop clinical reasoning in undergraduate physiotherapy students.



1.7 Significance of the study

Ultimately, patient care may be improved if physiotherapists have adequate clinical reasoning. There is however no standard approach to the challenge of developing clinical reasoning in the undergraduate student physiotherapy population. By highlighting the difficulties students experience with clinical reasoning in clinical practice, the possible reasons for these difficulties, and the effects these difficulties have on patient management, possible solutions could be developed. Furthermore, understanding the strategies that clinical educators use during clinical teaching to help improve clinical reasoning skills in students, will allow for a more unified approach to the development of clinical reasoning during clinical placements. The results of the study therefore aim to add to the students' preparation

for the transition between academic and practical settings, and to help students understand how clinical reasoning skills can be developed.

1.8 Conclusion

In clinical practice, clinical reasoning is used to solve a clinical problem. Effective patient management depends on a health professional's clinical reasoning abilities, as the ability to make safe and accurate clinical decisions is the foundation of a competent health professional. Therefore, clinical reasoning development in health profession students is essential. Development of clinical reasoning skills happens in the clinical setting, where the application of knowledge gained in the classroom is used to solve clinical problems.

Translating theory into practical situations can be one of the main areas of difficulty during student clinical practice. Other areas of difficulty include data interpretation, prioritisation of information, hypothesis generation, formulation of final diagnoses and treatment planning difficulties. It is important for clinical educators to understand these difficulties as they play an important role in the development of clinical reasoning skills by identifying difficulties in student clinical reasoning processes. Chapter 2 provides a review of the literature on clinical reasoning difficulties in health profession students, mainly physiotherapy students, and how these difficulties are addressed in clinical practice.

1.9 Summary of chapters

Chapter 1: This chapter introduces the concept of clinical reasoning, the need for adequate clinical reasoning skills in clinical practice, the difficulties in student reasoning, and the roles of clinical educators in clinical practice.

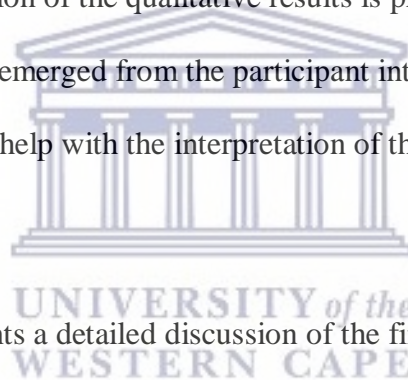
Chapter 2: Literature on clinical reasoning difficulties in undergraduate physiotherapy students is reviewed in this chapter. The chapter also reviews literature on the strategies that exist to improve clinical reasoning development in health profession students.

Chapter 3: This chapter describes the methods used to answer the research questions of this study. It includes population and sampling, the research design as well as the data collection and analysis procedures. Ethics considerations are also included in this chapter.

Chapter 4: A detailed description of the qualitative results is presented in this chapter. It discusses the main themes that emerged from the participant interviews, including verbatim quotations from participants to help with the interpretation of those themes.

Chapter 5: This chapter presents a detailed discussion of the findings of the study, using literature on clinical reasoning to assist in the interpretation.

Chapter 6: This chapter includes the conclusion of the study, summarising the main findings and presents the limitations of the study. Recommendations for further research is also discussed.



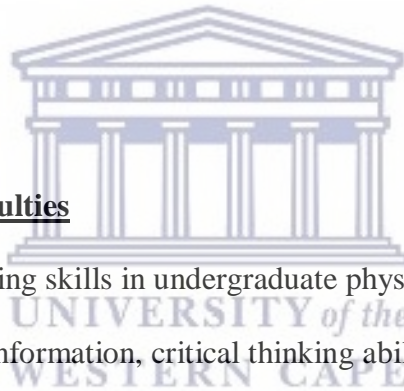
2 Chapter 2: Literature review

2.1 Introduction

The first chapter of the thesis established the importance of clinical reasoning for health professionals, and noted that there were several challenges with respect to the process of clinical reasoning and its development. This chapter gives a review of the literature on clinical reasoning difficulties in undergraduate health profession students, particularly physiotherapy students, and what strategies exist among clinical educators to improve clinical reasoning difficulties in the students. The theoretical framework for the study is also discussed.

2.2 Clinical reasoning difficulties

Prerequisites for clinical reasoning skills in undergraduate physiotherapy students should include the ability to integrate information, critical thinking abilities and the ability to generate hypotheses (Sole, Skinner, Hale, & Golding, 2019). However, clinical reasoning difficulties can arise at any time during the clinical reasoning process (Audétat, Laurin, Dory, Charlin, & Nendaz, 2017). According to Audétat et al. (2017), difficulties in clinical reasoning are often indicative of a delay in development as is common in novice health professionals, and should not lead to clinical educators identifying students as “problem learners” (Audétat et al., 2017, p. 794). Difficulties often occur because of failure to activate prior knowledge, and incorrect processing of information (Kassirer, 2010). Clinical reasoning difficulties should be identified early, to result in positive clinical outcomes (Audétat et al., 2017a; Dyrbye et al., 2011).



Clinical educators can identify clinical reasoning difficulties as they present during supervision, by interpreting cues or difficulty indicators such as the learner failing to detect key features that should allow hypothesis generation, or inadequately prioritising patient problems (Audétat et al., 2013). However, while identifying difficulties in student clinical reasoning, the focus should not only be on the results of the students' clinical reasoning, but also on the steps up to and including the diagnosis and treatment plan or a particular patient case (Durning, Artino, Schuwirth, & van der Vleuten, 2013). This can be done by asking the student to verbalise their own reasoning (Nendaz, Gut, Louis-Simonet, Perrier, & Vu, 2011).

Evans et al. (2010) suggests that the process to identify clinical reasoning difficulties seems to resemble the same reasoning process used when making a clinical diagnosis, that is, collection and analysis of information while noting the student's performance and then suggesting hypotheses to explain clinical reasoning lapses that have been observed. Audétat et al. (2013) also describes a similar process to clinical reasoning – that of educational reasoning – which enables the clinical educator to create teaching scripts of effective clinical reasoning and clinical reasoning difficulties that could help them reach an educational “diagnosis”. This can be done by assessing a student's clinical reasoning “signs and symptoms”. This refers to taking into account the information collected by the student, their differential diagnosis and treatment plan, by using various means such as observation of the student directly and case discussions, and thereafter developing a clear understanding of their overall thinking pattern to identify the student's strengths and weaknesses. This can allow the clinical educator to identify the student's clinical reasoning difficulty (Audétat et al., 2017a).

2.3 Clinical reasoning development during clinical teaching

Improving clinical reasoning is an important goal in clinical education (Schmidt & Mamede, 2015), and for this reason is among the key competencies a physiotherapist should have (Wijbenga et al., 2018). Clinical reasoning development occurs gradually over time (Furze et al., 2017), with clinical teaching being a significant process to help students with this development (Audétat et al., 2017). Clinical teaching provides opportunities for formative feedback and repeated practice to improve confidence in dealing with diverse clinical situations (Modi, Anshu, Gupta, & Singh, 2015). The understanding of the clinical educators' own clinical reasoning process, which involves relying on patterns recognised and non-analytical problem-solving (Gummesson, Sundén, & Fex, 2018b), along with their engagement in the educational diagnosis, can facilitate the development of clinical reasoning in students (Audétat et al., 2017). Although the studies mentioned above have provided valuable information regarding clinical reasoning difficulties and development, more research needs to be done to explore these areas in undergraduate physiotherapy students (Wijbenga et al., 2018). There is a need to steer student clinical reasoning development towards demonstrating clinical reasoning at a level suitable for clinical practice in physiotherapy (Sole et al., 2019; Trommelen, Karpinski, & Chauvin, 2017).

2.4 Strategies to improve clinical reasoning difficulties

Although further research on identifying the facilitators of and barriers to clinical reasoning development in health profession students is needed (Hunter & Arthur, 2016), different strategies have already been suggested for improving clinical reasoning skills in health profession students (Beer & Mårtensson, 2015; Burgess, van Diggele, Roberts, & Mellis, 2020; Campbell, Walters, Couper, & Greacen, 2017). Campbell et al. (2017) found that providing safe learning environments facilitated development of clinical reasoning skills.

Safe learning environments allow free discussion among students and clinical educators, and clinical educators can demonstrate their trust in students' abilities to take responsibility for their patients (Campbell et al., 2017; Wijbenga et al., 2018). Constructive feedback was found to be an important strategy in clinical reasoning development when it was related to students' clinical reasoning skills, included in clinical discussions, and followed up with suggestions on how to improve (Beer & Mårtensson, 2015; Burgess et al., 2020). Reflection on clinical reasoning processes during individual feedback could also enhance student learning (Wijbenga et al., 2018).

In the clinical setting where the complexity of patient cases often gives rise to multiple problem representations, ten Cate et al. (2018) suggest that health profession students should be encouraged to generate problem representations that highlight key features of a patient case, thereby bringing about hypothesis generation that is relevant to the patient case. They also suggest that students who request immediate feedback on whether or not their problem representations are correct, be shown that problem representations should not be considered "correct" or "incorrect". Instead, problem representation should be a continuously improving skill when all relevant elements for a specific case are addressed; it is an early step in the clinical reasoning process. This formulation process, to which each health professional has their own approach, is influenced by clinical experience (ten Cate, Custers, & Durning, 2018), and includes non-analytical approaches to making connections between a clinical situation, and patterns stored in long-term memory (Pelaccia, Tardif, Tribby, & Charlin, 2011).

2.5 Theoretical framework

This section discusses two theoretical frameworks, namely, dual process theory and situated cognition. These frameworks will form the basis on which the study instrument is designed in order to answer the research questions in Chapter 1.

2.5.1 Dual process theory

Dual process theory has been identified as a model that integrates the main processes of reasoning identified in the field of clinical reasoning research (ten Cate et al., 2018), in particular clinical reasoning processes in health professionals to make a diagnosis (Pelaccia, Tardif, Tribby, & Charlin, 2011). The theory posits two processing types. Type 1, also referred to as non-analytical thinking, relies on pattern recognition, and is intuitive and fast. Non-analytical thinking takes time to develop through practice and experience (Helfrich et al., 2018). The second, Type 2, also referred to as analytical thinking, is slow, rational and demands more thought (Norman, 2009a). Expert practitioners such as clinical educators use a combination of non-analytical and analytical thought processes. Using a “think out loud” approach (Durning et al., 2015), allows students to learn from the clinical educator as they demonstrate how to formulate diagnostic hypotheses using the two thought processes. As novice health professionals, undergraduate physiotherapy students are more likely to use an analytical process as knowledge is progressively acquired, followed by a non-analytical process in their clinical practice (Sole et al., 2019). Analytical thinking processes can improve learning when a student receives detailed feedback on performance, and has the opportunity to practice tasks (Ericson, 2004; Helfrich et al., 2018). Using dual process as a theoretical framework in this study could assist in establishing which type of thought processes undergraduate physiotherapy students use, as well as how clinical educators gauge clinical reasoning abilities of the students in clinical practice.

The concept map below (Figure 1) demonstrates the framework that was used to inform the study methods of this thesis.

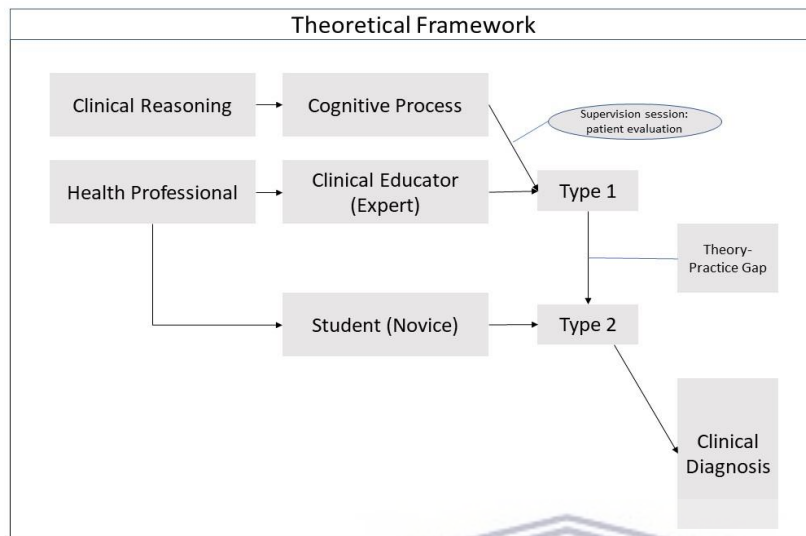


Figure 1: Dual process theory as a framework for student and clinical educator clinical reasoning



2.5.2 Situated cognition

Situated cognition argues that learning and performance depends on contexts of human behaviour, cultural and social practices, and language (Brown, Collins, & Duguid, 1989).

This approach argues that the thought process, like clinical reasoning, is situated in the specifics of a situation, for example, this could explain why classroom knowledge is difficult to use in the clinical setting because the contexts differ. It also argues that clinical reasoning is a non-linear process that results from multiple interactions that can occur during an experience. Situated cognition forms part of a theoretical framework that explains how thinking and learning are situated in experience (Durning & Artino, 2011). In the clinical setting, situated cognition recognises the interplay of health professional and patient factors, health profession practices and the clinical environment (Merkebu et al., 2020), unlike dual process theory that places emphasis on the individual (McBee et al., 2018). Therefore, in

terms of student clinical reasoning, situated cognition suggests that clinical problem-solving is not only based on a student's abilities to use knowledge in different contexts, but also on the interaction between student, clinical educator and the clinical environment. It therefore demands authenticity in learning, and encouragement of active student participation and peer contribution to improve clinical reasoning development (Durning & Artino, 2011). The concept map in Figure 2 demonstrates the framework as it was used to inform different aspects of this study, including the design of interview questions and data analysis.

