



School of Health, Care and Social Welfare

# CLINICAL REASONING FOCUSED ON CLIENTS' BEHAVIOUR CHANGE AND TREATMENT ORIENTATION IN THE TRANSITION FROM A PHYSIOTHERAPY STUDENT TO A CLINICALLY WORKING PHYSIOTHERAPIST

A longitudinal study

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*Main Area:* Physiotherapy with a specialization in Behavioural Medicine

*Level:* Second-cycle level

*Credits:* 15 hp

*Programme:* Master's Programme In Physiotherapy with Specialization In Behavioral Medicine

*Course Name:* Master's thesis in Physiotherapy with a Specialization in Behavioural Medicine

*Course Code:* FYS037

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*Seminar date:* 2022-05-30

*Grade date:* [year-month-day]

## ABSTRACT

**Background:** The present study evaluated physiotherapists' clinical reasoning focused on clients' behaviour change and treatment orientation in the transition from university to work. It further investigated how self-efficacy, attitudes and contextual factors influence clinical reasoning and treatment orientation.

**Methods:** In a longitudinal design, the clinical reasoning focused on clients' behaviour change and treatment orientation of physiotherapists (n = 24) were assessed over approximately two years, using the R4C instrument and the PABS-PT. Non-parametric statistical analysis was applied as well as a simple regression model.

**Results:** Participants showed a significant decrease in the clinical reasoning focused on clients' behaviour change regarding the R4C domains assessment, analysis and treatment. Physiotherapists' self-efficacy at graduation showed no influence on their assessment, analysis and treatment in clinical practice. Their attitudes at graduation explained 35,1% of the variation in assessment ability. Treatment orientation showed no significant changes. The contextual factors in clinical practice and attitudes at graduation showed no influence on treatment orientation.

**Conclusion:** The physiotherapists in this study show a persistent tendency to apply the biopsychosocial model. Due to the decrement in clinical reasoning focused on clients' behaviour change, research is warranted regarding determinants of physiotherapists' clinical reasoning skills in this transition.

**Keywords:** physiotherapy, clinical reasoning, behavioural medicine, education, treatment orientation

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# 1 BACKGROUND

## 1.1 The biopsychosocial model and behavioural medicine in the context of physiotherapy

The practice of physiotherapy addresses a variety of clinical pictures in different settings. It can include a person's rehabilitation after a stroke or heart attack, the management of pain, congenital or chronic diseases and others. With it, comes the complexity of the rehabilitation process and the interplay of different influences (Driver et al., 2021). The biopsychosocial model is an approach to grasping possible factors that influence this process. This model was introduced by Engel (1977) after questioning the strongly prevailed biomedical model, which explains the cause of diseases through biological measurements deviating from the norm. Engel (1977) proposed the biopsychosocial model on the grounds that a medical model has to consider the social and cultural environment and the very individual experiences and perceptions of one's state of health.

Applying a biopsychosocial approach within physiotherapy is strongly supported by research (Bello, 2012; Semmons, 2019). Using the biopsychosocial model follows to consider physical and social characteristics as well as the thoughts and emotions of a client (Semmons, 2019). The term 'behaviour' can be used to summarize these individual actions, reactions, thoughts or emotions (Martin & Pear, 2019). Behavioural medicine describes a field of research in which interactions between biomedical and social, environmental and behavioural processes are being looked at. Beyond, its knowledge is applied in various disciplines that encompass health promotion, prevention, clinical diagnosis and others (Dekker et al., 2017). The International Society of Behavioural Medicine states behavioural medicine is based on the biopsychosocial model.

Establishing a behavioural medicine approach within physiotherapy is growing in research. McGrane et al. (2014) describe physiotherapists as ideally placed to affect and initiate behaviour change towards physical activity. Studies focusing on different patient groups have investigated the effects of behaviour change techniques on physical activity adherence (Bishop et al., 2015; Eisele et al., 2019), reduction in sedentary time (Stephenson et al., 2017) or increasing physical activity (Nyman et al., 2018; O'Dwyer et al., 2017). The measured effects were increment in health-enhancing physical activity, Quality-of-Life and reducing sedentary time and the studies present a range of applied behaviour change techniques such as goal setting, prompts and cues, action planning, self-monitoring of behaviour or graded tasks and others. Researchers evaluating the treatment outcome in patients with musculoskeletal pain found a behavioural medicine approach to be more effective than leaving out behavioural medicine components in terms of disability reduction and impact on activity performance (Åsenlöf et al., 2005, 2009).

Theories regarding behaviour change support the implementation and understanding of possible frameworks of behaviour change within physiotherapy. Keogh et al. (2015) argue for the underpinning of interventions with a theory as it can help to better grasp the process of behaviour change, identifying determinants or modifying techniques within it. Davis et al. (2015) explain that theories can be tested through interventions allowing revision of the theory and improved understanding of a behavioural change. Several behaviour change theories originated from psychology in physiotherapy practice. This includes the social cognitive theory (Ghazi et al., 2018), the transtheoretical model (McGrane et al., 2015) and the health belief model (Hay-Smith et al., 2016). In the following, the social cognitive theory (SCT) will be viewed, together with a definition and areas of application.

### **1.1.1 Social cognitive theory**

The social cognitive theory explains the influence of an individual's behaviour through personal cognitive factors, behavioural factors and the social and physical environment (Bandura, 1991). "Self-efficacy" and "knowledge" are two core constructs of the SCT, belonging to the personal cognitive factors. Self-efficacy defines personal confidence in the ability to perform a certain behaviour. It can be strengthened through mastery experiences (successes and failures), and social modeling, especially when the individual perceives the social model as similar to themselves, as well as social persuasion (Bandura, 1995, Chapter 1). Knowledge is defined as a person's information about the health benefits and risks of engaging in a behaviour and how to engage in it (Kelder et al., 2015).

Within physiotherapy, the SCT can be applied in the individual treatment of patients in different settings, such as rehabilitation in patients with musculoskeletal or orthopaedic conditions or treating chronic diseases (Ghazi et al., 2018; Richardson et al., 2014; Sirur et al., 2009). It has been studied by Dohnke et al. (2005) that the enhancement of the patients' self-efficacy showed a decrement in their perceived pain and disability. Hoffman (2013) explains that the empowerment of the patients' self-efficacy improves their self-management of symptoms. The SCT can also be viewed as a theoretical framework to explain the change in the health care professionals' clinical behaviour (Eccles et al., 2005; Godin et al., 2008). A recently published dissertation demonstrated that the SCT can serve as one possible theoretical background to underpin implementation intervention within physiotherapy (Fritz, 2020). This work contributes detailed information about methods of how to implement a behavioural medicine approach within physiotherapy. Fritz (2020) discusses that a physiotherapist's self-efficacy in applying a behavioural medicine approach alone seemed not efficient enough as a factor to sustain a clinical behaviour change.

## **1.2 Education within physiotherapy with a behavioural medicine approach**

In Sweden, two existing study programs have integrated behavioural medicine competencies and content within the curriculum of physiotherapy students' education (Elvén et al., 2021). The initiative for embedding this approach was supported by several viewpoints (Sandborgh

et al., 2020). To mention some of them, there is empirical evidence speaking for behavioural medicine within physiotherapy, the ICF (International Classification of Functioning, Disability and Health) involving behavioural and psychosocial factors in patient care as well as targeting communication competencies of physiotherapists to educate patients or clients in their self-management of health.

