A Qualitative Study of Clinical Reasoning in Physiotherapy with Preterm Infants and Their Parents: Action and Interaction.

ABSTRACT

Background: Physiotherapists (PTs) in primary health care provide services to preterm infants and their parents after hospital discharge. The service should be collaborative and individualized to meet the family's needs. In this study, we analyze pediatric PTs' collaborative work in the clinical setting and investigate the PTs' emerging clinical reasoning (CR) in interaction with the infant and parent(s).

Methods: The study is based on observations of 20 physical therapy sessions and 20 interviews with PTs. We performed a systematic content analysis informed by enactive theory regarding the interactions and co-creation of meaning.

Results and discussion: CR emerged in reciprocity with the PTs' interaction with the infant and parent(s). Based on sensitivity to the infant's motor abilities and signs of engagement as well as the parents' need of support and education, the PTs individualized and reasoned about their therapeutic approach. This interactional CR was vulnerable: infant disengagement, parent expectations, and PT preoccupations could obfuscate interactions and hamper CR.

Conclusion: Through mutuality and engagement with the infant and parent(s), the PTs allow the autonomy of interaction to emerge and shape the translation of CR into successful therapeutic actions and learning together with the infant and parent(s).

Keywords: clinical reasoning (CR), interaction, parents, pediatric physical therapy, preterm infants.

INTRODUCTION

Preterm infants who are at risk of motor impairments need physiotherapy to support learning and development (Blauw-Hospers et al., 2007; Shepherd, 2013; Spittle et al., 2012). There is a range of available therapeutic approaches that can be applied with the aim of improving the infant's motor function (Spittle et al., 2012). However, evidence is varied when it comes to the effectiveness of these interventions (Spittle et al., 2012) and there is an increasing skepticism toward hands-on interventions such as neurodevelopmental treatment (NDT) (Dirks, Blauw-Hospers, Hulshof, and Hadders-Algra, 2011; Novak et al., 2013). Nonetheless, findings from neuroscience are used as a theoretical foundation across approaches and provide a unifying view of attention, motivation, self-generated action and varied movement experiences as prerequisites for children's motor learning and development (Adolph, 2008; Brodal, 2010; Hadders-Algra, 2011; Shepherd, 2013).

In addition to the aim of treating the preterm infant's motor impairments, physiotherapists (PTs) need to enable parents as supporters and promotors of their child's development in everyday life (Campbell, Palisano, and Orlin, 2012). This enablement of parents warrants a family centered care (FCC) approach (Dirks and Hadders-Algra, 2011; King and Chiarello, 2014; King, Teplicky, King, and Rosenbaum, 2004). In FCC, services are individualized to meet the needs of the child and parents. Health care providers are expected to be respectful and supportive, facilitate mutual information exchanges and act in partnership with the family (Dirks, Blauw-Hospers, Hulshof, and Hadders-Algra, 2011; Dunst and Espe-Sherwindt, 2016; King and Chiarello, 2014; King, Teplicky, King, and Rosenbaum, 2004). For families with preterm infants, research has demonstrated that parents have persistent concerns about the infant's future and want health care providers to help them learn about their infant and gain a sense of self-efficacy (Benzies, Magill-Evans, Hayden, and Ballantyne, 2013; Brett et al., 2011; Håkstad, Obstfelder, and Øberg, 2015).

Both neuroscientific knowledge about children's learning and development and FCC principles are foundational to the pediatric PT's clinical reasoning (CR) (Furze et al., 2013; Goldstein, Cohn, and Coster, 2004; Jensen, Gwyer, and Shepard, 2000; Kenyon, 2013; King et al., 2007). CR refers to the professional reasoning, judgements and decision making that PTs engage in before, during and after clinical sessions (Edwards et al., 2004; Higgs, 2008). In physical therapy, CR is typically described as a cognitive process in which the PT develops a hypothesis and proceeds with further examinations or treatment strategies to confirm, adjust or reject this hypothesis (Edwards et al., 2004; Higgs, 2008). However, there has been increased attention toward the multidimensional nature of CR and how the expert practitioner manages the artistry of his/her profession (Higgs, 2008). In the interactive clinical context, health care providers need to engage in collaborative decision making with the patient on the basis of factual knowledge, patient narratives and ethical aspects. In addition, the PT must continuously evaluate his/her practice via individual meta-cognitive reflection processes (Edwards, Braunack-Mayer, and Jones, 2005; Edwards et al., 2004; Higgs, 2008). Studies of CR in pediatric physical therapy highlight these collaborative aspects of decision making and focus on the enablement of the child and parents within the participative, emotional and personal domains of the International Classification of Functioning, Disability and Health (ICF) (Furze et al., 2013; Goldstein, Cohn, and Coster, 2004). Expert practitioners in the field are described as pragmatic and flexible in their approach as a means of fulfilling their role as enablers of the child and parent (King et al., 2007).