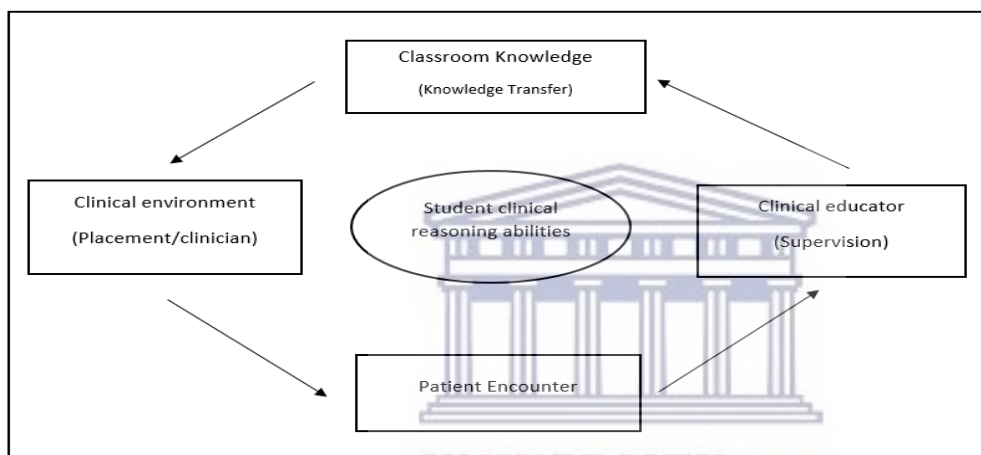


Figure 2: Situated cognition as a framework for student clinical reasoning

2.6 Conclusion

The review of the literature on clinical reasoning provided insight into clinical reasoning difficulties in undergraduate health profession students, including physiotherapy students. These difficulties pertain to delayed development of skills and failure to activate prior knowledge and process patient information. The literature also highlighted that clinical reasoning skills develop over time with clinical teaching that provides opportunities for feedback and repetitive practice to improve confidence in dealing with clinical situations. Strategies were discussed that clinical educators could use to remediate these difficulties, which include providing safe learning environments, constructive feedback, reflection on

clinical reasoning processes and encouraging the generation of problem representation that highlights key features of a patient case. The research also suggested that further studies are needed regarding clinical reasoning development in clinical practice. The aim of this study was to explore the student and clinical educator perspectives on clinical reasoning. The following chapter describes the methods used in this study to achieve this aim.



3 Chapter 3: Methods

3.1 Introduction

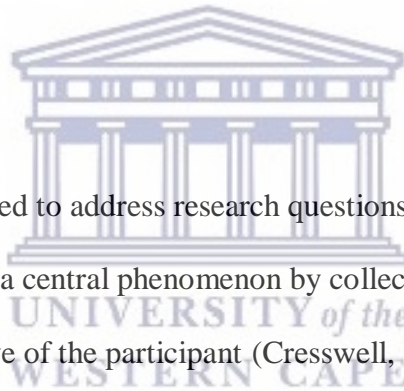
In order to gain insight into the experiences of the participant groups, the researcher used an interpretivist approach (Cresswell, 2011) with a cross-sectional design to collect qualitative data to explore the objectives outlined in Chapter 1. This chapter provides a detailed description of the research approach, the study design, the research setting, the population and sampling procedure. It also describes the data collection and analysis processes, trustworthiness and the ethics considerations that were taken into account.

3.2 Research paradigm

An interpretivist paradigm is used to address research questions where variables are unknown and a need exists to understand a central phenomenon by collecting data based on words from individuals to get the perspective of the participant (Cresswell, 2011). Qualitative research uses the accounts of individuals via interaction with them (Jameel, Shaheen, & Majid, 2018). Therefore, to explore the experiences of both the students and clinical educators in this study, qualitative data was collected within an interpretivist paradigm which allowed the researcher to view the experiences through the eyes of the participants (Thanh, Thi, & Thanh, 2015).

3.3 Research design

A cross-sectional study design was applied in this study. Cross-sectional designs are used to compare two or more groups, collecting qualitative data about individual attitudes, opinions or beliefs, as they exist in the present, in a short amount of time (Cresswell, 2011). The researcher used one-on-one, semi-structured interviews as the method for collection of data,



which enabled the researcher to use a predetermined list of open-ended questions (DiCicco-Bloom & Crabtree, 2006) that could explore both student and clinical educator experiences of clinical reasoning situated in clinical practice.

3.4 Research setting

The study was conducted at the Physiotherapy Department of the Faculty of Community and Health Sciences at the University of the Western Cape. This is where the students attend weekly lectures, and is also a convenient location for clinical educators. The majority of the study was, however, done online as a result of the national COVID-19 pandemic and lockdown of the country¹.



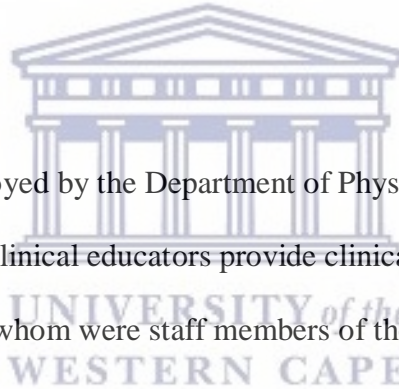
3.5 Population and sampling

In this cross-sectional study, purposive sampling was used; this involved identifying and selecting a diverse group of individuals who had an interest in the same phenomenon (Etikan, Musa, & Alkassim, 2016). Purposive sampling also meant that participants were deliberately selected to reflect particular groups within the sample populations (Ritchie et al., 2003). For example, in this study only clinical educators actively participating in clinical teaching at the time of the study were approached. In the same way, only undergraduate physiotherapy students actively participating in clinical practice at the time of the study were included.

The study population included both students and clinical educators. Initially, 57 third-year physiotherapy students (19 male and 38 female), and 50 fourth-year physiotherapy students

¹ The national pandemic refers to the spread of the Coronavirus Disease 2019 (COVID-2019) which was declared an international public health emergency on 30 January 2020 by the World Health Organisation, and later declared a pandemic on 11 March 2020. Owing to its highly contagious nature preventative measures such as social or physical distancing became a legal requirement for all South African citizens, resulting in a national lockdown (World-Health-Organization, 2020).

(11 male and 39 female), all of whom were enrolled at the University of the Western Cape, were invited to participate. The researcher attempted to recruit students from diverse academic, cultural and social backgrounds. However, the participants who agreed to take part in the study were limited to a certain subset of students. Multiple attempts to recruit participants who were more representative of the department and institution were unsuccessful, and so the study was undertaken with those participants who accepted the invitation. A total of nine students agreed to take part in the study. The sample size started with a minimum of five participants from each group and continued until no further data was necessary and a point of saturation was reached (Gentles, Charles, Ploeg, & Ann McKibbin, 2015; Saunders et al., 2018).



The 22 clinical educators employed by the Department of Physiotherapy were invited to participate in the study. These clinical educators provide clinical teaching for students at various clinical settings, six of whom were staff members of the Department of Physiotherapy. A total of eight clinical educators agreed to participate in the study.

Inclusion criteria: Only students participating in clinical practice during 2019 to 2020 were invited to take part in the study. Clinical educators supervising and evaluating students at various clinical settings during 2019 to 2020 were invited to take part in the study.

Exclusion criteria: No exclusion criteria were applied to the volunteers.

3.6 Instrument design

The researcher created an interview guide designed in such a way as to allow the participants to impart as much detailed information as possible, allowing the researcher to follow up with probing questions (Turner, 2014). The questions were designed to probe participants' experiences with regards to student clinical reasoning in clinical practice. The questions were developed on the basis of findings from qualitative literature (Cresswell, 2011) and previous qualitative studies on clinical reasoning in health profession students (Delany & Bragge, 2009; Gilliland, 2014; Linn et al., 2012; Wijnbenga et al., 2018).

3.7 Data collection

Data was collected using one-on-one, semi-structured interviews conducted by the researcher, using open-ended questions (Appendices 1 & 2). Because of the onset of the Coronavirus Disease 2019 (COVID-19) pandemic, the face-to-face interview method had to change to online interviews using video conferencing software, specifically, the Zoom Video Communication application. This allowed for safe and convenient participation in the interviews. Using Zoom also ensured secure data generation and storage, as well as the personal safety of all participants without compromising a meaningful connection with the participants (Gray, Wong-Wylie, Rempel, & Cook, 2020).

Interviews were conducted in English as this was the language of instruction at the university and it was anticipated that no volunteers would have difficulty with being interviewed in English. Prior to the interviews, participants were contacted via email, with information regarding the study and its aims (Appendices 5 & 6). Once participation was confirmed, meetings were arranged at times convenient to the participants. Three participants were

interviewed face to face before the national lockdown laws were enforced; thereafter, online interviews were carried out. It should be noted that the change in the data collection method could have resulted in the online participants feeling more at ease than face-to-face interviewees in answering questions. Consent forms (Appendix 7) and demographic information forms were sent to participants who were requested to complete and submit the forms to the researcher before the commencement of the interviews. The consent forms were signed by willing participants and returned to the researcher before interviews commenced. Each interview lasted between 30 and 60 minutes (DiCicco-Bloom & Crabtree, 2006).

The researcher asked the questions on a one-on-one basis, either face to face, in a room unlikely to be disturbed which allowed for privacy during the interview session, or online. During the online interviews participants were not asked to turn their cameras on. As the interview progressed, probing questions were asked based on what was heard by the researcher to clarify points or to have the participant expand on ideas. During the interviews the researcher made written notes about the participants' behaviours and attitudes and willingness to share, as well as any ideas mentioned by participants that could lead to probing questions (Cresswell, 2011). Interviews were concluded once all initial questions had been exhausted, probing and follow-up questions had been answered, and the participants no longer had anything more to share with the researcher. Participants were then thanked for participating in the study, and reminded that their comments would be kept confidential and that they would be able to view and comment on analysis of transcripts should they request it. The interviews were transcribed verbatim by an independent transcriber who anonymised participants in the process.

3.8 Data analysis

The data collected was thematically analysed. Thematic analysis can be used as a method to analyse experiences and the reality of participants (Braun & Clarke, 2006, 2012). Braun and Clark (2006, 2012) formulated six phases of data analysis, which were used to analyse the data collected in this study. These phases are described in the following paragraph.

The researcher collected data through interactive means, allowing the researcher to be immersed in the data, an important phase of data analysis within interpretive qualitative methodology (Bird, 2005). In phase 1, the researcher listened to recordings of the interviews, and read the interview transcripts numerous times to familiarise herself with the data collected. Once the researcher was familiar with the data, phase 2 commenced with the generation of initial codes. While reading the transcripts, the researcher assigned a code or codes to each sentence based on the interpretation of what was read. In phase 3, coded data was sorted into potential themes by grouping together common ideas behind those codes, and all the relevant coded data within the themes was collated. Once a set of prospective themes was devised, phase 4 commenced where prospective themes were further refined by reviewing collated data to determine whether coherent patterns appeared to form. Similar themes were collapsed into each other or merged, while themes found to be broad were broken down into separate themes. In phase 5, themes were defined and named, followed by analysis of data within them, identifying the core of what each theme was about. Themes were further refined where hierarchy of meaning within data had to be demonstrated, producing subthemes to give the larger themes structure. On completion of the final phase of thematic analysis, the researcher was able to determine whether the themes within the data demonstrated patterns related to the research questions and objectives of the study.

3.9 Trustworthiness

Various criteria proposed by Guba (1981) were used to enhance trustworthiness in the findings of this study, detailed as follows.

Credibility: Participants were invited to view and comment on the researcher's interpretation of data received from them, which is also referred to as member checking (Anney, 2014).

This was to ensure that the participants' ideas were accurately interpreted. Invited participants were also given the opportunity to refuse to participate, to ensure that data collection sessions involved only those participants who wanted to partake in the study.

Transferability: A detailed (thick) description of the findings of the study was provided for future researchers, as well as a detailed description of the research settings. The events leading up to data collection, including how participants were recruited and the changes made to the planning of data collection methods, were provided for future researchers. This allowed for applicability of the findings to other contexts, circumstances and situations (Bitsch, 2005).

Dependability: The researcher followed a code–recode procedure throughout the data analysis to ensure dependability by returning to recode the same data after initial codes had already been generated. Dependability is enhanced if the coding results correspond (Anney, 2014). The data analysed was also sent to the supervisors of the study for reviewing.

Confirmability: Confirmability is concerned with establishing that the interpretation of the results of the study are clearly derived from the data, and not the imagination of the researcher (Tobin & Begley, 2004). An audit trail was used by the researcher which highlighted every step of the data analysis, accurately portraying the participants' responses. An in-depth description of the study's methodology was given to allow scrutiny of the integrity of the research findings. Any shortcomings in the study were recognised and

included in the write-up of the thesis. The transcripts and data analysis were also reviewed by the supervisors of the study.

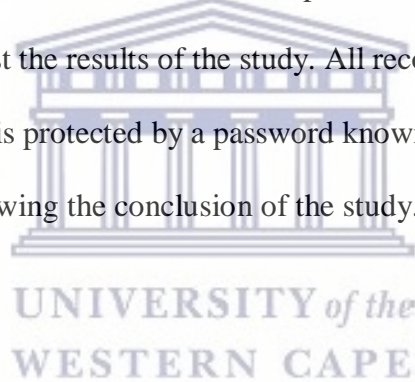
3.10 Reflexivity

Reflexivity refers to the continuous process of self-reflection that researchers undertake to create awareness about their actions, feelings and perceptions (Anderson, 2008). The researcher is aware that she may have projected her own feelings into interviews, describing her own feelings or reactions towards the situation as the researcher has the same role as the clinical educators in this study. Given her role as a clinical educator at the same institution as the participants, the researcher was familiar to some of the participants when data collection was done, and thus the researcher is aware of the possibly influence this may have had on the responses of the participants. However, every effort was made by the researcher to ensure objectivity which included having the interviews transcribed by an independent transcriber and data analysis reviewed by the supervisors of the study.