The presentation of the programs' education content by Sandborgh et al. (2020) includes the analysis of the clients' behaviour in participatory activities and the selection and application of behaviour change methods. Through the discussion of case reports, the students learn about identifying and assessing the biopsychosocial factors of the patient together with carrying out a functional behaviour analysis. Then establishing a treatment plan from the perspective of behaviour change and maintenance also becomes part of the students' education.

A literature review by Keogh et al. (2015) identified systematic reviews about usage behaviour change techniques and theories targeting a certain patient group. "By broadening physiotherapists' understanding of psychological theories and related constructs through undergraduate and postgraduate training, it may allow them to identify and target the psychological factors in the most effective manner as part of their clinical practice." (Keogh et al., 2015). The authors point out that physiotherapy undergraduate programs teach about psychological variables such as self-efficacy, or techniques like goal setting. Also, the physiotherapists see the importance of including these competencies and factors in their practice. Alexanders et al. (2015) capture in their systematic review the physiotherapist's perceptions and practice and draw the conclusion that even though physiotherapists are aware of the benefits of integrating psychological approaches, they feel not sufficiently trained to improve and apply them. Parallel to this, Fritz et al. (2019) identify that even though physiotherapists were educated in a behavioural medicine approach, they do not apply the approach to its fullest extent. As possible explanations, the authors state that the interviewed physiotherapists feel embarrassed to ask the patient about psychosocial factors or want to meet the patient's expectations of a biomedical treatment approach.

The presented literature shows the reasons for and the complexity of integrating a behavioural medicine approach within physiotherapy practice and the education of becoming physiotherapists. A major competency of physiotherapists will be looked at in more detail in the following: the clinical reasoning.

### **1.3 Clinical reasoning: definition, dimensions and challenges**

(Higgs & Jones, 2008) define 'clinical reasoning' generally as the decision-making and thinking processes in the context of clinical practice. The World Confederation for Physical Therapy (2019) outlines clinical reasoning as a process where impairments, restrictions in participation and activity as well as environmental influences are identified as part of formulating a diagnosis. With the diagnosis, the physiotherapist can determine the most adequate treatment and share information with the patient.

There are several definitions of what competencies are included in a physiotherapist's clinical reasoning. Models or frameworks help to explain the bigger picture, and what factors and settings contribute to a health care practitioner's clinical reasoning. (Jones et al., 2008) present a "biopsychosocial, collaborative hypothesis-oriented model of clinical reasoning". The authors highlight the contemporary biopsychosocial model and state that it asks for the "full consideration of environmental and psychosocial factors that may influence physical health". An equally important part of the process of making clinical decisions is the patient's thoughts. The individual's understanding of the health problem finds its way into the decision-making process. It is shaped by personal beliefs and experiences or external advice and has been shown to influence the level of disability, pain tolerance and treatment outcome (Flor & Turk, 2013; Jones & Edwards, 2006). From the first meeting with a patient, the physiotherapist gathers information to identify the problem and formulates the first hypotheses. These hypotheses will be tested and modified throughout the treatment. This process of analysing data is considered a cognitive skill and reflecting upon it is a metacognitive skill. Jones et al. (2008) consider these skills to have a crucial influence on the physiotherapists' clinical reasoning. And so does knowledge, which encompasses professional and scientific skills as well as personal values and ethics (Jones et al., 2008).

Elvén et al. (2015) have developed the "Clinical Reasoning model focused on clients' Behaviour Change with reference to Physiotherapists" (CRBC-PT)". One given reason for the development of this model is that behaviour change interventions and the biopsychosocial model are recommended as a basis for treating complex health problems. Identifying theories and concepts that underpin physiotherapists' clinical reasoning focused on clients' behaviour change (such as SCT) and including the opinions of physiotherapy students and physiotherapists with expertise in behavioural medicine, shaped the CRBC-PT. The model comprises five dimensions: Client, Physiotherapist, Input from Client, Functional Behavioural Analysis and Strategies for Behaviour Change. Skills such as cognition and metacognition, and knowledge contribute to the physiotherapists' clinical behaviour. Additionally, the model includes psychological factors, which are the self-efficacy in and attitudes towards a behavioural approach in clinical reasoning, and contextual factors, the physical and social work environment, of the therapist. The client dimension involves physical and psychological capabilities, contextual and biomedical influences and the clients' behaviour towards tasks related to daily activities. The centre of the CRBC-PT is formed by the next three dimensions. The 'Input from the Client' is defined as the problem identification and capturing of the prioritized activity-related behaviour. It is obtained by data collection through e.g. interviews, observations and assessments. Concepts such as the readiness to change, behavioural skills, self-efficacy, outcome expectations, perceived barriers and others, are included in this dimension. The 'Functional behavioural analysis' summarizes the clients' physical, psychological, contextual and biomedical factors that are believed to influence the activity-related behaviour. The physiotherapist identifies relationships among them and states hypotheses as an outcome. The dimension 'Strategies for behaviour change' encompasses behavioural change strategies with the functional behaviour analysis as a basis. Included are a variety of strategies, for example, to improve the clients' motivation towards behaviour change through motivational interviewing or discuss



antecedents and consequences of the activity-related behaviour and monitor it to shape knowledge (Elvén et al., 2015).

The CRBC-PT shows how multidimensional the clinical reasoning of physiotherapists is viewed. Incorporating these concepts into clinical reasoning in practice demands several versatile skills from the physiotherapist. And at the same time, it poses a challenge to education programs. Torres et al. (2020) state the learning, teaching and assessment of clinical reasoning within undergraduate studies are challenging. Published research presents various methods to promote clinical reasoning skills among physiotherapy students. Examples are peer learning through blogging (Tan et al., 2010), interactive virtual scenarios (Torres et al., 2020) or blended learning consisting of in-class activities and using a wiki (Snodgrass, 2011). Next to learning in the classroom setting, the clinical education setting lets students gain practical experience. It allows putting the acquired knowledge into practice, enhancing and reinforcing it (Higgs et al., 2004). Noll et al. (2001) simply state in their conclusion "Clinical reasoning is built on experience.". Through deconstructing the reasoning process of an experienced physiotherapist, the authors identified clinical experience and advanced training to be two crucial influences on the clinical reasoning capability.

Wijbenga et al. (2019) assume a gap between the students' learning in the classroom and the workplace. Especially in the first placement, the authors suspect it to be the greatest, possibly because the students lack clinical experience. The researchers investigated how physiotherapy students acquire clinical reasoning skills in the workplace. Semi-structured interviews were conducted with physiotherapy students and clinical teachers. In conclusion, Wijbenga et al. (2019) report that physiotherapy students acquire clinical reasoning skills through observing professional physiotherapists. The students then compare the clinical approaches, reflect upon them and integrate them into their personal professional approaches. Clinical teachers affirm the importance of taking the patient's perspective into account from the beginning, as part of the students' development of clinical reasoning. Gilliland and Wainwright (2017) report that students showed greater reflection-in-action during a patient encounter when they focused more on educating and empowering the patient. "Undergraduate students [...] tend to focus on clients' symptoms, impairments, and functional problems, instead of integrating patients' problems with their needs, lifestyles and environment" shows research by Cruz et al. (2012, p. 553) in contrast.