Recently, enactive theory has provided new insights into the interactional nature of CR (Øberg, Normann, and Gallagher, 2015) and serves to unveil the embodied artistry in physical therapy practice that is often described as tacit and "beyond science" (Higgs, 2008). Enactive theory integrates knowledge from dynamic systems theory, neuroscience and phenomenology (Gallagher, 2012) and seeks to explain the nature of human cognition with an emphasis on

how interaction is constitutive to understanding and behavior. Thus, it moves beyond the dualistic understanding and cognitive paradigm of "the mind as a computer" which is merely informed by bodily experiences and sensory input (Higgs, 2008; Johansson and Lynöe, 2008). In enactive terms, cognition is coupled with and constituted by our embodied being and enactment of our world (De Jaegher, Di Paolo, and Gallagher, 2010). Accordingly, embodied-enactive CR elucidates how joint attention and joint action, enabled by bodily interactions and coordination between the PT and patient, is intrinsic to the PT's CR during therapy sessions (Øberg, Normann, and Gallagher, 2015). In a FCC setting, these interactions and their influence on the PT's CR will involve complex, triadic interactions with both the child and parent(s). In this study, we investigate how these interactional CR processes unfold and develop in physical therapy for preterm infants and their parents.

Theoretical perspectives

To understand the complexity of PT-infant-parent interactions and extend the current knowledge of how these interactions influence PTs' CR in a FCC setting, we connect with enactive theoretical perspectives regarding participatory sense-making, intersubjectivity and social interaction (De Jaegher, Peräkylä, and Stevanovic, 2016; Di Paolo and De Jaegher, 2017; Fuchs and De Jaegher, 2009).

The clinical encounters encompass social interactions between individuals, within a socio-cultural context with its norms and expectations. This means that the roles the participants take on are "in the hands of our interaction partners" (De Jaegher, Peräkylä, and Stevanovic, 2016). As individuals, the participants have an autonomy and identity that they bring into the interaction. Driven by intentions, thoughts and perceptions, they engage themselves in activities and interaction. In this engagement, the body plays a significant role. Based on their bodily experiences, the participants are sensitized to and develop their ability to participate in sense-making activities with others (De Jaegher, Peräkylä, and Stevanovic,

2016; Fuchs and De Jaegher, 2009). This participatory sense-making is a mutual incorporation and coordination with an interaction partner(s) with fluctuations between synchrony and de-synchrony that bring the interaction forward (Fuchs and De Jaegher, 2009).

In addition to the individuals' autonomy in interaction, the encounter itself has its own autonomy (De Jaegher, Peräkylä, and Stevanovic, 2016; Fuchs and De Jaegher, 2009). For one, this autonomy relates to the structure of interaction, i.e. how the sequencing, engagement and turn-taking governs the interaction. Second, the interactors' coordination with each other attains its own dynamics, and concurrently regulates each individual's behavior (De Jaegher, Peräkylä, and Stevanovic, 2016). In other words, interactions with others is in a way out of the control of the individual (Fuchs and De Jaegher, 2009). However, skillful interactors are flexible toward these regulatory influences and mediate more fluent interactional patterns in their encounters with others (Fuchs and De Jaegher, 2009).

Along with autonomy comes vulnerability; misunderstandings, disengagement and diverging intentions can lead to interactional breakdowns (De Jaegher, Peräkylä, and Stevanovic, 2016; Di Paolo and De Jaegher, 2017). Thus, successful interactions depend on the participants' ability to co-create meaning and understanding. As De Jaegher, Peräkylä & Stevanovic explain, "It is at the interplay between individual and interactional autonomy and vulnerabilities that the co-creation of significance and significant action happens" (2016).

MATERIALS AND METHODS

Study design

This is a qualitative study within an interpretive research paradigm. We collected data by observing physiotherapy sessions and interviewing the PTs after the sessions. In accordance with the phenomenological-hermeneutic traditions, we conducted an abductive analysis informed by enactive theory (Malterud, 2016). The study is part of a larger project, in which

we investigate the nature, qualities and impacts of physical therapy intervention for preterm infants and their parents.

Study setting

The study was conducted in Norway at three different geographical sites. In Norway, public health care is well developed; both preventive and treatment physiotherapy services are available for the general population. The majority of the physiotherapy sessions took place in the families' homes with one or both parents present. All interviews were conducted after the completion of the session in a private area at the PTs' workplace.

Participants and recruitment

We recruited seven preterm infants (including one set of twins), their parents (six mothers and three fathers) and their respective PTs (six in total). The inclusion criteria were preterm infants born at gestational age ≤ 33 weeks who received physiotherapy in their local community. The infants' motor development status ranged from age adequate to severely impaired. Thus, their physiotherapy services varied accordingly; some of the infants had occasional appointments as a preventive service, while others received more frequent and longer term treatment services.