3.11 Ethics considerations

The research proposal was submitted to the Community and Health Sciences Higher Degrees Committee and approval of the study was requested from the Humanities and Social Sciences Research and Ethics Committee (HSSREC) of the University of the Western Cape. Ethical clearance for the study was obtained (reference number: HS19/9/20, Appendix 8). Permission to conduct the study on the premises of the Faculty of Community and Health Sciences was requested from the Registrar of the University (Appendix 3), and the Head of the Department of Physiotherapy (Appendix 4). Information sheets (Appendices 5 & 6) were provided to potential participants, informing them of the study details, and consent forms (Appendix 7)

were given to each participant to sign before interviews commenced. Participants were notified that participation was voluntary and that the participant would be allowed to leave the study at any time without having to provide a reason and with no negative impacts. Participants were also made aware that their participation in the study and any information gathered would remain confidential as no personally identifiable information was collected. Permission to be recorded was obtained from the participants. Interviews were recorded via the Zoom Communications application, and face-to-face interviews were recorded using a voice recording application. Interviews were transcribed verbatim using an independent transcriber. Transcripts were stored on a laptop which was only accessible with the use of a password known only to the researcher, the research supervisor and co-supervisor. The participants were able to request the results of the study. All recordings of the interviews were stored in Dropbox which is protected by a password known only by the researcher and will be kept for five years following the conclusion of the study.



The study was conducted according to ethical practices pertaining to the study of human subjects. It was not anticipated that the study would expose the participants to any risk or harm as the risk of participation in this study was low. However, should a participant have felt any discomfort during the interview, they were able to take a break during the interview or leave the interview. Detailed information with contact numbers was provided on information sheets given to the participants should any issue relating to the study be raised.

3.12 Conclusion

The cross-sectional research design applied to this study allowed the researcher to compare the views of both participant groups. The research paradigm allowed the researcher to explore

both the students' and clinical educators' experiences with student clinical reasoning situated in clinical practice. By interacting with the participants using semi-structured, one-on-one interviews, the researcher was able to collect qualitative data within an interpretivist paradigm. All participants' interviews were recorded and transcribed verbatim by an independent transcriber who anonymised participants in the process. The research methods used in this study allowed for collection of rich data, and thematic data analysis was used to analyse participant responses. Trustworthiness was enhanced by following the criteria proposed by Guba (1981), and ethics considerations were taken into account including obtaining ethical clearance for the study from the Humanities and Social Sciences Research and Ethics Committee (HSSREC) of the University of the Western Cape. The results of the study follow in Chapter 4, detailing the themes generated from the interviews and the interpretation of the responses.



4 Chapter 4: Results

4.1 Introduction

This chapter presents the results of the cross-sectional study. One-on-one, semi-structured interviews were used to explore the understanding of clinical reasoning across both groups of participants, the difficulties experienced in the clinical reasoning processes of undergraduate physiotherapy students, and the strategies used by clinical educators to improve clinical reasoning skills in undergraduate physiotherapy students in clinical settings. Themes generated from the participants' interviews, the associated subthemes and interpretations of these themes, are presented in this chapter. Verbatim quotations are included to illustrate the meaning behind the participants' responses, and in support of the themes and subthemes.

4.2 Clinical educator interview results

Out of the 22 clinical educators who were invited to participate in the study, a total of eight volunteered. The sample consisted of two males and six females, four of whom were part of the academic staff of the Physiotherapy Department of the University of the Western Cape. Table 1 illustrates the themes and subthemes that emerged from the data collected from the clinical educators, as well as the researcher's interpretation of each theme and subtheme.

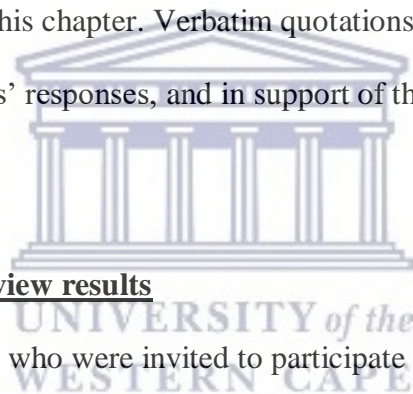


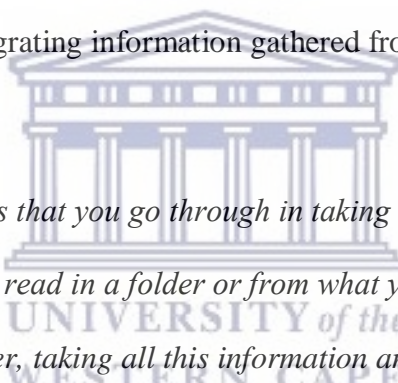
Table 1: Themes, subthemes and interpretations generated from the clinical educators

| Theme | Subtheme | Interpretation |
|--|---|---|
| Understanding of clinical reasoning | Not applicable | Clinical educators understand clinical reasoning to be a process of gathering information and using that information to solve a clinical problem. The thought process in clinical reasoning leads health professionals to formulating a hypothesis. How and when a student's ability to clinically reason develops is not the same for every student. |
| Strategies to improve clinical reasoning | Establishing the clinical educator role | Clinical educators believe that altering their roles as clinical educators to a more peer-related role helped establish relationships suitable for learning. Clinical educators plan supervision sessions according to the needs identified by the students, because students should share responsibility for their development as health professionals. |
| | Feedback during supervision | Observing what students demonstrate practically during supervision helps clinical educators establish clinical reasoning abilities. Clinical educators give feedback when the student needs it. Demonstration by clinical educators and discussion of patient cases were found to be the strategies most clinical educators used to help with knowledge transfer and improved clinical reasoning. |
| Challenges students face with the process and development of clinical reasoning during supervision | Not applicable | Students are able to gather information but have difficulty interpreting the information. Students find it challenging to take knowledge acquired in the classroom to solve a patient problem in the clinical setting. Clinical reasoning processes are hindered by the demands of clinicians at clinical placements. |

While exploring the understanding of clinical reasoning in clinical educators, and the strategies used by clinical educators to improve clinical reasoning skills in undergraduate physiotherapy students, three main themes were noted.

4.2.1 Theme 1: Understanding clinical reasoning

The clinical educators understood clinical reasoning to be the process a health professional goes through to solve a clinical problem. It was also seen as the ability of students to link what was found in a patient assessment with the underlying reasons in order to formulate a treatment plan for the patient. Clinical educators mentioned that the thought process behind clinical reasoning involved integrating information gathered from the patient in order to solve the clinical problem.



“like I said it’s a process that you go through in taking things that you observe, taking things from what you’ve read in a folder or from what you’ve heard from a doctor or a nurse or family member, taking all this information and then trying to solve this problem.” (CE1)

“My understanding of the clinical reasoning is a student being able to find links between what they’ve assessed or what they’ve seen being assessed and the reason behind it, and then work out how to treat that.” (CE6)

“You see how everything fits together and you get the bigger picture of ‘Okay, so this is what’s wrong’ and you already automatically know how you’re going to approach this problem.” (CE1)

Furthermore, clinical reasoning was seen as a process that is learned and that the time when it is learned is student-dependent.

“They process and they learn differently. They are not stupid. They are very intelligent but they feel stupid because they don’t grasp it quickly like the others.” (CE6)

4.2.2 Theme 2: Strategies to improve clinical reasoning

Subtheme 1: Establishing the clinical educator role

Stepping down from the authoritarian role of a clinical educator was found to be important in establishing a relationship that is suitable for learning during clinical teaching. Some clinical educators found that getting students to plan their own supervision sessions was beneficial because it was based on what the students believed their needs were. They stated that students needed to take responsibility in improving their development as health professionals, because students did not always take responsibility for their own learning, which hindered their development of clinical reasoning during clinical teaching. Overall, the clinical educators stated that clinical teaching was beneficial in helping students develop their clinical reasoning skills by the end of the clinical rotation.

“we don't have to prove ourselves to say that we are better than the students, but that also sets a tone that the students can trust you and they can learn” (CE8)

“I do get the student to plan out the session. So whatever it is that they want to do in the supervision then it is their responsibility to tell me and I plan based on that” (CE7)

“they come into the block and they are scared and they feel like they know nothing but when they leave there, they would have done well in their exam and they have actually gained a lot of knowledge and they walk away from there more equipped” (CE7)

Subtheme 2: Feedback during clinical teaching

While observing students during their supervision sessions, clinical educators explored the clinical reasoning skills of the student to determine possible weaknesses. Some clinical educators mentioned that giving feedback as needed during a supervision session helped students with patient management. Others used demonstrations and discussion sessions with students as key strategies to assist with improving knowledge transfer when students experienced difficulty integrating knowledge into practice.

“I find that the best time for learning is when they show me something, then I can see what their clinical reasoning is like. That’s the only time that I can really see when they give something back to me.” (CE6)

“But I will provide it [feedback] intermittently during the session.” (CE2)

“Where if I’m demonstrating, I would also try to facilitate that similar situation where – or give them a scenario, and then will ask them ‘Can you go further with this? Do you have the ability to?’” (CE8)

“I’ll take the student out of the environment, where we’ll talk about the patient. We’ll kind of brainstorm together like that, and then we’ll link that to the theory provided to the students.” (CE8)

4.2.3 Theme 3: Challenges students face with the process of clinical reasoning and its development

Clinical educators mentioned that students were able to gather information during an assessment but that they did not know how to interpret this information. They then went on to say that the inability to interpret information caused students to lose confidence in their

ability to reason. The clinical educators also said that the students' lack of confidence led to difficulty expressing their clinical reasoning processes.

"Because the students often do this they observe, they're good at observing but they can't interpret that finding. Their interpretation is the reasoning." (CE1)

"And that's the reality, these students then draw back because they feel that they are stupid just because they take longer to process things, and they're not, they just learn differently." (CE6)

"Maybe that's [confidence] more of a soft skills than anything else, but I feel like sometimes maybe the students lack the confidence to speak up. The fact that they have the clinical reasoning but they just can't express it out." (CE8)

The integration of theory into practice to solve a clinical problem was said to be difficult for many students, but also that having knowledge played an important role in whether or not a student could integrate theory into practice.

"The students struggled a lot with that translation of theory into practice." (CE2)

"integration of theory into practice is a challenge for most students. But it's easy to get the student to translate their knowledge when they have knowledge." (CE1)

The clinical educators believed that clinical reasoning was further inhibited when students felt intimidated by clinicians at the clinical placements, leading to inhibition of their clinical reasoning process or clinical reasoning development.

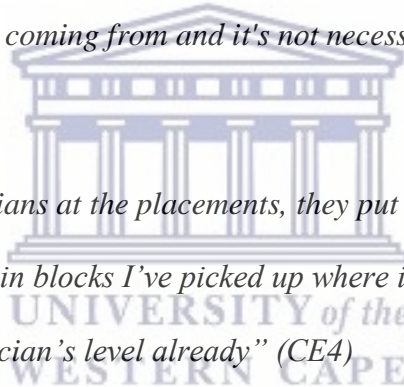
"And I think that hampers their own personal clinical reasoning because they get told what to do by clinicians and ... because the clinician said and so I must do it that way." (CE4)

The clinical educators observed that some students disregard their advice and are overconfident, which makes facilitating clinical reasoning difficult. The participants also stated that negative attitudes of students were not always directly linked to the clinical educator or supervision session, but possibly to external factors affecting the student. They went on to say that some clinicians had premature expectations of student capabilities, adding to difficulties in the student's ability to develop clinical reasoning.

“But it is so difficult because you get some very stubborn students that think they know it all and they don't listen to reason or logic or anything.” (CE4)

“They don't want to [learn] because they'll just have an attitude and sometimes you can't pinpoint where it's coming from and it's not necessarily specifically related to you ...” (CE1)

“with some of the clinicians at the placements, they put so much pressure on the students! ... it's on certain blocks I've picked up where it's expected of the students to be operating at the clinician's level already” (CE4)



4.3 Undergraduate physiotherapy students interview results

One hundred and seven undergraduate physiotherapy students were invited to participate in the study, of whom nine students in total agreed to volunteer. The sample consisted of seven female students and two male students. The study explored the understanding of clinical reasoning in students, as well as the difficulties that undergraduate physiotherapy students experience during clinical reasoning processes. Table 2 illustrates the themes and subthemes that emerged from the data, and includes the researcher's interpretation of those themes.

Table 2: Themes, subthemes and interpretations generated from the student interviews

| Theme | Subtheme | Interpretation |
|--|---|---|
| Challenges with clinical reasoning development | Application of theory to practice | Classroom theory differs from what gets seen in the actual clinical environment. Difficulty with data interpretation makes clinical reasoning difficult. Students' clinical reasoning abilities are inhibited by clinical environment intimidation. |
| | Negative clinical experiences during clinical rotations | Students' fear of clinical teaching leads to lack of learning, and students perceived clinical educators to be domineering in their supervision practices. The students, while acknowledging the importance of clinical educator feedback, dislike being interrupted during their clinical reasoning processes during patient management. Continuous negative feedback from the clinical educators makes clinical reasoning development difficult. Students cannot develop their clinical reasoning skills with clinical educator negativity. |
| Understanding clinical reasoning | Using clinical reasoning to solve a clinical problem | Students understand clinical reasoning to be the ability to make a decision about a patient by integrating information gathered to plan patient management. |
| | Clinical reasoning in clinical practice to formulate a hypothesis | Clinical reasoning processes are goal-orientated in clinical practice and used to formulate a hypothesis. |

| | | |
|--|-----------------------|---|
| Clinical teaching as a strategy to develop clinical reasoning skills | Facilitating thinking | In order to facilitate thinking, the students found discussions, demonstrations and facilitation helpful strategies. Discussing patient cases with clinical educators, and observing practical demonstrations by the educators, helped students improve their clinical reasoning skills. Facilitation while seeing a patient helps develop clinical reasoning skills. Adequate supervision time is important for clinical reasoning development. Students expect to develop clinical reasoning skills when a clinical educator is positive and helpful. |
|--|-----------------------|---|

While exploring the difficulties outlined in the objectives explored in the study, three main themes were noted.

4.3.1 Theme 1: Challenges with clinical reasoning development

Subtheme 1: Application of theory to practice

The students highlighted a theory–practice disconnect that makes clinical reasoning difficult in the clinical setting. In situations where a condition was not taught in the classroom, the students found they were unable to interpret the information gathered, which made clinical reasoning processes more challenging and it was difficult to formulate a treatment plan for the patient.