The variation in how physiotherapy students approach a patient case can be explained by their applied models of practice, such as the biomedical or biopsychosocial model (Trede & Higgs, 2008). This relates to the therapist's treatment orientation.

#### **1.4 Treatment orientation of physiotherapists**

Treatment orientation is expressed in the attitudes and beliefs of health care professionals. It describes a trend toward applying particular models in a patient's treatment, such as the biomedical or biopsychosocial model (Ostelo et al., 2003). Depending on which orientation is more pronounced, the therapist chooses certain interventions and is guided by a particular way of decision-making (Christe et al., 2021).

The systematic review by Gardner et al. (2017) concludes that there is a relationship between the clinical practice and treatment orientation of physiotherapists. Synnott et al. (2015) investigated in their systematic review how physiotherapists identify and treat social, psychological and cognitive factors in people with low-back pain. As a result, the authors state that part of the therapists recognizes these factors to be important in treatment, but the majority follow a treatment focused on mechanical aspects of low-back pain. From the therapists' side, Synnott et al. (2015) mention a feeling of being unprepared to address contextual factors of patients, due to their biomedically oriented education. As another influence, Young et al. (2019) explain the workplace to be a possible factor influencing the physiotherapist's approach to treatment.

Elvén et al. (2021) compared the treatment orientation of physiotherapy students with and without education in a behavioural medicine approach. Students receiving an education without behavioural medicine content presented stronger biomedical treatment orientation. The instrument used for quantification of the students' treatment orientation was the "Pain Attitudes and Beliefs Scale for Physiotherapists" (PABS-PT) which will be presented in the following section.

### **1.5 Assessing treatment orientation and clinical reasoning focused on clients' behaviour change of physiotherapy students**

The PABS-PT originated as a 31-item instrument to assess the treatment orientation towards a biomedical or biopsychosocial approach of a physiotherapist (Ostelo et al., 2003). The authors developed this instrument following the background that patients manage chronic low back pain, not by a physical-related pathology and that the treatment orientation of health care providers plays a role in managing low back pain. Later, a 19-item-version of the PABS-PT was published (Houben et al., 2005).

Based on the CRBC-PT, Elvén, Hochwälder, Dean, and Söderlund (2018) have developed an instrument to assess the clinical reasoning focused on clients' behaviour change of physiotherapists and physiotherapy students. It is titled "Reasoning 4 Change" (R4C) and it incorporates the main domains of the CRBC-PT. The instrument has found application in identifying predictors of students' clinical reasoning focused on clients' behaviour change (Elvén et al., 2019) and comparing it between students with and without education in a behavioural medicine approach (Elvén et al., 2021). Here, students with an educational background in behavioural medicine showed superior scores in several clinical reasoning domains, compared to students without this particular education. Elvén, Hochwälder, Dean, and Söderlund (2018) state R4C to be the first theory- and evidence-informed as well as a systematically developed instrument that assesses the clinical reasoning concerning clients' behaviour change of physiotherapy students and physiotherapists.

Elvén et al. (2019) identified several clinical reasoning predictors in different domains of physiotherapy students. Cognitive and metacognitive skills as well as positive attitudes focused on behaviour change showed to be great predictors in the dimension of 'Input from

Patient'. The authors state the chosen cross-sectional design to be a limitation, so no causal relations could be identified.

## **1.6 Problem formulation**

The presented literature has shown growing importance and arguments for following a biopsychosocial approach within physiotherapy practice. It supports a treatment in which individual psychological and contextual factors of a patient, next to visible physical impairments and symptoms, are considered. Behavioural medicine is guided by that approach. In the physiotherapy context, it means to take a closer look at the clients' behavioural background of the action and thinking patterns. Consequently, this demands analytic and critical thinking capabilities from the physiotherapist's side in making decisions for an enriching treatment. This broad set of capabilities is summarized by 'clinical reasoning', a key competence of physiotherapists. In addition, the treatment orientation provides information about beliefs and attitudes in the practice of a physiotherapist. Both the treatment orientation and clinical reasoning are shaped by several influences. The educational background and experience gained in practice belong to those. Researchers identify a gap between students learning in the classroom and the workplace, and between the knowledge versus practice of working physiotherapists. This poses a problem in the transition of physiotherapy students from the educational institution to the workplace. Physiotherapy students educated in the behavioural medicine approach show high scores in assessed clinical reasoning focused on clients' behaviour change and orientation towards a biopsychosocial approach. It raises the question of how their clinical reasoning and treatment orientation develop within this transition and what factors influence it.

## **2 AIM**

This study aimed to evaluate the clinical reasoning focused on clients' behaviour change and treatment orientation of physiotherapy students with an educational background in behavioural medicine over approximately two years, also considering the students not participating in the follow-up. Further, the aim was to investigate how self-efficacy and attitudes at graduation and contextual factors influence clinical reasoning and treatment orientation after two years as a clinical physiotherapist.

## 2.1 Research questions

1. In what way has the student's clinical reasoning focused on clients' behaviour change, assessed with R4C, changed within about two years after graduation?
2. In what way has the student's treatment orientation, assessed with the PABS-PT, changed within about two years after graduation?
3. In what way have the self-efficacy and attitudes at graduation influenced clinical reasoning focused on clients' behaviour change related to assessment, analysis and treatment after about two years as a clinical physiotherapist?
4. In what way have attitudes at graduation and contextual factors in clinical practice influenced the treatment orientation within about two years as a clinical physiotherapist?
5. Is there a difference between the students participating in the follow-up compared to the students who dropped out, concerning their scores in clinical reasoning focused on clients' behaviour change and treatment orientation from the first measurement?

## 3 METHODS

### 3.1 Design

The chosen design of the presented thesis is non-experimental and longitudinal. The clinical reasoning focused on clients' behaviour change and treatment orientation of students was measured at two measure points without applying an intervention.

### 3.2 Participants and setting

The participant group consisted of physiotherapy students from two study programs with an implemented behavioural medicine approach located in Sweden. Participants were in the final semester at the first measurement point and working as physiotherapists at the second measurement point. Since the students were not all in the same graduation class, the follow-ups after the first measurement were carried out after one year and eleven months and two years and six months. Figure 1 presents a flowchart of the participant recruitment in both 2017/2016 and 2018/2019. 61 students from institutions A and B were recruited from which 18 students finished their studies in 2016 and 43 in 2017. In Table 1, the participant's characteristics are presented.

Only participants who have filled out the R4C and PABS-PT at both measure points were included. That is because the matching scores of both timepoints are evaluated. Another

inclusion criterion was that the former students had to reply with background information about work and education. This resulted in including a total of 24 physiotherapists which equals a response rate of 39% for the second recruitment in 2018/2019. The “former students” will now be referred to as “participants” or “physiotherapists” since they completed their education.

Table 1: Characteristics of included participants

Institution	Sex	Age in years	Year of graduation	Work areas
A (n = 3)	Woman (n = 18)	26-35	2016 (n = 14)	<ul style="list-style-type: none"> <li>- Primary care</li> <li>- Hospital</li> <li>- Rehabilitation center (for children/youth, adults)</li> <li>- Home care for elderly</li> </ul>
B (n = 21)	Men (n = 6)		2017 (n = 10)	

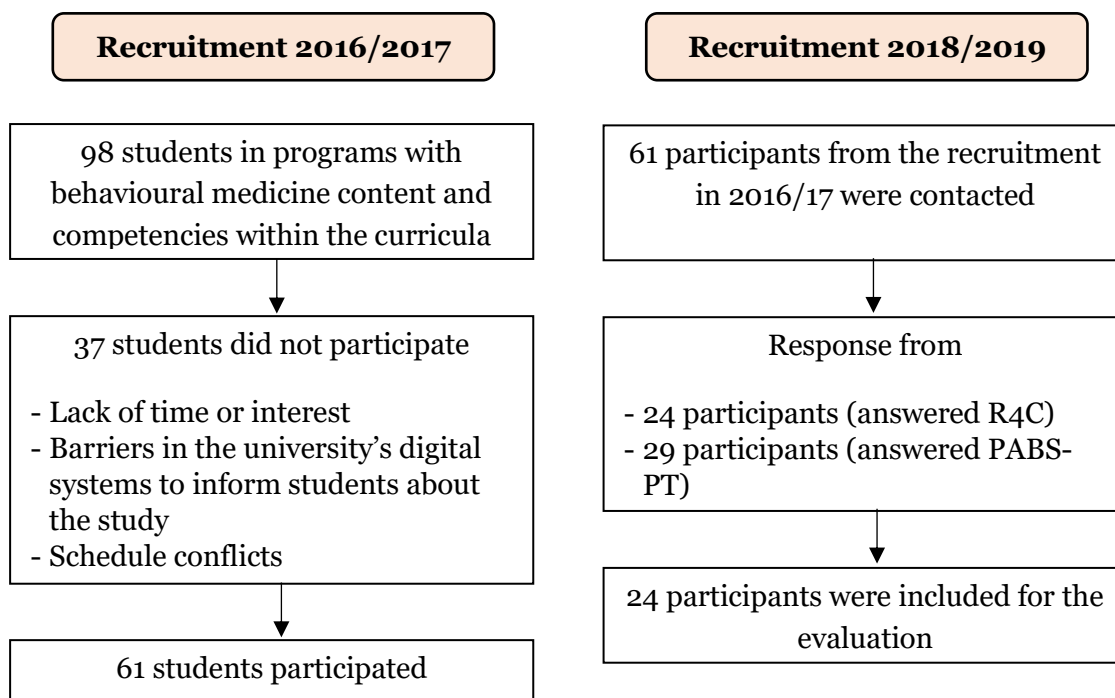


Figure 1: Flowchart of participants recruitment at the two measure points

### 3.3 Data collection

The data was collected through the web-based instrument R4C, the PABS-PT (19 items) and a self-developed questionnaire asking about work and education. All three assessment tools were available to the students in the Swedish language.

The web-based instrument Reasoning 4 Change (R4C) was used in this study to measure the participant’s clinical reasoning focused on clients’ behaviour change in the context of physiotherapy (Elvén, Hochwälder, Dean, & Söderlund, 2018). R4C consist of four domains

(D). The first domain (D1) asks the physiotherapist for his/her self-assessment in the subscales of knowledge (D1.1), cognition (D1.2), metacognition (D1.3), attitudes towards and self-efficacy in applying a behavioural approach, summarized as psychological factors (D1.4), and contextual factors (D1.5). The responses from the first domain are rated on a 6- or 11-point Likert scale. Domains 2, 3, and 4 incorporate case scenarios from different medical fields and settings (Elvén et al., 2021). D2 (Input from Client) measures the student's assessment of the patient, D3 (Functional behavioural analysis) captures the student's ability to perform a functional behavioural analysis and D4 (Strategies for behaviour change) measures the student's treatment of the patient, including choices of interventions. The responses are either given through choosing from a list of options, rating on Likert scales or free texts. The case scenarios and response options help to assess the student's ability to identify and prioritize factors regarding the management of the patient example (Elvén et al., 2021). The scores are then distributed according to the answers of a physiotherapy expert panel. Depending on the proportion of experts that have selected a certain option, the option is assigned a credit (Elvén et al., 2021). The higher the scores within the domains, that were added up for each domain separately, the better the clinical reasoning focused on clients' behaviour change. Table 2 presents the minimum and maximum scores of the R4c domains.

*Table 2: Theoretical min-max scores of the R4C domains (Elvén, 2019).*

<b>Domains and subscales</b>	<b>Theoretical min-max scores</b>
D1.1 Knowledge	8 - 48
D1.2 Cognition	7 - 46
D1.3 Metacognition	8 - 48
D1.4 Psychological factors total	0 - 200
Attitudes	0 - 100
Self-efficacy	0 - 100
D1.5 Contextual factors	5 - 30
D2 Input from client	0.6 - 66.1
D3 Functional behavioural analysis	3.8 - 34.3
D4 Strategies for behaviour change	0 - 36.4

Concerning the psychometric properties of the R4C, the instrument has shown satisfactory internal consistency, test-retest reliability and reliability in terms of interrater reliability and acceptable construct validity regarding convergent validity (Elvén, Hochwälder, Dean, Hällman, & Söderlund, 2018).

The Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT) is a questionnaire which determines a physiotherapist's treatment orientation either toward a biopsychosocial or biomedical approach (Ostelo et al., 2003). The present study used a version with 19-items (Houben et al., 2005) and a Swedish translation of it (Overmeer et al., 2009). On a 6-point Likert scale, the physiotherapist rates statements about the management in patients with non-specific low back pain. Nine statements express an orientation toward a biopsychosocial approach and ten towards a biomedical, which are mixed in the questionnaire. These are the two subscales after which the tendency towards a treatment orientation can be decided. The

minimum-maximum attainable scores reach from 10-60 for the biomedical subscale and 9-54 for the biopsychosocial (Houben et al., 2005).

The psychometric properties of the PABS-PT show a satisfactory test-retest reliability, responsiveness and construct validity (Mutsaers et al., 2012). The internal consistency assessed through Cronbach's alpha for the 19-item version shows 0.68 for the biopsychosocial subscale and 0.80 for the biomedical subscale (Houben et al., 2005).

Additionally, students were asked about background information concerning further education and their current work. The questionnaire consisted of seven questions asking the participants if they work as a physiotherapist, the working duration and work areas they work in, if they have taken additional courses at or outside university and completion of other study programs.

### **3.4 Procedure**

The data collection was conducted by a different researcher than the author of this study. The first recruitment in 2017/2018 started by contacting the program directors about the planned study. The directors then provided written consent that the students, who were in their final semester, will be asked about interest in participating in the study. Following, the students received written and verbal information, either via email, face-to-face or a video uploaded on the student's learning platform. The data collection took place at the participant's university in the presence of a researcher. As the students gave their written consent to participate, they were provided with the PABS-PT questionnaire, the R4C instrument with private and password-secured login details and a questionnaire asking about demographics and work experience. The participants were asked to respond in honesty and informed that their responses will be held confidential. The described recruitment procedure was part of a study by Elvén et al. (2021). In the first recruitment, the students were also asked for their interest and consent to be contacted after a two-year follow-up.