“So with clinical reasoning what I struggle with is what we are being taught in the classroom are completely different from what you get to experience in the hospital setting.” (S2)

“I think not knowing the condition ... that would throw me off because then I am obviously not sure, okay what do I need to assess, where is the treatment going” (S7)

Subtheme 2: Negative clinical experiences during clinical rotations

Some students explained that clinical reasoning development was hindered by fear of being embarrassed during supervision sessions. They also perceived clinical educators to be domineering in their supervision practices, intimidating students into following the clinical educators' method of reasoning instead of being able to navigate their own processes. The students stated that continuous negative feedback had a negative effect on their self-confidence, which in turn hindered their clinical reasoning abilities. The students also stated that the clinical environment sometimes had a negative impact on clinical reasoning skills and its development in the clinical setting.

“if [we] focus on that one patient and a lot of times we do not really get to see that help because we always scared by, we have supervision, always scared, okay the supervision today ... Then we cannot even reason because we do not want to look down in front of the supervisors, yet we want to learn.” (S1)

“Sometimes it feels like they want you to think the way that they think and they want you to follow their way of clinical reasoning.” (S6)

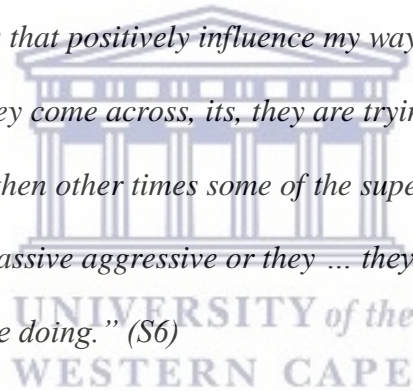
“but if they focus on what you couldn't do or you didn't do then, it also, I believe that it also affect you if you can't reason because of your confidence ... you are losing that confidence or you are losing that motivation that every time I am just failing. Every time I am not doing everything correctly, then you end up like sort of giving up then that then will reduce your clinical reasoning.” (S5)

“So if they have a clinician that's always there to help it's a good thing, but you also have clinicians that break students down” (S3)

The students acknowledged the importance of clinical educator feedback but disliked being interrupted during their clinical reasoning processes while interacting with patients. They explained that they expect to benefit from a clinical educator that is helpful and positive.

“I think something that really makes it difficult for me is especially in supervision sessions if your supervisor kind of ... kind of chirps in the whole time and interrupting me. I mean I understand I have to get the feedback but it’s while they are interrupting me with my process with my patient, especially when I was now working with kids. If you get interrupted the whole time the kids kind of lose interest in what you are busy with” (S9)

“I have had supervisors that positively influence my way of clinical reasoning because the way that they come across, its, they are trying to guide you, they are trying to help you, and then other times some of the supervisors, it is not that I want to say they, they are like passive aggressive or they ... they questioning you as if you don’t know what you are doing.” (S6)



4.3.2 Theme 2: Understanding clinical reasoning

Subtheme 1: Using clinical reasoning to solve a clinical problem

The students understood clinical reasoning as the ability to make a decision about a patient in the clinical setting by integrating all the relevant patient information and using clinical reasoning processes to decide how to proceed with patient management.

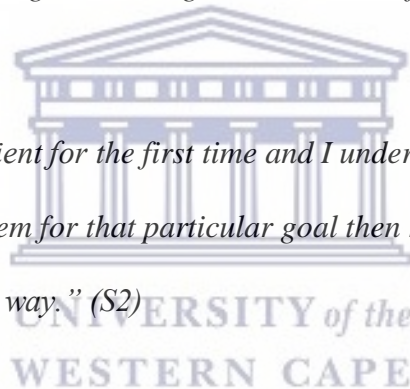
“clinical reasoning includes everything that you are presented with. So their condition, any changes, your subjective history, and then taking all of that information to then either assess the patient, or treat the patient in a correct way, in a safe way, and in an effective way as well.” (S8)

Subtheme 2: Clinical reasoning in clinical practice to formulate a hypothesis

The students also described how they used clinical reasoning to formulate a hypothesis, prioritise patient problems and use a process of elimination to decide on the next step in patient care. They explained that their clinical reasoning was goal-orientated, that is, it depended on the prioritisation of the patient's needs.

“I would use my clinical reasoning to formulate what the next step would be in terms of what is the next priority on the list to treat in a way ... I always keep in mind, what are the top problems then go according to that list and if one is cleared out, then go to the next priority.” (S8)

“So I am seeing the patient for the first time and I understood what their needs are or what I want to do for them for that particular goal then my clinical reasoning will be somehow, be along that way.” (S2)



The following theme is an additional theme that emerged while interpreting the responses of the student interviews.

4.3.3 Theme 3: Clinical teaching as a strategy to develop clinical reasoning skills

Subtheme 1: Facilitating thinking

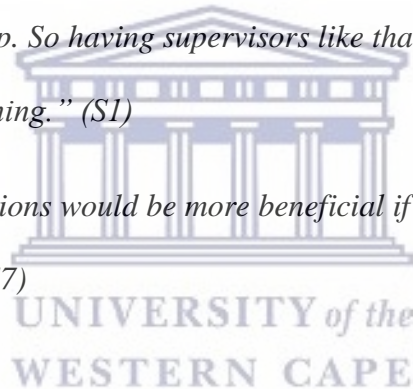
Discussing patient cases with the clinical educator, and seeing clinical educators demonstrate practical techniques or their problem-solving, was said to be beneficial to the students. The students said that being facilitated by the clinical educator helped their clinical reasoning skills develop. They also said that adequate time spent in clinical teaching could improve clinical reasoning skills.

“if she asked us a question, and we were, for example, doing a file presentation or going through vitals and there was something that we didn't explain properly or something that we said incorrectly she would stop us in the moment and we will discuss that aspect ... like right at that, you know, our assessment and supervision sessions flows well. That also helped.” (S8)

“if you are performing a technique and it is wrong, and then obviously the clinician interrupts you and then maybe then performs it correctly and then you do it again ... you are able to ... you can adapt and correct the problem right then and there.” (S4)

“But because she sat down with me, she told me start here, do like this, she was like she was grooming me up. So having supervisors like that, they really help when it comes to clinical reasoning.” (S1)

“I just feel like the sessions would be more beneficial if we had like [supervision] maybe twice a week” (S7)



4.4 Conclusion

The results of the study show that, in this population, the clinical educators and students had similar understandings of clinical reasoning. The study results also demonstrate that the clinical educators have differing opinions regarding the difficulties in student clinical reasoning compared to the student participants. The clinical educators are of the opinion that these difficulties stem from the inability to integrate theory into practice, and challenges interpreting patient information. The students' perceptions are that clinical reasoning difficulties stem from the presence of a theory–practice gap, and practising in unknown clinical environments with sometimes demanding instructions from clinicians. Both participant groups are of the opinion that fear and intimidation play an important role in the

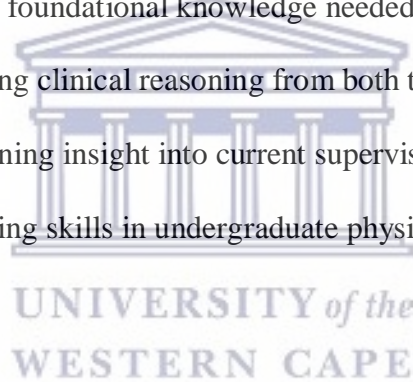
inhibition of student clinical reasoning. An unexpected finding in the results was that clinical educators and students have differing views on the causes of fear and intimidation. Clinical educators believe that clinical reasoning processes are inhibited by challenging clinical environments, specifically the expectations of the placement clinicians. The student participants, however, expressed their fear of embarrassment during clinical teaching sessions, and of negative clinical educator critique. At times, they were also intimidated by domineering clinical educator practices. On the other hand, the results show that the strategies used by clinical educators include establishing relationships with the students conducive to learning, and providing feedback which involves discussion of patient cases and demonstration of thinking processes.



5 Chapter 5: Discussion

5.1 Introduction

This chapter presents a discussion of the findings of the study in detail. The main aim of this study was to explore the student and clinical educator perspectives of clinical reasoning at the University of the Western Cape. Physiotherapists require adequate clinical reasoning abilities to be able to manage patients (Rochmawati & Wiechula, 2010b). Undergraduate physiotherapy students find difficulty with clinical reasoning (McMillan, 2010), which could be the result of difficulty transferring knowledge into practice, challenges adjusting to a clinical environment, or lack of foundational knowledge needed to begin the clinical reasoning process. Understanding clinical reasoning from both the students' and clinical educators' perspectives and gaining insight into current supervision practices could assist with developing clinical reasoning skills in undergraduate physiotherapy students in the future.



5.2 Discussion of the results

The results of the study indicate that clinical educators and students have a similar understanding of what clinical reasoning is, namely the reasoning process used to solve a clinical problem. Undergraduate physiotherapy students reported challenges that inhibit the development of clinical reasoning abilities during clinical teaching sessions. This study also demonstrates that clinical educators make use of various strategies to improve clinical reasoning skills in students and that students have expectations regarding clinical teaching

processes. Clinical teaching was seen as helpful in improving clinical reasoning skills in undergraduate physiotherapy students by both participant groups.

5.3 The understanding of clinical reasoning

One of the objectives of the study was to establish what the understanding of clinical reasoning was among clinical educator participants. The findings of the study demonstrated that clinical educators understood clinical reasoning as a process of gathering information, and then using that information to solve a clinical problem. However, their understanding describes only one aspect of clinical reasoning that is highlighted in the literature (Higgs & Jones, 2008). The clinical reasoning process is complex in nature, and according to literature, is not the only model for problem-solving (Levett-Jones et al., 2010). Knowledge that upholds clinical reasoning, and the decisions and actions that follow, also have a social context including the culture of the working environment, and personal attributes of the health professional (Ebright, Patterson, Chalko, & Render, 2003; Hoffman, Donoghue, & Duffield, 2004; Killam & Heerschap, 2013; Nordquist et al., 2019). The understanding of clinical reasoning from the perspective of the undergraduate physiotherapy students was also explored in this study. Similar to the clinical educators, the undergraduate students understood clinical reasoning to be the ability to make a decision based on integration of information gathered to plan further management of a patient. This is in keeping with literature on the perceptions of health profession students regarding clinical reasoning (Cruz, Moore, & Cross, 2012; Wijbenga et al., 2018). All participants viewed clinical reasoning as the thought process used to formulate a clinical hypothesis, which concurs with the concept that clinical reasoning is a decision-making process associated with clinical practice (Higgs & Jones, 2008). Clinical educators also perceived clinical reasoning as a skill that students learn through clinical practice. This is supported by Linn et al. (2012) who contend that clinical

reasoning is a process that must be learnt, particularly for novice students who find it challenging to work through knowledge gained during interactions with patients. The students however, had difficulty accepting that clinical reasoning development develops over time (Furze et al., 2015), expecting clinical educators to be able to quickly gauge the clinical reasoning process during supervision session. The complexity of clinical reasoning has been the cause of confusion and conflicting discussions regarding its nature among expert health professionals (Gruppen, 2017). As novice health professionals, the students in this study had unrealistic, and possibly misguided expectations that clinical reasoning skills should develop more rapidly.

5.4 Difficulties experienced by undergraduate physiotherapy students

Difficulties with clinical reasoning was a common theme among both the clinical educators and the undergraduate physiotherapy students in this study. These difficulties include interpretation of patient information, knowledge transfer, a theory–practice disconnect, and negative experiences during clinical teaching sessions and while on clinical rounds. This finding aligns with previous studies (Audétat et al., 2013; Wijnbenga et al., 2018) which found that students experience various difficulties with the clinical reasoning process and its development owing to delayed abilities, which can be expected with novice health professionals who are inexperienced in new clinical environments.

5.4.1 Opposing views on the provision of feedback

Feedback is information provided by a clinical teacher regarding aspects of a student's performance or understanding, and aims to provide knowledge and skills development (Hattie & Timperley, 2007). There were different views among the participant groups concerning

when feedback was most beneficial. Some undergraduate physiotherapy students in this study did not like receiving corrective feedback during bedside care because they stated that this disrupted their process of clinical reasoning. The clinical educators had opposing views that feedback given immediately when an error was observed was beneficial to students developing their clinical reasoning skills. Literature seems to acknowledge the view taken by the clinical educators, that intervention at various times of need during clinical teaching sessions is helpful to the development of clinical reasoning, if done so accurately and in a constructive manner (Ntuli, September, & Sithole, 2018). Hattie and Timperly (2007) suggest that corrective feedback, for example when a student has challenges performing tasks during clinical teaching, should include further instructions that helps the student to focus on the processes leading to achieving tasks rather than how the task is performed. Excessive feedback on how well a task is performed can lead to a lack of cognitive effort to develop concepts about the relationship between instructions given, the feedback, and the intended learning that should take place (Hattie & Timperley, 2007). The contradicting view on the part of the undergraduate physiotherapy students in this study could stem from the fact that corrective feedback was interpreted as negative feedback. Fear of constant negative feedback was found to be a factor in the clinical reasoning difficulties of students as reported in this study. The negative perception of feedback could perhaps be associated with the students' self-regulation levels, which are dependent on their self-efficacy, in other words, their belief in their capabilities to accomplish designated tasks (Bandura, 1994). Depending on a student's self-efficacy, negative feedback can lead to the student being unable to relate feedback to the cause of their poor performance, as students with low self-efficacy lack motivation to learn from opportunities provided (Hattie & Timperley, 2007).