For the second recruitment, the participants who gave their consent to be contacted in the follow-up were contacted via email and post in 2018 (two years and six months after graduation) and 2019 (one year and eleven months after graduation). The student received an information guide, asking if they would like to participate in the follow-up study, instructions for the R4C instrument, the PABS-PT and a questionnaire asking about education and work. The students were again informed that all their data will be held confidential and that they have the right to leave the study at any point. 24 students replied with the filled-out instrument R4C and 29 filled out the PABS-PT and the questionnaire with background information on work and education.

### **3.5 Data analysis**

The data analyses were carried out with IBM SPSS Statistics version 28.0 (Windows) with a set significance level of  $p \leq 0.05$ . To answer study questions 1 and 2, the following

considerations were made when calculating the difference between two dependent groups. The present study includes a sample of 24 participants and the measured score pairs in the R4C do not show a normal distribution, emerging from a non-symmetric formed bell curve shaped by the data. In the case of not normally distributed data, authors recommend using a non-parametric test for testing a difference between two dependent groups of scores (Field, 2018, Chapter 7; Plichta & Kelvin, 2013, Chapter 6). Additionally, Plichta and Kelvin (2013, Chapter 6) recommend the parametric paired t-test with a sample size of at least  $n = 30$ , which is not the case for the presented study.

Therefore, the Wilcoxon signed-rank test was applied to compare the participant's scores of all domains of the instrument R4C and to identify the development of the student's clinical reasoning focused on clients' behaviour change over approximately two years. The scores from the first and second measurements were analysed in pairs from domains 1-4, which equals nine pairs. The Wilcoxon signed-rank test was also carried out to identify the development of the student's treatment orientation, assessed with the PABS-PT over the same period. Again, a difference between two dependent groups of scores, the subscales of the biopsychosocial and biomedical orientation from the first and second measurements, were tested.

For the effect size calculation, the z-value as output from the Wilcoxon signed-rank test was used together with the total number of observations (Coolican, 2014, Chapter 17). The effect size  $r$  was interpreted as the following: 0.1 as a small effect size, 0.3 as medium effect size and 0.5 as a large effect size (Cohen, 1988, Chapter 3).

For study question 3, multiple regression analyses were considered to identify what influence the self-efficacy and attitudes at graduation have on the student's clinical reasoning focused on clients' behaviour change related to assessment, analysis and treatment after approximately two years. Regarding the sample size and the number of independent variables, Bartlett et al. (2001) recommend a ratio of observation to independent variables not smaller than five. Otherwise, the results are bound to the sample and no generalizability is possible (Hair et al., 2013). Halinski and Feldt (1970) advise using a ratio of ten observations to one independent variable. Before the multiple regression analyses, a correlation calculation among the independent and dependent variables was carried out through the Pearson product-moment correlation. The independent variables were only included in the regression analysis if they correlated with the dependent variables. The analyses would then be carried out with each domain 2, 3 and 4 as the dependent variables and self-efficacy and attitudes at graduation as the independent variables. Concerning study question 4, similar methodological steps were followed as for study question 3. Multiple regression analyses were considered to identify the influence of the attitudes at graduation and contextual factors in clinical practice on the orientation of the physiotherapist's within about two years. The attitudes at graduation and contextual factors in clinical practice were set to be the independent variables and the second measured scores from subscales biomedical and biopsychosocial were the dependent variables. A Pearson product-moment correlation was used again among the independent and dependent variables.



Concerning study question 5, the non-parametric Mann-Whitney U test was applied to test a difference between two independent groups in data on the ordinal level (Coolican, 2014, Chapter 17). All scores from the domains 1, 2, 3 and 4 in the R4C and the two subscales of the PABS-PT from the first measurement were set as test variables. The two independent groups were defined as group one participating in the follow-up and group two not participating in the follow-up.

### **3.6 Ethical considerations**

Ethical approval for the first and second recruitment and data collection was granted. Both were reviewed by the Swedish Regional Ethical Review Board, Uppsala (Dnr 2013/020) and met the Swedish law in terms of ethical requirements and the Helsinki declaration outlining human research (World Medical Association, 2013). Before the participants enrolled in the study, their written consent was obtained. They also received information that they can withdraw their consent at any time during the study process. The data was put into a coded form, so the participants' names were kept anonymous to the people evaluating the data. Further, the data was stored safely to not be publicly accessible.

## **4 RESULTS**

### **4.1 Development of the clinical reasoning and treatment orientation**

The Wilcoxon signed-rank test revealed a significant decrease in the scores of the domains 2, 3 and 4 of the participants. For domain 2 in the second measurement, the scores were significantly lower ( $Mdn = 33.42, N = 24$ ) compared to the scores from the first measurement ( $Mdn = 36.20, N = 24$ ),  $z = -2.57, p = 0.01$ . This shows a medium effect size of  $r = 0.37$ . In domain 3, the R4C scores of the participants after about two years are significantly lower ( $Mdn = 20.77, N = 24$ ) when compared to the first measurement ( $Mdn = 22.31, N = 24$ ),  $z = -3.23, p = 0.001$ . The effect size is medium with  $r = 0.47$ . The scores of D4 are also significantly lower in the second measurement ( $Mdn = 18.82, N = 24$ ) by contrast with the first measured scores at graduation ( $Mdn = 20.88, N = 24$ ),  $z = -2.31, p = 0.021$ . Here, the effect size is again medium with  $r = 0.33$ . The scores of the subscales of domain 1 showed no significant change within the same period, which are presented in Table 3.

The participant's treatment orientation assessed with the PABS-PT showed no significant changes within approximately two years. The scores of the biomedical subscale presented a median of  $Mdn = 32.00 (N = 24)$  at the first measurement point and  $Mdn = 31.50 (N = 24)$  at the second with a significance of  $p = 0.09$ . For the biopsychosocial subscale, the first

measurement showed a median of  $Mdn = 40.00$  ( $N = 24$ ) and  $Mdn = 40.50$  ( $N = 24$ ) at the second measurement with a significance of  $p = 0.15$ .

Table 3: Scores in domain 1 of the R4C at the first and second measurement

Subscales of domain 1	Median (1 <sup>st</sup> measurement)	Median (2 <sup>nd</sup> measurement)	p-value (2-tailed)
D1.1 Knowledge	36.50	36.00	0.889
D1.2 Cognition	35.00	35.00	0.689
D1.3 Metacognition	38.00	37.50	0.577
D1.4 Attitudes	78.50	76.00	0.171
Self-efficacy	72.00	68.50	0.875
D1.5 Contextual factors	15.00	17.00	0.782

## 4.2 Collinearity and correlations

The collinearity calculation detected collinearity among one pair of independent variables. The scores of the first measure in self-efficacy (old) and attitudes (old) revealed a strong correlation,  $r(N = 24) = 0.75$ ,  $p = < 0.001$ . Additionally, self-efficacy (old) showed no correlation with any of the dependent variables, the second measured scores in D2, D3 or D4, thus the variable self-efficacy (old) was excluded from the multiple regression analysis. This reduces the model to a simple regression analysis, including attitudes (old) as one explanatory variable, which showed a significant correlation with the dependent variable D2,  $r(N = 24) = 0.6$ ,  $p = 0.002$  and a negative correlation with D3,  $r(N = 24) = -0.016$ ,  $p = 0.941$  and D4  $r(N = 24) = -0.020$ ,  $p = 0.927$ . The second pair of independent variables, attitudes (old) and contextual factors (new), showed no correlation with the dependent variables, the second measures of the subscales in the PABS-PT. Therefore, the multiple regression analysis regarding study question 4 was completely omitted since the measured attitudes at graduation and contextual factors in clinical practice show no correlation with the biomedical and biopsychosocial (BPS) subscales of the PABS-PT. An influence of these factors on the participant's treatment orientation was not detected after approximately two years. Table 4 presents the correlation between the variables.

Table 4: Correlation between the independent and dependent variables

Independent Variable	D2 (Assessment)	D3 (Analysis)	D4 (Treatment)	Biomedical subscale (new)	BPS subscale (new)
Self-efficacy (old)	$r = 0.386$ $p = 0.063^*$	$r = -0.093$ $p = 0.665^*$	$r = -0.052$ $p = 0.811^*$	—	—
Attitudes (old)	—	—	—	$r = 0.234$ $p = 0.270^*$	$r = -0.323$ $p = 0.124^*$
Contextual factors (new)	—	—	—	$r = -0.058$ $p = 0.787^*$	$r = -0.240$ $p = 0.259^*$

\* 2-tailed

### 4.3 Influence of attitudes on clinical reasoning

Three simple regressions were run to investigate how much variation in the participant's clinical reasoning related to assessment, analysis and treatment in clinical practice can be explained by their attitudes at graduation. 35,1% of the variation in the clinical reasoning related to the D2 (assessment) can be explained by the attitudes at graduation and was significant,  $p = 0.002$ . The variable attitudes (old) was highly significant and showed a positive correlation with the D2 (assessment),  $\beta = 0.592$ ,  $p = 0.002$ . For the D3 (analysis) and D4 (treatment), the model could not explain any significant variation in the clinical reasoning of the participants. The regression revealed that the attitudes at graduation explained 0% of the variation in the clinical reasoning related to D3 (analysis) and a non-significant negative correlation between the variables,  $\beta = -0.016$ ,  $p = 0.941$ . Equally, the independent variable explained a variation of 0% regarding D4 (treatment) and showed a non-significant and negative correlation between the variables,  $\beta = -0.020$ ,  $p = 0.927$ .

### 4.4 Comparing the follow-up and non-follow-up groups in the measurements of the R4C and PABS-PT

The comparison of the two independent groups, students participating in the follow-up and students not participating, showed no significant difference in the scores of their clinical reasoning focused on clients' behaviour change and treatment orientation. The group participating in the follow-up included  $N = 24$  whereas the group not participating included  $N = 37$ .

Table 5: Scores of the R4C and PABS-PT of the Follow-up and Non-Follow-up group at the first measurement

Variable	Mean Rank		p-value (2-tailed)
	Follow-up group	Non-Follow-up group	
<b>R4C</b>			
D1.1 Knowledge	34.08	29.00	0.273
D1.2 Cognition	32.54	30.00	0.584
D1.3 Metacognition	31.00	31.00	1.000
D1.4 Attitudes	28.56	32.58	0.387
D1.4 Self-efficacy	30.63	31.24	0.894
D1.5 Contextual factors	36.23	27.61	0.063
D2 Input from client	34.04	29.03	0.281
D3 Functional behavioural analysis	36.15	27.66	0.068
D4 Strategies for behaviour change	33.58	29.32	0.360
<b>PABS-PT</b>			
Biomedical subscale	28.56	32.58	0.387
BPS subscale	34.33	28.84	0.236

## 5 DISCUSSION

### 5.1 Summary of results

In the transition from university to the workplace, the physiotherapists show a significant decrease in their clinical reasoning scores regarding the assessment, analysis and treatment, measured with the R4C instrument. Their scores in the subscales of domain 1 showed no significant change. The student's treatment orientation has not changed significantly within approximately two years. The student's self-efficacy in using a behavioural approach in clinical reasoning at graduation showed no influence on their assessment, analysis and treatment in clinical practice, however their attitudes at graduation explained 35,1% of the variation in their assessment ability. The participant's attitudes at graduation and contextual factors in clinical practice showed to not influence their treatment orientation within the same time. There is no significant difference between the participants who continued the study and who dropped out, regarding the scores of their clinical reasoning focused on clients' behaviour change and treatment orientation.

## 5.2 Results discussion

The present study attained the aim to evaluate the clinical reasoning focused on clients' behaviour change of physiotherapy students with an educational background in behavioural medicine over approximately two years. It is noteworthy that the student's clinical reasoning significantly decreased over this period. These results shed light on the transition of the physiotherapy students going from the classroom to the workplace. With the measured decrement in the student's clinical reasoning, the statement by Wijnbenga et al. (2019) can be confirmed that there is a gap between the students' learning in the classroom and the workplace. The authors recommend that program developers should include early practical experience with various patient cases within multidisciplinary settings to bridge this gap. Noll et al. (2001) share a similar view, suggesting an early link between theoretical knowledge and clinical reasoning skills and also emphasizing the role of practical experience in the student's education.

A possible explanation for the decrement in the physiotherapist's clinical reasoning focused on clients' behaviour change can be, as mentioned, the change in the environment. As the former students start their work as physiotherapists, they gain their own experience in making and questioning their clinical decisions. Cruz et al. (2012) observed that undergraduate students in their final year have the tendency to concentrate more on the patient's functional problems and symptoms than the overall problems in the patient's lifestyle. As this follows less an approach focused on clients' behaviour change, this can explain the decrease in the scores of the R4C in assessment, analysis and treatment. Another explanation serves the new social environment at the workplace. Wijnbenga et al. (2019) explain how physiotherapy students acquire clinical reasoning skills through observing professional physiotherapists. In that case, if the professional physiotherapists in the work environment follow a clinical practice and reasoning that is not guided by a behavioural medicine approach, the former students acquire the same or similar approach affecting their clinical reasoning. A possible barrier for physiotherapists to apply a behavioural medicine approach is mentioned by Fritz et al. (2019), where the therapists do not feel comfortable asking the patient about psychosocial factors or not meeting the patient's expectations. The authors also identify that the physiotherapists rarely applied strategies for behaviour change or functional behaviour analyses. However, Elvén et al. (2019) identified the clinical reasoning regarding assessment, analysis and treatment to show higher scores in students educated with a curriculum incorporating behavioural medicine competencies compared to students without these competencies. This strengthens the implementation of a behavioural medicine approach in physiotherapy.