5.4.2 Fear and intimidation

Both the clinical educators and the undergraduate physiotherapy students were of the opinion that fear and possibly intimidation played a key role in the difficulties that students experienced when trying to reason. However, what this study found was that opinions differed with regard to the causes of fear and intimidation. The clinical educators stated that clinical reasoning processes were inhibited by the clinical environment, specifically by the expectations of the placement clinicians. On the other hand, undergraduate physiotherapy students feared embarrassment during clinical teaching sessions and were intimidated by domineering clinical educator practices, therefore leading to inhibition of their clinical reasoning development. Some of the students did not always feel free to act independently in terms of their clinical reasoning abilities. The literature (Barrett & Scott, 2018; Chapman & Sellheim, 2017; Donough & der Heever, 2018) on intimidation of health profession students in the clinical learning environment, focuses mainly on the perspective of health profession students, and is similar to the opinions of the student participants in this study in that student confidence is lowered in intimidating situations. For example, when being questioned by clinical educators in the presence of peers, some students believed that questions are deliberately asked to highlight their lack of knowledge by dominating clinical educators (Barrett & Scott, 2018; Chapman & Sellheim, 2017; Donough & der Heever, 2018). This manner of questioning, also referred to as “pimping” in the medical education literature, is a practice of “teaching by humiliation” (Barrett & Scott, 2018, pp. 69 - 70), which has suboptimal outcomes in student learning. Learning in the clinical setting can become challenging with clinical educators who are perceived as intimidating or condescending (Reising, James, & Morse, 2018), and fear of negative evaluation and distrust between student and clinical educator can limit professional development in the skill of clinical reasoning (Staples-Bradley, Duda, & Gettens, 2019). Some of the undergraduate

physiotherapy students in this study had similar views in that they felt they were questioned by clinical educators in a manner that assumed that they did not know what they were doing.

5.4.3 Knowledge transfer and integration of theory into practice

For undergraduate physiotherapy students, knowledge transfer – that is, the ability to use knowledge acquired in the classroom to solve a problem in the clinical setting – becomes increasingly difficult as the new clinical environments differ from the classroom environment (Montpetit-Tourangeau et al., 2017). According to Brown et al. (1989) and the literature on situated cognition, when authentic activities are transferred and used in a different form, their contexts automatically adapt to form part of the culture it is used in. With this concept in mind, it can be deduced that the student participants have difficulty transferring the authentic activity, that is, classroom knowledge, and adapting that context of the activity to form part of the clinical environment. Integration of theory into practice was identified in the current study as a difficulty for undergraduate physiotherapy students by both participant groups, in that students experienced a disconnect between theory learnt in the classroom and the reality of the clinical setting, making clinical reasoning difficult. Both groups of participants agreed that students have difficulty interpreting the information gathered from patients, and that failing to find key features in the information inhibits hypothesis generation (Audétat et al., 2013). This could be a reason why the undergraduate physiotherapy students in this study experience a theory–practice disconnect, as their interpretation of patient information depends on their ability to extract that knowledge appropriately (Ignatavicius & Chung, 2016) before knowledge is transferred. Situated cognition theory explains the reason for this in that learning and performance is dependent on context (situation) (Brown et al., 1989). Contexts such as the clinical environment, language, and clinical social practices (Brown et al., 1989) form part of the processes that affect clinical reasoning during a patient encounter

(Durning et al., 2012). Other studies involving medical and nursing students investigated the theory–practice disconnect and also found that students felt a separation between classroom teachings and contradictions that arose within the clinical setting, although these contradictions related more to clinical staff members’ manner of doing things than to differences between classroom case-studies and actual patient cases (Odetola et al., 2018). Additionally, students were confused by methods of assessment and intervention that were different in the clinical setting to what they had learnt in the classroom. (Anakin, Jouart, Timmermans, & Pinnock, 2020).

5.4.4 Clinical reasoning development

Discrepancies between the clinical educators and students were also identified in this study regarding their perceptions of the challenges around developing clinical reasoning skills. In the opinion of the undergraduate physiotherapy students, continuous negative feedback was a barrier for their clinical reasoning development. Another South African study produced similar findings, where some podiatry students felt that negative feedback was demotivating and left them confused (Ntuli et al., 2018). This is a concern, because students are more teachable in an approachable environment (Faisal Fahim, 2018). Students do not improve with negative feedback during clinical teaching unless the negative feedback is given in a constructive manner (Rodger, Fitzgerald, Davila, Millar, & Allison, 2011). The clinical educators in this study, on the other hand, saw development of clinical reasoning skills to be a shared responsibility (Ernstzen, Bitzer, & Grimmer-Somers, 2009).

5.5 Strategies used to improve clinical reasoning

Clinical educators play an important role in improving clinical reasoning difficulties in students (Audétat et al., 2017a). This study found that strategies used by clinical educators to improve clinical reasoning difficulties were similar to those used in previous studies (Audétat et al., 2017a; Hunter & Arthur, 2016; Klein, Otto, Fischer, & Stark, 2019).

The common methods to improve clinical reasoning in the undergraduate physiotherapy students used by the clinical educators in this study included discussion of patient cases and demonstration. Discussion of patient cases with students should involve identifying incorrect decisions and actions made while managing a patient, why it was wrong in a particular context, and what the correct way to move forward in patient management would be, since this can help students remember and avoid future errors (Klein et al., 2019). Demonstration, by both the clinical educator and student of their own clinical reasoning processes, is also suggested as an approach to manage difficulties in the clinical reasoning process by Audétat et al. (2017c). The undergraduate students in this study also mentioned these strategies as tools that helped to improve their clinical reasoning abilities. The students stated that they benefited from clinical educators who demonstrated how to carry out practical techniques correctly. This shows that students learn from role modelling while observing clinical educators (Burgess et al., 2020).

Clinical educators in this study found it useful to demonstrate their own clinical reasoning processes, although from the students' perspective, demonstration by clinical educators pertained more to practical techniques than to the clinical reasoning processes of the clinical educators. The difference in perspectives could be caused by a lack of student feedback literacy, in other words, of the student's ability to understand and use feedback (Carless &

Boud, 2018). The students in this study perceived what was meant to be a demonstration of clinical reasoning processes as practical technique demonstrations. This means that clinical educators would need to adapt the implementation of their feedback processes to enable students to understand and use feedback, essentially improving student feedback literacy and allowing students to appreciate the importance of future feedback (Carless & Winstone, 2020). If authentic feedback is given to a student in a manner that encourages student learning, as situated cognition suggests, then the student can use that feedback in similar contexts, and develop clinical reasoning (Brown et al., 1989).

Clinical educators expressed the opinion that clinical teaching helps with the development of clinical reasoning skills of the students, but that improvement was only seen by the end of the clinical rotation. This is consistent with views that clinical reasoning develops over time (Furze et al., 2015). A subtheme arising from the student participants' opinions in this study was that clinical reasoning would develop more effectively when supervised by positive and helpful clinical educators. Some studies agree that student clinical reasoning develops best not only in environments that promote learning, but also when there is rapport and mutual respect between students and clinical educators with non-judgemental clinical teaching (Burgess et al., 2020; Hunter & Arthur, 2016; MacNeil, Cuncic, Voyer, Butler, & Hatala, 2020; Wijnbenga et al., 2018). Some clinical educators in this study reported stepping down from their clinical educator roles to build relationships suitable for learning during their clinical teaching sessions, making themselves more approachable to the undergraduate physiotherapy students. Given that feedback can either be welcomed as a learning opportunity by students or an aversion depending on the individual (Lefroy, Watling, Teunissen, & Brand, 2015), clinical educators have to build good relationships with students in order to, for example, initiate difficult conversations that contribute to improving clinical

reasoning (Honkavuo, 2020) such as reflecting on poor decisions and actions and their causes (Klein et al., 2019).

5.6 Conclusion

The aims of the study were discussed in detail, comparing the findings of the current study to the findings from research into clinical reasoning. It was found that although the study's participant groups had similar views on clinical reasoning, their understanding was limited to only one aspect of the concept of clinical reasoning compared to the literature. The difficulties in clinical reasoning development reported in the study were similar to findings in the literature in terms of interpretation of patient information, knowledge transfer, a theory–practice disconnect, and negative experiences during clinical rounds. Feedback given during patient encounters was seen as an unwanted disruption by the student participants. This finding differed from the literature which seemed to largely support the views of the clinical educators who stated that feedback was more beneficial when given as needed. Fear and possible intimidation appear to have played a key role in the difficulties experienced by the student participants with clinical reasoning development. Unexpectedly, opinions regarding the causes of fear and intimidation differed. The clinical educators used discussion of patient cases and demonstration of clinical reasoning processes as strategies to improve clinical reasoning difficulties, which concurs with what is found in the literature regarding the development of clinical reasoning. Student perceived the clinical educator demonstrations to be practical demonstrations rather than clinical reasoning processes. Regardless of this difference in perception, however, the students said that supervision sessions played a role in improving their clinical reasoning skills.

6 Chapter 6: Conclusions, recommendations and limitations

6.1 Introduction

Effective clinical reasoning is an important skill in clinical practice, and should result in appropriate decision-making that leads to effective clinical outcomes for patients.

Undergraduate physiotherapy students have difficulty with clinical reasoning in the clinical setting. Understanding clinical reasoning from both the students' and the clinical educators' perspectives and gaining insight into current supervisor practices could assist with designing strategies that aim to develop clinical reasoning abilities in undergraduate physiotherapy students. In this study, the researcher explored the perceptions of clinical reasoning in undergraduate physiotherapy students and clinical educators by answering the question: What are the perspectives of both clinical educators and undergraduate physiotherapy students on clinical reasoning? This final chapter provides a conclusion to the study, demonstrating how the research questions were answered, and how the study objectives were achieved. It also discusses the limitations of the study, and its implications for future research.

6.2 Conclusions of the thesis

The first chapter of this study provided insight into the concept of clinical reasoning and its role in clinical decision-making processes. Effective patient management depends on a health professional's clinical reasoning abilities. As an important skill of a competent and effective health professional, the development of clinical reasoning in undergraduate physiotherapy students is therefore essential. Undergraduate physiotherapy students possibly have difficulty with clinical reasoning because they struggle to transfer knowledge gained in the classroom context, into a clinical setting. To get a better understanding of the experiences of clinical

reasoning among the participants of this study, the researcher asked: what are the undergraduate physiotherapy student and clinical educator perspectives of clinical reasoning? The researcher identified the following three objectives needed to answer the research question: 1) explore the understanding of clinical reasoning in students and clinical educators, 2) explore the difficulties experienced by undergraduate physiotherapy students during the clinical reasoning process and 3) explore the strategies used by clinical educators to help undergraduate physiotherapy students develop clinical reasoning skills.

Chapter 2 of this study provided a review of the literature on clinical reasoning, focusing on the ongoing concern of clinical reasoning difficulties in undergraduate health professions students, including physiotherapy students. It also provided insight into the strategies used by clinical educators to overcome these difficulties. The literature suggested that further studies were needed in order to understand the development of clinical reasoning in physiotherapy students in clinical practice. The researcher aimed to answer the research question by using study methods that drew on the perspectives of the clinical educators and undergraduate physiotherapy students in this study to gain insight into experiences situated in the clinical setting. Chapter 3 described the cross-sectional research design applied to the study that allowed the researcher to compare the views of both participant groups. Interviews allowed for interaction with the participants, and the researcher was able to collect qualitative data within an interpretivist paradigm. The methods used in this study allowed for collection of rich data as participants were able to provide detailed accounts of their experiences in clinical reasoning and its development situated in clinical practice. The researcher made use of thematic data analysis to analyse participant responses.

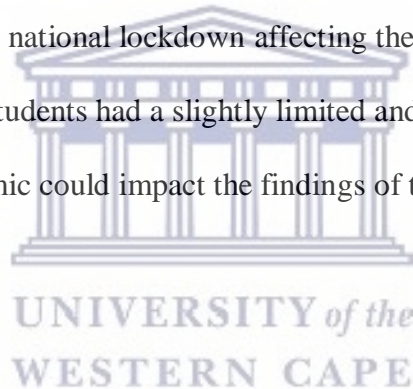
The results of the analysis, provided in Chapter 4, answered the research sub-questions: 1) What is the understanding of clinical reasoning in students and clinical educators? 2) What are the difficulties experienced by undergraduate physiotherapy students during the clinical reasoning process? 3) What strategies do clinical educators use to help undergraduate physiotherapy students develop clinical reasoning skills? The results showed that the clinical educators and students had similar understandings of clinical reasoning in that it was a process of gathering patient information and using that information to plan patient management. With regard to the difficulties encountered by the undergraduate physiotherapy students, the results also showed that the clinical educators saw the challenges in student clinical reasoning as stemming from the inability to integrate theory into practice, difficulty interpreting patient information, and in the unreasonable demands placed on students by clinical placement clinicians. However, students were of the opinion that the difficulties with their clinical reasoning processes stemmed from a theory–practice disconnect, practising in unknown clinical environments with demanding expectations from clinicians, and fear of negative clinical educator critique and practices. Furthermore, this study demonstrated that the strategies used by clinical educators to develop clinical reasoning in the undergraduate physiotherapy students involved establishing relationships with the students that were conducive to learning, and providing feedback which included the discussion of patient cases and demonstration of thinking processes. By answering the sub-questions above, the researcher was able to answer the main research question in Chapter 1 by establishing the perspectives of both participant groups on the concept of clinical reasoning as it is used in clinical practice, and their perspectives on the clinical reasoning challenges in effective patient management, and the various strategies used by the clinical educators to remediate those challenges.

The results of this study were then discussed in Chapter 5, interpreting the findings in terms of existing research that had been done on the topic of clinical reasoning. The participant groups of the study had similar understandings of clinical reasoning but these described only one aspect of the concept of clinical reasoning compared to the literature. By broadening their understanding of the clinical reasoning concept, and taking into account that it is context-dependant, clinical educators can use a more holistic approach in helping students develop their clinical reasoning, and undergraduate physiotherapy students can let go of unrealistic expectations concerning the rate at which clinical reasoning development takes place. The difficulties in clinical reasoning development found in this study were similar to findings in the literature, and included the interpretation of patient information, knowledge transfer, a theory–practice disconnect, and negative experiences during clinical practice. The clinical educators used discussion of patient cases and demonstration of clinical reasoning processes as strategies to improve clinical reasoning difficulties, which is similar to what is found in the literature regarding development of clinical reasoning difficulties. However, the student participants perceived the clinical educator demonstrations to pertain to practical demonstrations rather than to clinical reasoning processes, demonstrating a lack of student feedback literacy. Feedback was interpreted differently by the different participant groups, and could be seen as an unwanted interruption by the student participants when feedback was given during patient encounters. However, corroborating the literature, the clinical educators mentioned that feedback was more beneficial when given as needed. Fear, and possibly intimidation, played a role in the development difficulties experienced by the student participants. Unexpectedly, opinions regarding the causes of fear and intimidation differed between participant groups. Clinical educators reported that students were intimidated by the demands of the placement clinicians, while student participants feared embarrassment during clinical teaching sessions and felt intimidated by domineering clinical educator practices.

Regardless of the difference in perceptions between the participant groups, the undergraduate physiotherapy students believed that clinical educators played a role in the development of their clinical reasoning skills, and that clinical teaching was beneficial.

6.3 Limitations

While the methods used were effective in answering the research question, this study was limited to a small sample of clinical educators and undergraduate physiotherapy students selected from one tertiary institution, which limits the generalisability of the study. The undergraduate physiotherapy students were also delayed entering the clinical platform, owing to the worldwide pandemic and national lockdown affecting the country at the time of data collection. The fact that these students had a slightly limited and different clinical experience as a consequence of the pandemic could impact the findings of the study.



6.4 Study implications

The responses from the clinical educators in this study, regarding their understanding of clinical reasoning, show that only a fragment of the concept of clinical reasoning is understood. This could be due to the fact that clinical reasoning is complex in nature. The student participants' understanding of clinical reasoning confirms that the students know what is expected of them during clinical practice but that there are difficulties beyond inexperience that affect their clinical reasoning processes. Further research into how the concept of clinical reasoning is introduced in pre-clinical education undergraduate physiotherapy students is therefore needed to explore the limited understanding presented in this study.

This study demonstrated that these clinical reasoning difficulties are not different from those identified in previous studies, and that the difficulties experienced during the clinical reasoning process in undergraduate students are still not entirely understood. The cause of the difficulties in clinical reasoning remains an enigma, given the substantial amount of research on clinical reasoning difficulties across different healthcare professions. It is also clear from the findings of this study that the clinical reasoning difficulties in undergraduate physiotherapy students encountered by both participant groups did not stem from knowledge deficits alone, as is often thought, but from challenges transferring knowledge gained in the classroom to solve a problem in the clinical setting, and the disconnect between what was learnt in the classroom and the reality of what is experienced in the clinical setting. In order to prepare undergraduate students for the realities of clinical practice, further research into clinical practice expectations of students is recommended.

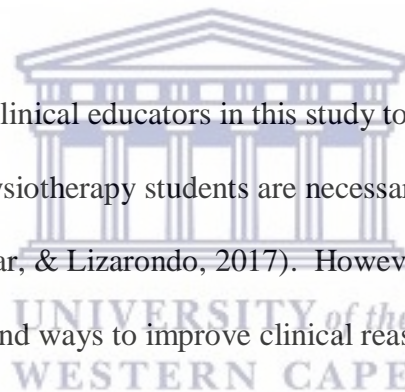


This study also showed that the fears of the students regarding clinical teaching had a real impact on their confidence to clinically reason. Because student fear and possible intimidation were highlighted as some of the inhibitors of clinical reasoning development by the participants in this study, it is recommended that further research is undertaken to explore these concerns, using a larger sample size.

The conflicting views among the participant groups of this study concerning the expectations of what feedback encompasses, could very well be a key factor contributing to fearful environments which are not suitable for learning in clinical practice. Feedback was viewed by the clinical educators as a helpful strategy in developing clinical reasoning skills. While this view is similar to findings mentioned in studies in medicine, nursing and podiatry

(Honkavuo, 2020; MacNeil et al., 2020; Ntuli et al., 2018), it is nonetheless a concern, because the weaknesses in student feedback literacy identified in this study do not seem to play a role in how the clinical educator study participants conceive of student feedback. Clinical educators need to take this into account since underdeveloped student feedback literacy has been associated with low self-confidence (Sutton, 2012), and lack of confidence was mentioned by the student participants in this study as an inhibitor of clinical reasoning development. The differing perceptions of feedback held by clinical educators and undergraduate physiotherapy students call for further exploration into feedback in physiotherapy research.

Finally, the strategies used by clinical educators in this study to improve the clinical reasoning of undergraduate physiotherapy students are necessary components of effective clinical teaching (Martin, Kumar, & Lizarondo, 2017). However, the fact that continuous research is still being done to find ways to improve clinical reasoning development in undergraduate health professionals shows that these strategies alone are not effective in solving this ongoing issue in clinical practice, and that further studies are needed.



References

- American Physical Therapy Association. (2004). A Normative Model of Physical Therapist Professional Education: Version 2004. Alexandria, VA: American Physical Therapy Association
- Anakin, M., Jouart, M., Timmermans, J., & Pinnock, R. (2020). Student experiences of learning clinical reasoning. *The Clinical Teacher*, 17(1), 52–57.
<https://doi.org/10.1111/tct.13014>
- Anderson, Jane, K. (2006). *Factors affecting the clinical reasoning ability of medical students*. (November). Retrieved from
<https://digital.library.adelaide.edu.au/dspace/bitstream/2440/37850/10/02whole.pdf>
- Anney, V. N. (2014). *Ensuring the quality of the findings of qualitative research: Looking at trustworthiness criteria*. Retrieved from
<http://196.44.162.10:8080/xmlui/handle/123456789/256>
- Audétat, M. C., Laurin, S., Dory, V., Charlin, B., & Nendaz, M. R. (2017a). Diagnosis and management of clinical reasoning difficulties: Part I. Clinical reasoning supervision and educational diagnosis. *Medical Teacher*.
<https://doi.org/10.1080/0142159X.2017.1331033>
- Audétat, M. C., Laurin, S., Dory, V., Charlin, B., & Nendaz, M. R. (2017b). Diagnosis and management of clinical reasoning difficulties: Part II. Clinical reasoning difficulties: Management and remediation strategies*. *Medical Teacher*.
<https://doi.org/10.1080/0142159X.2017.1331034>
- Audétat, M. C., Laurin, S., Sanche, G., Béique, C., Fon, N. C., Blais, J. G., & Charlin, B. (2013). Clinical reasoning difficulties: A taxonomy for clinical teachers. *Medical Teacher*. <https://doi.org/10.3109/0142159X.2012.733041>

- Barrett, J., & Scott, K. M. (2018). Acknowledging medical students' reports of intimidation and humiliation by their teachers in hospitals. *Journal of Paediatrics and Child Health*, 54(1), 69–73. <https://doi.org/10.1111/jpc.13656>
- Beer, M., & Mårtensson, L. (2015). Feedback on students' clinical reasoning skills during fieldwork education. *Australian Occupational Therapy Journal*, 62(4), 255–264. <https://doi.org/10.1111/1440-1630.12208>
- Best, D., White, E., Cameron, J., Guthrie, A., Hunter, B., Hall, K., ... Lubman, D. I. (2014). A Model for Predicting Clinician Satisfaction with Clinical Supervision. *Alcoholism Treatment Quarterly*, 32(1), 67–78. <https://doi.org/10.1080/07347324.2014.856227>
- Bird, C. M. (2005). How I stopped dreading and learned to love transcription. *Qualitative Inquiry*. <https://doi.org/10.1177/1077800404273413>
- Bitsch, V. (2005). Qualitative Research: A Grounded Theory Example and Evaluation Criteria. *Journal of Agribusiness*, 23(1), 75–91. <https://doi.org/http://dx.doi.org/10.22004/ag.econ.59612>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*. <https://doi.org/10.1191/1478088706qp063oa>
- Braun, V., & Clarke, V. (2012). Thematic analysis. In *APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological*. (pp. 57–71). <https://doi.org/10.1037/13620-004>
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated Cognition and the Culture of Learning. *Educational Researcher*, 18(1), 32–42. <https://doi.org/10.3102/0013189X018001032>
- Burgess, A., van Diggele, C., Roberts, C., & Mellis, C. (2020). Key tips for teaching in the

clinical setting. *BMC Medical Education*, 20(S2), 463. <https://doi.org/10.1186/s12909-020-02283-2>

Campbell, D., Walters, L., Couper, I., & Greacen, J. (2017). What are they thinking? Facilitating clinical reasoning through longitudinal patient exposure in rural practice. *Rural and Remote Health*. <https://doi.org/10.22605/RRH4162>

Carless, D., & Boud, D. (2018). The development of student feedback literacy: enabling uptake of feedback. *Assessment & Evaluation in Higher Education*, 43(8), 1315–1325. <https://doi.org/10.1080/02602938.2018.1463354>

Carless, D., & Winstone, N. (2020). Teacher feedback literacy and its interplay with student feedback literacy. *Teaching in Higher Education*, 1–14. <https://doi.org/10.1080/13562517.2020.1782372>

Castillo, J. M., Park, Y. S., Harris, I., Cheung, J. J. H., Sood, L., Clark, M. D., ... Woods, N. (2018, June 1). A critical narrative review of transfer of basic science knowledge in health professions education. *Medical Education*, Vol. 52, pp. 592–604. <https://doi.org/10.1111/medu.13519>

Chapman, D. D., & Sellheim, D. O. (2017). PEDIATRIC EDUCATION SPECIAL SERIES: Assessment of Teaching and Learning Activities in Pediatric Physical Therapy: Factors Influencing Knowledge Development and Confidence. *Journal of Physical Therapy Education*, 31(2), 108–118. <https://doi.org/10.1097/00001416-201731020-00013>

Christensen, N., Black, L., Furze, J., Huhn, K., Vendrely, A., & Wainwright, S. (2017). Clinical reasoning: Survey of teaching methods, integration, and assessment in entry-level physical therapist academic education. *Physical Therapy*, 97(2), 175–186. <https://doi.org/10.2522/ptj.20150320>

- Cresswell, J. W. (2011). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research, 4th Edition* (4th ed.). Pearson Education.
- Croskerry, P., Petrie, D. A., Reilly, J. B., & Tait, G. (2014). Deciding about fast and slow decisions. *Academic Medicine*. <https://doi.org/10.1097/ACM.0000000000000121>
- Cruz, E. B., Moore, A. P., & Cross, V. (2012). A qualitative study of physiotherapy final year undergraduate students' perceptions of clinical reasoning. *Manual Therapy*. <https://doi.org/10.1016/j.math.2012.05.013>
- Culyer, L. M., Jatulis, L. L., Cannistraci, P., & Brownell, C. A. (2018). Evidenced-Based Teaching Strategies that Facilitate Transfer of Knowledge Between Theory and Practice: What are Nursing Faculty Using? *Teaching and Learning in Nursing, 13*(3), 174–179. <https://doi.org/10.1016/j.teln.2018.03.003>
- Delany, C., & Bragge, P. (2009). A study of physiotherapy students' and clinical educators' perceptions of learning and teaching. *Medical Teacher, 31*(9). <https://doi.org/10.1080/01421590902832970>
- DiCicco-Bloom, B., & Crabtree, B. F. (2006). Making sense of qualitative research: The qualitative research interview. *Medical Education*. <https://doi.org/10.1111/j.1365-2929.2006.02418.x>
- Donough, G., & der Heever, M. van. (2018). Undergraduate nursing students' experience of clinical supervision. *Curationis, 41*(1). <https://doi.org/10.4102/curationis.v41i1.1833>
- Dowson, J. (2019). Transferring knowledge into practice? Exploring the feasibility of action learning for improving knowledge, skills and confidence in clinical communication skills. *BMC Medical Education*. <https://doi.org/10.1186/s12909-019-1467-4>
- Durning, S. J., & Artino, A. R. (2011). Situativity theory: A perspective on how participants

and the environment can interact: AMEE Guide no. 52. *Medical Teacher*, 33(3), 188–199. <https://doi.org/10.3109/0142159X.2011.550965>

Durning, S. J., Artino, A. R., Boulet, J. R., Dorrance, K., van der Vleuten, C., & Schuwirth, L. (2012). The impact of selected contextual factors on experts' clinical reasoning performance (does context impact clinical reasoning performance in experts?). *Advances in Health Sciences Education*, 17(1), 65–79. <https://doi.org/10.1007/s10459-011-9294-3>

Durning, S. J., Artino, A. R., Schuwirth, L., & van der Vleuten, C. (2013). Clarifying Assumptions to Enhance Our Understanding and Assessment of Clinical Reasoning. *Academic Medicine*, 88(4), 442–448. <https://doi.org/10.1097/ACM.0b013e3182851b5b>

Durning, S. J., Dong, T., Artino, A. R., van der Vleuten, C., Holmboe, E., & Schuwirth, L. (2015). Dual processing theory and experts' reasoning: exploring thinking on national multiple-choice questions. *Perspectives on Medical Education*. <https://doi.org/10.1007/s40037-015-0196-6>

Dyrbye, L. N., Schwartz, A., Downing, S. M., Szydlo, D. W., Sloan, J. A., & Shanafelt, T. D. (2011). Efficacy of a brief screening tool to identify medical students in distress. *Academic Medicine*. <https://doi.org/10.1097/ACM.0b013e31821da615>

Ebright, P. R., Patterson, E. S., Chalko, B. A., & Render, M. L. (2003). Understanding the Complexity of Registered Nurse Work in Acute Care Settings. *Journal of Nursing Administration*, 33(12), 630–638. <https://doi.org/10.1097/00005110-200312000-00004>

Ernstzen, D. V., Bitzer, E., & Grimmer-Somers, K. (2009). Physiotherapy students' and clinical teachers' perceptions of clinical learning opportunities: A case study. *Medical Teacher*. <https://doi.org/10.1080/01421590802512870>

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of Convenience Sampling and

Purposive Sampling Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*.