The physiotherapists in this study show minimal change in their treatment orientation over the measured time span. Both subscales stay nearly on the same level, with the biopsychosocial subscale showing a higher Median compared to the biomedical subscale. It reveals that the majority of the former students are rather oriented toward applying the biopsychosocial model than the biomedical. Research by Synnott et al. (2015) demonstrated that physiotherapists felt unprepared to address contextual factors of patients when their education was biomedically oriented. In the case of the included participants in the present study, the education was oriented towards a biopsychosocial approach, which can be a

possible explanation for the sustained scores in the PABS-PT. Here should be mentioned that research by Ostelo et al. (2003) found that physiotherapists attending education courses with a biopsychosocial background showed higher scores in the “behavioural orientation”, assessed through one item of the PABS-PT.

The self-efficacy in applying a behavioural medicine approach did not show to influence the later clinical reasoning in the R4C regarding the assessment, analysis and treatment. Surprisingly, because it is presented as a crucial determinant contributing to a physiotherapist’s clinical decision-making (Smith et al., 2008). Self-efficacy, as one key construct of SCT (Bandura, 1995, Chapter 1), describes a person’s confidence to perform a behaviour. The SCT has been used to explain the health care professional’s clinical behaviour (Eccles et al., 2005; Godin et al., 2008). In research by Fritz (2020), the SCT theoretically underpins methods in how to implement a behavioural medicine approach within physiotherapy, taking a closer look at the construct of self-efficacy. This construct alone did not show being efficient enough for sustaining clinical behaviour change. Therefore, it might not be able to explain variation in the physiotherapist’s clinical reasoning. This can be confirmed by the study conducted by Elvén et al. (2019) where predictors of students’ clinical reasoning were identified. The authors found the variable self-efficacy to add no significant contribution to the model in explaining the clinical reasoning also regarding the assessment, analysis and treatment, in a cross-sectional design (Elvén et al., 2019). As described by Bandura (1991), self-efficacy in being convicted to perform a behaviour is one construct of the personal cognitive factors that contribute to a person’s behaviour in SCT. Next to the personal cognitive factors belong the behavioural factors and the environmental determinant. The behavioural factors describe the actually executed choices while the environmental determinant sets the framework for the level of challenge and responsiveness to behavioural actions (Bandura, 1991). As these three major determinants of the SCT interact with each other, the explanation of an individual’s behaviour becomes more complex. In the present study, for instance, the physiotherapist’s self-efficacy in applying a behavioural approach does not necessarily explain their clinical reasoning regarding clients’ behaviour change, though might influence another factor which in turn influences the clinical behaviour.

The physiotherapist’s attitudes at graduation explain 35,1% of the variation in physiotherapist’s assessment ability in the R4C, however no variation in the categories of analysis and treatment. This result is consistent with research by Elvén et al. (2019), revealing the attitudes toward a behavioural approach being a great predictor mere in the clinical reasoning regarding the assessment ability. As one explanation, the authors mention a possible imbalance in teaching, meaning the emphasis is rather laid on improving the student’s skills to collect and reflect upon information about the patient than the analysis and selection of the intervention (Elvén et al., 2019).

Noteworthy are the results concerning the non-correlation of the assessed scores in attitudes and contextual factors between the subscales of the PABS-PT. As elaborated by Young et al. (2019) and Ostelo et al. (2003), the working environment and attitudes are influencing determinants of a physiotherapist’s treatment orientation. Elvén, Hochwälder, Dean, Hällman, and Söderlund (2018) though presented a weak association between the scores in domain 1.4 of the R4C (attitudes and self-efficacy) and the biomedical and biopsychosocial

subscales of the PABS-PT, using the Pearson product-moment correlation coefficient. Accordingly, the present study, which used the same correlation coefficient, shows a weak association between the contextual factors measured by the R4C and the PABS-PT subscales.

The comparison between the physiotherapists who participated in the follow-up and the ones who dropped out revealed no significant difference between the scores in all domains of the R4C and the subscales of the PABS-PT. This result shows a similarity in the characteristics of the two groups, regarding the two measurements.

Looking at the definition of 'clinical reasoning' by Noll et al. (2001), it is described as applying clinical experience and knowledge in a patient case, whereas Higgs and Jones (2008) define it broadly as the thinking and decision-making process behind clinical practice. This is necessary to mention as it shows that the clinical reasoning of physiotherapists can have varying definitions and focuses, revealing the complexity and diversity in research regarding this research topic.

### **5.3 Methods discussion**

The longitudinal design of the present study seemed to be an adequate approach to capture changes in the clinical reasoning and treatment orientation in the physiotherapist's transition. With a longitudinal design, changes and patterns in development can be identified (Hua & David, 2008). On the other hand, the authors also mention a risk of reduction in sample size, especially for small samples, which is the case in the present study and a great limitation.

The choice of measuring the clinical reasoning with the R4C instrument seemed adequate as the participants have undergone physiotherapy education based on a behavioural medicine approach. The same applies to choosing the PABS-PT as it is a common instrument to measure health care professionals' treatment orientation. The items of the R4C and PABS-PT were treated as ordinal scale, therefore the Medians were reported and compared.

The procedure of this study followed a structured order by gaining the program director's consent first for the students to participate. The demographics and background questions about work and education gave valuable information about the participants to be presented in the study. Contacting the participants via email and post ensured that they received information through more than one communication channel.

The small sample size and non-normal distribution of the data led to performing non-parametric tests, the Wilcoxon signed-rank test and the Mann-Whitney U test. Several authors recommend using a non-parametric test for the mentioned conditions (Fagerland, 2012; Field, 2018, Chapter 7; Plichta & Kelvin, 2013, Chapter 6). However a non-parametric test might have a smaller statistical power compared to a parametric test, meaning that false-negative results are more likely (Field, 2018, Chapter 7; Grech & Calleja, 2018). The effect size was calculated for significant results.

The loss in follow-up poses a possible attrition bias, which is a kind of selection bias and present if there are differences between the participants who continued the follow-up and participants who dropped out (Nunan et al., 2018). Therefore, a comparison of the groups was performed to reveal if the sample included in the statistical analysis to answer study questions 1-4 is representative.

A strength of the present study is its longitudinal design with which the development of the clinical reasoning focused on clients' behaviour change and the treatment orientation of the former students were evaluated. However, the results need to be interpreted in the light of the following limitations. The data analysis included a relatively small sample so the results lack in generalizability to a population with similar or different characteristics. Secondly, Coolican (2014, Chapter 19) explains that the values of the Pearson's  $r$  correlation coefficient become larger with a smaller sample. Concerning the consideration of multiple regression to detect influences on the clinical reasoning and treatment orientation, an omitted variable bias is present. By leaving possible explanatory variables out of the regression model (Wooldridge, 2013, Chapter 3) explanation in the clinical reasoning or treatment orientation becomes less substantial.

It is noteworthy that the collected information about the education and work areas of the participants might not have been used to its fullest extent. This background information was considered to be used as variables explaining scores in the clinical reasoning focused on clients' behaviour change and the PABS-PT subscales. Splitting the already small sample into subgroups, would have deprived the results of more significance.

## **5.4 Ethical discussion**

The conduct of the present study was ethically approved. The participant's consent was obtained and the data was handled and kept under safe circumstances.