<https://doi.org/10.11648/j.ajtas.20160501.11>

Eva, K. W. (2005). What every teacher needs to know about clinical reasoning. *Medical Education*. <https://doi.org/10.1111/j.1365-2929.2004.01972.x>

Faisal Fahim, M. (2018). Perception of physical therapy students regarding effectiveness of clinical teaching in physical therapy education at Karachi. *Biometrics & Biostatistics International Journal*, 7(3), 211–216. <https://doi.org/10.15406/bbij.2018.07.00211>

Furze, J., Black, L., Hoffman, J., Barr, J. B., Cochran, T. M., & Jensen, G. M. (2015). Exploration of Students' Clinical Reasoning Development in Professional Physical Therapy Education. *Journal of Physical Therapy Education*. <https://doi.org/10.1097/00001416-201529030-00005>

Furze, J., Black, L., Hoffman, J., Barr, J. B., Cochran, T. M., & Jensen, G. M. (2017). Exploration of Students' Clinical Reasoning Development in Professional Physical Therapy Education. *Journal of Physical Therapy Education*, 29(3), 22–33. <https://doi.org/10.1097/00001416-201529030-00005>

Gard, G., Nyboe, L., & Gyllensten, A. L. (2020). Clinical reasoning and clinical use of basic body awareness therapy in physiotherapy – a qualitative study? *European Journal of Physiotherapy*, 22(1), 29–35. <https://doi.org/10.1080/21679169.2018.1549592>

Garraway, J. (2010). Knowledge boundaries and boundary-crossing in the design of work-responsive university curricula. *Teaching in Higher Education*. <https://doi.org/10.1080/13562511003620035>

Gentles, S. J., Charles, C., Ploeg, J., & Ann McKibbin, K. (2015). Sampling in qualitative

research: Insights from an overview of the methods literature. *Qualitative Report*.

Gilliland, S. (2014). Clinical Reasoning in First- and Third-Year Physical Therapist Students.

Journal of Physical Therapy Education, 28(3), 64–80.

<https://doi.org/10.1097/00001416-201407000-00009>

Gray, L. M., Wong-Wylie, G., Rempel, G. R., & Cook, K. (2020). Expanding qualitative

research interviewing strategies: Zoom video communications. *Qualitative Report*.

Gruppen, L. D. (2017). Clinical reasoning: Defining it, teaching it, assessing it, studying it.

Western Journal of Emergency Medicine.

<https://doi.org/10.5811/westjem.2016.11.33191>

Gummesson, C., Sundén, A., & Fex, A. (2018a). Clinical reasoning as a conceptual

framework for interprofessional learning: a literature review and a case study. *Physical*

Therapy Reviews, 23(1), 29–34. <https://doi.org/10.1080/10833196.2018.1450327>

Gummesson, C., Sundén, A., & Fex, A. (2018b). Clinical reasoning as a conceptual

framework for interprofessional learning: a literature review and a case study. *Physical*

Therapy Reviews. <https://doi.org/10.1080/10833196.2018.1450327>

Günay, U., & Kılınç, G. (2018). The transfer of theoretical knowledge to clinical practice by

nursing students and the difficulties they experience: A qualitative study. *Nurse*

Education Today, 65, 81–86. <https://doi.org/10.1016/j.nedt.2018.02.031>

Hattie, J., & Timperley, H. (2007). The Power of Feedback. *Review of Educational Research*,

77(1), 81–112. <https://doi.org/10.3102/003465430298487>

Hay-Smith, E. J. C., Brown, M., Anderson, L., & Treharne, G. J. (2016). Once a clinician,

always a clinician: a systematic review to develop a typology of clinician-researcher

dual-role experiences in health research with patient-participants. *BMC Medical*

Research Methodology, 16(1), 95. <https://doi.org/10.1186/s12874-016-0203-6>

Helfrich, C. D., Rose, A. J., Hartmann, C. W., Bodegom-Vos, L., Graham, I. D., Wood, S. J., ... Aron, D. C. (2018). How the dual process model of human cognition can inform efforts to de-implement ineffective and harmful clinical practices: A preliminary model of unlearning and substitution. *Journal of Evaluation in Clinical Practice*, 24(1), 198–205. <https://doi.org/10.1111/jep.12855>

Hoffman, K., Donoghue, J., & Duffield, C. (2004). Decision-making in clinical nursing: investigating contributing factors. *Journal of Advanced Nursing*, 45(1), 53–62. <https://doi.org/10.1046/j.1365-2648.2003.02860.x>

Holdar, U., Wallin, L., & Heiwe, S. (2013). Why do we do as we do? Factors influencing clinical reasoning and decision-making among physiotherapists in an acute setting. *Physiotherapy Research International*. <https://doi.org/10.1002/pri.1551>

Honkavuo, L. (2020). Nursing students' perspective on a caring relationship in clinical supervision. *Nursing Ethics*, 27(5), 1225–1237. <https://doi.org/10.1177/0969733019871695>

Hunter, S., & Arthur, C. (2016). Clinical reasoning of nursing students on clinical placement: Clinical educators' perceptions. *Nurse Education in Practice*, 18, 73–79. <https://doi.org/10.1016/j.nepr.2016.03.002>

Ignatavicius, D., & Chung, C. E. (2016). Professional Development for Nursing Faculty: Assessing Transfer of Learning into Practice. *Teaching and Learning in Nursing*, 11(4), 138–142. <https://doi.org/10.1016/j.teln.2016.05.005>

Jameel, B., Shaheen, S., & Majid, U. (2018). Introduction to Qualitative Research for Novice Investigators. *Undergraduate Research in Natural and Clinical Science and Technology*

(URNCSST) *Journal*, 2(6), 1–6. <https://doi.org/10.26685/urncst.57>

Jawaid, M., Bakhtiar, N., Masood, Z., & Mehar, A.-K. (2019). Effect of Paper- and Computer-based Simulated Instructions on Clinical Reasoning Skills of Undergraduate Medical Students: A Randomized Control Trial. *Cureus*.
<https://doi.org/10.7759/cureus.6071>

Jessee, M. A. (2018). Pursuing Improvement in Clinical Reasoning: The Integrated Clinical Education Theory. *Journal of Nursing Education*, 57(1), 7–13.
<https://doi.org/10.3928/01484834-20180102-03>

Karvonen, E., Paatelma, M., Laitinen-Väänänen, S., & Piirainen, A. (2017). Clinical reasoning and critical reflection in physiotherapists' examinations of patients with low back pain in its early phase: a qualitative study from physiotherapists' point of view. *European Journal of Physiotherapy*, 19(4), 185–193.
<https://doi.org/10.1080/21679169.2017.1316311>

Kassirer, J. P. (2010). Teaching clinical reasoning: Case-based and coached. *Academic Medicine*. <https://doi.org/10.1097/ACM.0b013e3181d5dd0d>

Killam, L. A., & Heerschap, C. (2013). Challenges to student learning in the clinical setting: A qualitative descriptive study. *Nurse Education Today*, 33(6), 684–691.
<https://doi.org/10.1016/j.nedt.2012.10.008>

Klein, M., Otto, B., Fischer, M. R., & Stark, R. (2019). Fostering medical students' clinical reasoning by learning from errors in clinical case vignettes: effects and conditions of additional prompting procedures to foster self-explanations. *Advances in Health Sciences Education*, 24(2), 331–351. <https://doi.org/10.1007/s10459-018-09870-5>

Lefroy, J., Watling, C., Teunissen, P. W., & Brand, P. (2015). Guidelines: the do's, don'ts

and don't know of feedback for clinical education. *Perspectives on Medical Education*, 4(6), 284–299. <https://doi.org/10.1007/s40037-015-0231-7>

Levett-Jones, T., Hoffman, K., Dempsey, J., Jeong, S. Y.-S., Noble, D., Norton, C. A., ... Hickey, N. (2010). The 'five rights' of clinical reasoning: An educational model to enhance nursing students' ability to identify and manage clinically 'at risk' patients. *Nurse Education Today*, 30(6), 515–520. <https://doi.org/10.1016/j.nedt.2009.10.020>

Linn, A., Khaw, C., Kildea, H., & Tonkin, A. (2012). Clinical reasoning: A guide to improving teaching and practice. *Australian Family Physician*.

MacNeil, K., Cuncic, C., Voyer, S., Butler, D., & Hatala, R. (2020). Necessary but not sufficient: identifying conditions for effective feedback during internal medicine residents' clinical education. *Advances in Health Sciences Education*, 25(3), 641–654. <https://doi.org/10.1007/s10459-019-09948-8>

Martin, P., Kumar, S., & Lizarondo, L. (2017). When I say ... clinical supervision. *Medical Education*, 51(9), 890–891. <https://doi.org/10.1111/medu.13258>

McBee, E., Ratcliffe, T., Schuwirth, L., O'Neill, D., Meyer, H., Madden, S. J., & Durning, S. J. (2018). Context and clinical reasoning. *Perspectives on Medical Education*, 7(4), 256–263. <https://doi.org/10.1007/s40037-018-0417-x>

McMillan, W. J. (2010). Teaching for clinical reasoning - Helping students make the conceptual links. *Medical Teacher*, 32(10). <https://doi.org/10.3109/01421591003695303>

Merkebu, J., Battistone, M., McMains, K., McOwen, K., Witkop, C., Konopasky, A., ... Durning, S. J. (2020). Situativity: a family of social cognitive theories for understanding clinical reasoning and diagnostic error. *Diagnosis*, 7(3), 169–176. <https://doi.org/10.1515/dx-2019-0100>

- Modi, J. N., Anshu, Gupta, P., & Singh, T. (2015). Teaching and assessing clinical reasoning skills. *Indian Pediatrics*. <https://doi.org/10.1007/s13312-015-0718-7>
- Montpetit-Tourangeau, K., Dyer, J.-O., Hudon, A., Windsor, M., Charlin, B., Mamede, S., & van Gog, T. (2017). Fostering clinical reasoning in physiotherapy: comparing the effects of concept map study and concept map completion after example study in novice and advanced learners. *BMC Medical Education*, *17*(1), 238. <https://doi.org/10.1186/s12909-017-1076-z>
- Nafea, E. T., & Dennick, R. (2018). Clinical reasoning skills in final-year dental students: A qualitative cross-curricula comparison. *European Journal of Dental Education*, *22*(2), 101–108. <https://doi.org/10.1111/eje.12256>
- Nendaz, M. R., Gut, A. M., Louis-Simonet, M., Perrier, A., & Vu, N. V. (2011). Bringing explicit insight into cognitive psychology features during clinical reasoning seminars: A prospective, controlled study. *Education for Health: Change in Learning and Practice*.
- Newton, J. M., Billett, S., Jolly, B., & Ockerby, C. M. (2009). Lost in translation: barriers to learning in health professional clinical education. *Learning in Health and Social Care*. <https://doi.org/10.1111/j.1473-6861.2009.00229.x>
- Nordquist, J., Hall, J., Caverzagie, K., Snell, L., Chan, M.-K., Thoma, B., ... Philibert, I. (2019). The clinical learning environment. *Medical Teacher*, *41*(4), 366–372. <https://doi.org/10.1080/0142159X.2019.1566601>
- Norman, G. (2009a). Dual processing and diagnostic errors. *Advances in Health Sciences Education*, *14*(S1), 37–49. <https://doi.org/10.1007/s10459-009-9179-x>
- Norman, G. (2009b). Teaching basic science to optimize transfer. *Medical Teacher*, *31*(9), 807–811. <https://doi.org/10.1080/01421590903049814>

- Ntuli, S., September, N. N., & Sithole, N. (2018). South African podiatry students' perceptions of feedback given as part of clinical training. *Journal of Foot and Ankle Research, 11*(1), 36. <https://doi.org/10.1186/s13047-018-0279-9>
- Odetola, T. D., Oluwasola, O., Pimmer, C., Dipeolu, O., Akande, S. O., Olaleye, O. S., ... Ajuwon, A. J. (2018). Theory-Practice Gap: The Experiences of Nigerian Nursing Students. *Africa Journal of Nursing and Midwifery, 20*(1), 1–14. <https://doi.org/10.25159/2520-5293/3694>
- Pelaccia, T., Tardif, J., Tribby, E., & Charlin, B. (2011). An analysis of clinical reasoning through a recent and comprehensive approach: The dual-process theory. *Medical Education Online. https://doi.org/10.3402/meo.v16i0.5890*
- Reising, D. L., James, B., & Morse, B. (2018). Student Perceptions of Clinical Instructor Characteristics Affecting Clinical Experiences. *Nursing Education Perspectives, 39*(1), 4–9. <https://doi.org/10.1097/01.NEP.0000000000000241>
- Ritchie, J., Lewis, J., & Elam, G. (2003). Designing and Selecting Samples. In J. Ritchie (Ed.), *Qualitative research practice* (1st ed., pp. 78–79). London: Sage.
- Rochmawati, E., & Wiechula, R. (2010a). Education strategies to foster health professional students' clinical reasoning skills. *Nursing and Health Sciences, 12*(2), 244–250. <https://doi.org/10.1111/j.1442-2018.2009.00512.x>
- Rochmawati, E., & Wiechula, R. (2010b). Education strategies to foster health professional students' clinical reasoning skills. *Nursing and Health Sciences. https://doi.org/10.1111/j.1442-2018.2009.00512.x*
- Rodger, S., Fitzgerald, C., Davila, W., Millar, F., & Allison, H. (2011). What makes a quality occupational therapy practice placement? Students' and practice educators' perspectives.

Australian Occupational Therapy Journal, 58(3), 195–202.

<https://doi.org/10.1111/j.1440-1630.2010.00903.x>

ROLFE, G. (1993). Closing the theory—practice gap: a model of nursing praxis. *Journal of Clinical Nursing*, 2(3), 173–177. <https://doi.org/10.1111/j.1365-2702.1993.tb00157.x>

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., ... Jinks, C.

(2018). Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality and Quantity*. <https://doi.org/10.1007/s11135-017-0574-8>

Schmidt, H. G., & Mamede, S. (2015). How to improve the teaching of clinical reasoning: A narrative review and a proposal. *Medical Education*.

<https://doi.org/10.1111/medu.12775>

Schuwirth, L. W. T., Durning, S. J., & King, S. M. (2020). Assessment of clinical reasoning: three evolutions of thought. *Diagnosis*. <https://doi.org/10.1515/dx-2019-0096>

Sole, G., Skinner, M., Hale, L., & Golding, C. (2019). Developing a framework for teaching clinical reasoning skills to undergraduate physiotherapy students: A delphi study. *New Zealand Journal of Physiotherapy*. <https://doi.org/10.15619/NZJP/47.1.06>

Staples-Bradley, L. K., Duda, B., & Gettens, K. (2019). Student self-disclosure in clinical supervision. *Training and Education in Professional Psychology*, 13(3), 216–221.

<https://doi.org/10.1037/tep0000242>

Sutton, P. (2012). Conceptualizing feedback literacy: knowing, being, and acting. *Innovations in Education and Teaching International*, 49(1), 31–40.

<https://doi.org/10.1080/14703297.2012.647781>

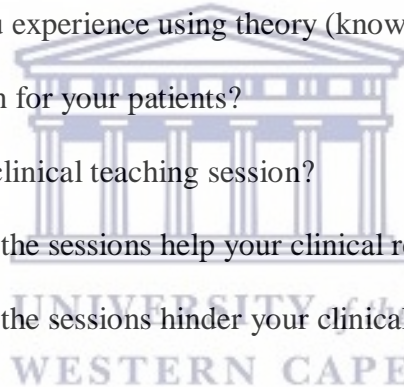
ten Cate, O., Custers, E. J. F. M., & Durning, S. J. (Eds.). (2018). *Principles and Practice of Case-based Clinical Reasoning Education*. <https://doi.org/10.1007/978-3-319-64828-6>

- Thanh, N. C., Thi, T., & Thanh, L. (2015). The Interconnection Between Interpretivist Paradigm and Qualitative Methods in Education. *American Journal of Educational Science*.
- Tobin, G. A., & Begley, C. M. (2004). Methodological rigour within a qualitative framework. *Journal of Advanced Nursing*, 48(4), 388–396. <https://doi.org/10.1111/j.1365-2648.2004.03207.x>
- Trommelen, R. D., Karpinski, A., & Chauvin, S. (2017). Impact of Case-Based Learning and Reflection on Clinical Reasoning and Reflection Abilities in Physical Therapist Students. *Journal of Physical Therapy Education*, 31(1), 21–30. <https://doi.org/10.1097/00001416-201731010-00006>
- Turner, D. (2014). Qualitative Interview Design: A Practical Guide for Novice Investigators. *The Qualitative Report*. <https://doi.org/10.46743/2160-3715/2010.1178>
- Voges, T. L., & Frantz, J. M. (2019). Clarifying the role of clinical supervisors according to physiotherapists at a higher education institution. *South African Journal of Physiotherapy*. <https://doi.org/10.4102/sajp.v75i1.523>
- Wihlborg, J., Edgren, G., Johansson, A., Sivberg, B., & Gummesson, C. (2019). Using the case method to explore characteristics of the clinical reasoning process among ambulance nurse students and professionals. *Nurse Education in Practice*. <https://doi.org/10.1016/j.nepr.2019.01.001>
- Wijbenga, M. H., Bovend'Eerdt, T. J. H., & Driessen, E. W. (2018). Physiotherapy Students' Experiences with Clinical Reasoning During Clinical Placements: A Qualitative Study. *Health Professions Education*. <https://doi.org/10.1016/j.hpe.2018.05.003>
- World-Health-Organization. (2020). *Considerations for implementing a risk-based approach*

to international travel in the context of COVID-19. (December), 1–8.

Appendix 1: Interview guide for student interviews

1. What is your understanding of clinical reasoning?
 - a. Describe your own process of clinical reasoning when you are with a patient.
 - b. Can you think of any situations during clinical practice or clinical teaching that make it difficult to stick to your own process of clinical reasoning?
 - c. How do you use clinical reasoning to formulate a hypothesis?
2. Can you describe any challenges that you experience with regard to the clinical reasoning concept?
3. What difficulties do you experience using theory (knowledge from the classroom) to develop a treatment plan for your patients?
4. Can you describe your clinical teaching session?
 - a. What aspects of the sessions help your clinical reasoning process?
 - b. What aspects of the sessions hinder your clinical reasoning process?



Appendix 2: Interview guide for clinical educator interviews

1. What is your understanding of clinical reasoning?
 - a. How do you see the process of clinical reasoning either when you are watching a student with a patient or when you are with a patient?
 - b. How do you identify clinical reasoning difficulties in students? OR What tells you a student has a problem with clinical reasoning?
 - c. Share your view on the integration of theory into practice from your personal experience of working with students

2. How do you think you personally help develop clinical reasoning in students?
 - a. What strategies (if you have any) have you found helps you develop this complex skill in undergraduate students?
 - b. Describe a typical supervision session with a student please.
 - i. Do you allow students to test their own theories?
 1. How do you deal with student logic? Thinking? Processing?
 - ii. Describe how you provide feedback to students
 1. How much time do you spend on feedback?
 2. When do you give feedback?

How do you cultivate trust and build a relationship with your student(s) during the supervision session?

Appendix 3: Permission request letter for the Registrar



UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +2782 4266 729

E-mail: 2026933@myuwc.ac.za

The Registrar
University of the Western Cape
Private Bag X17
Bellville
7535

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

Dear Ms. Lawton-Misra

My name is Jacqueline Hendricks, and I am a post-graduate Physiotherapy student at the University of the Western Cape.

The research I wish to conduct for my Master's thesis involves exploring strategies used by physiotherapy students and clinical educators to develop clinical reasoning. This study will be conducted under the supervision of Danelle Hess (MSc. Physiotherapy) and Prof Michael Rowe (PhD. Physiotherapy).

I am hereby requesting your consent to approach the students and clinical educators of the Physiotherapy Department and conduct interviews with them.

If you require any further information, please do not hesitate to contact me on contact number: +2782 4266 729 or email address: 2026933@myuwc.ac.za.

Thank you for your time and consideration in this matter.

Kind Regards,
Jacqueline Hendricks

Appendix 4: Permission request for the Head of the Physiotherapy Department



UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +2782 4266 729

E-mail: 2026933@myuwc.ac.za

The Head of the Physiotherapy Department
University of the Western Cape
Private Bag X17
Bellville
7535

Dear Professor Rowe

Re: Permission to conduct research in the Physiotherapy department

I, Jacqueline Hendricks, request your permission to conduct interviews with the 3rd and 4th year physiotherapy students and the clinical educators employed by the Physiotherapy Department.

These interviews will be conducted as part of my MSc Physiotherapy degree. Should you require any further information, please do not hesitate to contact me.

Kind regards

Jacqueline Hendricks

Appendix 5: Student information sheet



UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 82 4266 729

E-mail: 2026933@myuwc.ac.za

INFORMATION SHEET: Students

Project Title: Exploring the strategies used by clinical educators to develop clinical reasoning in undergraduate physiotherapy students

What is this study about?

This is a research project being conducted by Jacqueline Hendricks at the University of the Western Cape. We are inviting you to participate in this research project because you are currently enrolled as a 3rd or 4th year in Physiotherapy at The University of the Western Cape. The purpose of this research project is to explore difficulties students experience in clinical reasoning in clinical practice.

What will I be asked to do if I agree to participate?

On acceptance of the invitation to take part in the study:

- A set date and time of your convenience will be arranged for you to be interviewed. Interviews will be done via the Zoom Video Conferencing app.
- Interview questions will be based on your clinical reasoning experiences during assessing and treating of patients, difficulties you may have experienced with your clinical reasoning and how supervision has impacted your clinical reasoning skills
- Interviews will be recorded on the Zoom Video Conferencing app and your responses will be transcribed exactly how you've said it.

Would my participation in this study be kept confidential?

This research project involves making a video or audio recording of you. The recordings will be used to capture your responses to the questions so as to ensure accurate transcription of your answers. Transcripts will only be accessed by the researcher, research supervisors, and independent transcriber chosen by the researcher. The researcher undertakes to protect your identity and the nature of your contribution. To ensure your confidentiality, no mention of your name will be made during recording of interviews. All digital recordings will be stored on a password-protected laptop in Dropbox which is protected by a password known only to the researcher and research supervisors, and kept for 5 years following the conclusion of the study.

I agree to be recorded during my participation in this study.

I do not agree to be recorded during my participation in this study.

If we write a report or article about this research project, your identity will be protected.



What are the risks of this research?

It is unlikely that the research will impact you and the risk from participating in this study is low. The detailed information with contact numbers will be provided to you in should you want to raise any issue relating to the study.

What are the benefits of this research?

This research is not designed to help you personally, but the results may help the researcher learn more about clinical reasoning difficulties experienced in undergraduate physiotherapy students. We hope that, in the future, other people might benefit from this study through improved understanding of clinical reasoning skill development in undergraduate physiotherapy students.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

What if I have questions?

This research is being conducted by *Jacqueline Hendricks*, post-graduate student of *Department of Physiotherapy*, at the University of the Western Cape. If you have any questions about the research study itself, please contact Jacqueline Hendricks at: Telephone number: 082 4266 729

E-mail address: 2026933@myuwc.ac.za

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Prof. Michael Rowe
Head of Department: Physiotherapy
University of the Western Cape
Private Bag X17
Bellville 7535
mrowe@uwc.ac.za

Prof Anthea Rhode
Dean of the Faculty of Community and Health Sciences
University of the Western Cape
Private Bag X17
Bellville 7535
chs-deansoffice@uwc.ac.za



Humanities and Social Sciences Research Ethics Committee
University of the Western Cape
Private Bag X17
7535
Tel. No.: (021) 959 - 2948/ 49/ 88

This research has been approved by the University of the Western Cape's Humanities and Social Sciences Research Ethics Committee (REFERENCE NUMBER: HS19/9/20)

Appendix 6: Clinical educator information sheet



UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 82 4266 729

E-mail: 2026933@myuwc.ac.za

INFORMATION SHEET: Clinical educators

Project Title: Exploring the strategies used by clinical educators to develop clinical reasoning in undergraduate physiotherapy students

What is this study about?

This is a research project being conducted by Jacqueline Hendricks at the University of the Western Cape. You are invited to participate in this research project because you supervise and assess 3rd and/or 4th year students for the Physiotherapy Department of The University of the Western Cape. The purpose of this research project is to explore the strategies clinical educators used to improve clinical reasoning skills in undergraduate physiotherapy students.

What will I be asked to do if I agree to participate?

On acceptance of the invitation to take part in the study:

- A set date and time of your convenience will be arranged for you to be interviewed. Interviews will be done via the Zoom Video Conferencing app.
- Interview questions will be based on your experiences supervising undergraduate physiotherapy students at the various clinical settings, as well as the difficulties you find students experience with clinical reasoning and the strategies you use to improve their clinical reasoning skills.
- Interviews will be recorded via the Zoom Video Conferencing app and your responses will be transcribed exactly how you've said it.

Would my participation in this study be kept confidential?

This research project involves making a video or audio recording of you. The recording will be used to capture your responses to the questions so as to ensure accurate transcription of your answers. Transcripts will only be accessed by the researcher, research supervisors, and independent transcriber chosen by the researcher. The researcher undertakes to protect your identity and the nature of your contribution. To ensure your confidentiality, no mention of your name will be made during recording of interviews. All digital recordings will be stored on a password-protected laptop in Dropbox which is protected by a password known only to the researcher and research supervisors, and kept for 5 years following the conclusion of the study.

I agree to be recorded during my participation in this study.

I do not agree to be recorded during my participation in this study.

If we write a report or article about this research project, your identity will be protected.

What are the risks of this research?

It is unlikely that the research will impact you and the risk from participating in this study is low. The detailed information with contact numbers will be provided to you in should you want to raise any issue relating to the study.



What are the benefits of this research?

This research is not designed to help you personally, but the results may help the researcher learn more about clinical reasoning difficulties experienced in undergraduate physiotherapy students and the strategies clinical educators use to develop clinical reasoning skills. We hope that, in the future, other people might benefit from this study through improved understanding of clinical reasoning skill development in undergraduate physiotherapy students.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

What if I have questions?

This research is being conducted by *Jacqueline Hendricks*, post-graduate student of the *Department of Physiotherapy*, at the University of the Western Cape. If you have any questions about the research study itself, please contact Jacqueline Hendricks at: Telephone number: 082 4266 729

E-mail address: 2026933@myuwc.ac.za

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Prof. Michael Rowe
Head of Department: Physiotherapy
University of the Western Cape
Private Bag X17
Bellville 7535
mrowe@uwc.ac.za

Prof Anthea Rhode
Dean of the Faculty of Community and Health Sciences
University of the Western Cape
Private Bag X17
Bellville 7535
chs-deansoffice@uwc.ac.za

Humanities and Social Sciences Research Ethics Committee
University of the Western Cape
Private Bag X17
7535
Tel. No.: (021) 959 - 2948/ 49/ 88 or (021) 959 4111
Email Address: research-ethics@uwc.ac.za

This research has been approved by the University of the Western Cape's

Humanities and Social Sciences Research Ethics Committee (REFERENCE

NUMBER: HS19/9/20)

Appendix 7: Consent form for participants



UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 82 4266 729

E-mail: 2026933@myuwc.ac.za

CONSENT FORM

Title of Research Project: Exploring the strategies used by clinical educators to develop clinical reasoning in undergraduate physiotherapy students

The study has been described to me in language that I understand. My questions about the study have been answered. I understand what my participation will involve and I agree to participate of my own choice and free will. I understand that my identity will not be disclosed to anyone. I understand that I may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.

I agree to be recorded during my participation in this study.

I do not agree to be recorded during my participation in this study.

Participant's name.....

Participant's signature.....

Date.....

Humanities and Social Sciences Research Ethics Administration Research Office, New Arts Building, C-Block, Top Floor, Room 28, University of the Western Cape, Private Bag X 17, S7535.

Appendix 8: Ethics Approval letter



UNIVERSITY of the
WESTERN CAPE



01 October 2020

Mrs J Hendricks
Physiotherapy
Faculty of Community and Health Sciences

Ethics Reference Number: HS19/9/20

Project Title: Exploring the strategies used by clinical educators to develop clinical reasoning in undergraduate physiotherapy students.

Approval Period: 27 August 2020 – 27 August 2023

I hereby certify that the Humanities and Social Science Research Ethics Committee of the University of the Western Cape approved the methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report by 30 November each year for the duration of the project.

The permission to conduct the study must be submitted to HSSREC for record keeping purposes.

The Committee must be informed of any serious adverse event and/or termination of the study.

A handwritten signature in black ink, appearing to read 'Josias'.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

NHREC Registration Number: HSSREC-130416-049

Director: Research Development
University of the Western Cape
Private Bag X 17
Bellville 7535
Republic of South Africa
Tel: +27 21 959 4111
Email: research-ethics@uwc.ac.za

FROM HOPE TO ACTION THROUGH KNOWLEDGE.