It has to be pointed out that both data collections were conducted by a different researcher than the author of this study. The researcher who did not collect the data obtained the data without formulating study questions or an aim in advance. This might present the risk that the researcher looks for the significant relationships among variables, wanting to report significant results, not driven by explaining a "logical" background for selecting the variables. This is reflected by Broom (2006) who describes that authors of quantitative studies can manipulate the data or leave out contradicting or negative results to present a particular viewpoint. Resnik (1998, Chapter 4) explains honesty to be the most important ethical principle to follow in science, as the opposite does not promote the search for knowledge and solutions to problems.

Thorough research on background information and theories was conducted which led to the formulation of the studies' research aim and questions. This study reported significant as well as non-significant results.



## **5.5 Clinical implications and further research**

The present study indicates taking a closer look at physiotherapy students in their transition from the educational institution to the workplace. With the measured decrease in the domains regarding the assessment, analysis and treatment in the physiotherapist's clinical reasoning focused on clients' behaviour change, it shows to be sensitive to environmental change. In this case, it is of interest to identify influences on the clinical reasoning in this particular time frame, which could be investigated by comparing physiotherapists in a longitudinal study focusing on their differences in workplaces.

As research suggests the implementation of earlier clinical experience in education programs, it is of interest to compare the clinical reasoning of students/physiotherapists in different programs to confirm if clinical training/practice influences the improvement of clinical reasoning. It also allows checking imbalances in the teaching of clinical reasoning skills. The R4C represents a valuable tool to broadly capture and measure a physiotherapist's clinical reasoning. Further, it is suggested to look into factors that affect the maintenance of clinical reasoning in physiotherapists.

The treatment orientation in physiotherapists with education in a behavioural medicine approach shows to be persistent towards the application of the biopsychosocial model. This reveals the educational background to be an influential factor and shows potential in finding out more about how physiotherapists specialized in behavioural medicine integrate the model into their practice. This can be investigated in the form of qualitative research to capture the physiotherapist's opinions and thoughts through interviews or questionnaires.

## **6 CONCLUSION**

The Physiotherapists with specialisation in behavioural medicine in this study show a persistent tendency to apply the biopsychosocial model in practice in their transition from a student to a clinically working physiotherapists, over approximately two years. Their attitudes towards applying a behavioural approach in clinical reasoning at graduation and contextual factors in clinical practice revealed to have no influence on their treatment orientation. The clinical reasoning scores of the participants regarding the domains assessment, analysis and treatment present a significant decrease. This shows how clinical reasoning skills can change over a time period of two years and its sensitivity to environmental change. The self-efficacy in using a behavioural approach in clinical reasoning at graduation showed to not influence the developed clinical reasoning over the measured period, though their attitudes towards applying a behavioural approach at graduation explained 35,1% of the variation in their assessment ability. These results indicate further research concerning the education of future physiotherapists.

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## **APPENDIX A: PAIN ATTITUDES AND BELIEFS SCALE FOR PHYSIOTHERAPISTS**

This version of the PABS-PT includes 19 items and is in English.

1. Mental stress can cause back pain even in the absence of tissue damage.
2. The cause of back pain is unknown.
3. Pain is a nociceptive stimulus, indicating tissue damage.
4. A patient suffering from severe back pain will benefit from physical exercise.
5. Functional limitations associated with back pain are the result of psychosocial factors.
6. Patients with back pain should preferably practice only pain free movements.
7. Therapy may have been successful even if pain remains.
8. Back pain indicates the presence of organic injury.
9. If back pain increases in severity, I immediately adjust the intensity of my treatment accordingly.
10. If therapy does not result in a reduction in back pain, there is a high risk of severe restrictions in the long term.
11. Pain reduction is a precondition for the restoration of normal functioning.
12. Increased pain indicates new tissue damage or the spread of existing damage.
13. There is no effective treatment to eliminate back pain.
14. Even if the pain has worsened, the intensity of the next treatment can be increased.
15. If patients complain of pain during exercise, I worry that damage is being caused.
16. The severity of tissue damage determines the level of pain.
17. Learning to cope with stress promotes recovery from back pain.
18. Exercises that may be back straining should not be avoided during the treatment.
19. In the long run, patients with back pain have a higher risk of developing spinal impairments.

The participant rates each statement on the following scale:

Totally disagree – Largely disagree – Disagree to some extent – Agree to some extent – Largely agree – Totally agree

## APPENDIX B: DESCRIPTION OF THE REASONING 4 CHANGE INSTRUMENT

The instrument contains **four domains** covering how physiotherapists think and decide in their clinical reasoning along with the client.

**Domain 1:** Includes statements that relate to the physiotherapist and his/her knowledge, cognition, metacognition, psychological factors (which covers attitudes towards and self-efficacy in using a behavioural approach in clinical reasoning) and contextual factors. It covers a total of 49 items. The participants are asked to select the option that corresponds best with their opinion, so no answer is “correct”.

Knowledge: Answers are to be rated on a 6-point Likert scale (“Do not agree at all” to “Completely agree”).

- Example: “I have very good knowledge of theories and models about how behaviours are influenced and can be changed (e.g. Social Cognitive Theory and the Transtheoretical Model).”

Cognition: Answers are to be rated on a 6-point Likert scale (“Do not agree at all” to “Completely agree”).

- Example: “I have good skills in analysing how the client’s physical and social environment affect the performance of the target behaviour.”

Metacognition: Answers are to be rated on a 6-point Likert scale (“Do not agree at all” to “Completely agree”).

- Example: “To understand the client’s complaints and situation, I carefully consider what I need to collect information on before the assessment.”

Psychological factors: Answers are to be rated on a 11-point Likert scale (for attitudes towards using a behavioural approach “Not very important” to “Extremely important”; for self-efficacy in using a behavioural approach “Not certain at all” to “Highly certain”). For both subscales, the same questions are asked.

- Example: “Investigating physical factors that are important for the client’s target behaviour.”

Contextual factors: Answers are to be rated on a 6-point Likert scale (“Do not agree at all” to “Completely agree”).

- Example: “At my clinical training placement/workplace, I am often encouraged to focus on clients’ target behaviour and behavioural change in my clinical reasoning.”

**Domain 2:** Describes two case scenarios. It covers the clinical reasoning in the **assessment** of the client’s complaints in a total of twelve items. The participants are asked to answer in a short note form, select the response from a short or long list of options or rate the agreement of statements on a 6-point Likert scale.

- Example: "What three factors in the interview/case history do you think are the most important to ask more about in your first consultation in order to understand Joseph's complaints and situation?"

**Domain 3:** Describes four case scenarios. It covers the clinical reasoning in the **analysis** of the client's complaints in a total of eight items. The participants are asked to judge hypotheses on a 5-point Likert scale ranging from -2 to +2.

- Example: "Based on the information you now have about Albin, which three hypotheses do you think explain the most important causes for his difficulty in performing his target behaviour? Select three hypotheses:"

**Domain4:** Describes two case scenarios. It covers the clinical reasoning in the **selection of treatments/interventions** in a total of twelve items. The participants are asked to answer in a short note form or select the response from a long list of options. The options comprise techniques or interventions to support behaviour change or maintain achieved a behaviour.

- Example: "To help Anders achieve his target behaviour, you need to use different treatments/interventions. What four treatments/interventions do you think are most important at this stage and those you want to prioritise to begin with?"



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