PTs at three Norwegian hospitals provided parents with written information about the study. Parents returned a written consent directly to the researchers via regular mail. Once the parental consent and contact information was received, the first author contacted the family and collected an informed consent from the family's community PT. More information about the PTs, infants and parents is provided in Table 1.

Data collection

The data collection period was from December 2012 – November 2014. Each of the seven triads of infant, PT and parent(s) were visited three times over a period of 5-10 months. The

infant's age at the first visit ranged from 3 to 8 months corrected age (CA), and the third visits were conducted at 12-14 months CA. Due to cessation of physiotherapy, one of the triads received only two visits, at 3 and 6 months CA. This amounted to 20 visits, during which the first author observed and video-recorded physiotherapy sessions and subsequently interviewed the PTs. This combination of observations and interviews provided us with complementary information about the PTs' CR as we were able to observe their CR-in-interaction within its context and also obtain their verbal accounts regarding their reasoning processes (Higgs, 2008). Considering the scope of the study, the combination of observations and interviews gave a rich and nuanced data material.

The researcher was a non-participating observer during treatment sessions. She stayed in the background but moved around with a compact, hand-held camera to get good angles for capturing the ongoing activities and interactions between participants. The key points of the observation guide were the 1) treatment setting, 2) content of physiotherapy treatment, 3) PT-infant-parent(s) interactions, and 4) changes in the infant's function during sessions.

The interviews were semi-structured with open-ended questions that invited the PTs to elaborate on topics that concerned them. The main topics in the interview guide were 1) today's session, 2) impressions of the infant, 3) physiotherapy with the infant, 4) collaboration with the parents, and 5) the PT's background. All of the interviews were audio recorded. As the data collection proceeded, the researchers' growing interest toward interaction and clinical reasoning instigated more questions about these topics in later interviews.

Data analysis

We conducted a systematic content analysis of the data (Malterud, 2012). The first author was in charge of transcribing and the initial sorting and coding of the data material, which was discussed and further developed in regular collaborative meetings between all three authors.

After each visit, the first author composed field notes regarding contextual factors, impressions and thoughts. The video-recorded observations were viewed and an interpretive summary text from each session was composed. In the same manner, the first author listened to each interview and extracted the essence from them in writing. These summary texts were reviewed by all three authors and we together caught interest in how the PTs' ability to include both the infant and parent(s) in therapeutic activities and problem solving appeared to facilitate engagement and learning for all the participants. Thus, a growing curiosity toward this preliminary topic influenced the continuing analysis.

Next, the first author performed an extensive transcription of the video-recorded observations and interviews. The first author then coded both the interview and observation transcripts with an inductive approach to preserve the participants' perspective. Continuing the analysis, all three authors engaged in an iterative process of reviewing, categorizing and checking the data against initial impressions and the preliminary topic. QSR Nvivo 10 was used as a coding and sorting tool (QSR International Pty Ltd, 2012). Reviewing all codes and categories, we decided which categories were relevant to our topic of interest and sorted these further into themes.

At this point, the first author developed a text with the condensed findings within each theme. As we extracted this essence from themes and considered the relationships between them, the topic of CR as an overall perspective gradually emerged. During this process, the interviews and observations supplemented each other. The interview material provided the PTs' first person reflections and explanations of CR, while the observations gave a third person perspective on how interactions and participants' responses influenced the PTs' CR and actions. Observation sequences that were most illustrative of successful PT-infant-parent interactions were reviewed and transcribed in detail. By connecting impressions from observations with the PTs' own descriptions during interviews we were able to verify and

bring nuances to our developing analysis. Both the developing text and the selected observations were reviewed and discussed among all three authors. As an end result, the main themes as presented in this article were outlined: 1) The CR process – Improvisation, individualization and reflection; 2) CR and interactions with the child – Motivation, connectivity and compliance; and 3) CR and interactions with parents – Support, education and involvement. In the presentation of findings, the interviews form the main body of the text while findings from the observations supplement and give nuances to the results. Additional examples from the observation material are available in the appendix.

Ethical considerations

The study was conducted in accordance with the Helsinki declaration (World Medical Association, 2013), and ethical considerations were reviewed and approved by the NSD - Norwegian Centre for Research Data. Granted by the informed consent, both the PTs and parent(s) shared information about each other with the researcher. Thus, it was important to ensure both parties that their sharing of information was handled with confidentiality, respect and discretion.

Methodological considerations

The research team consisted of two pediatric PTs (first and last author) and one sociologist/nurse (second author). Our interest toward the interactional aspects of pediatric physiotherapy has guided the direction of the study and incited an orientation toward enactive theory as a means of comprehending clinical practice. The combination of the pediatric PTs' familiarity with the study field and the second author's outsider perspective enabled an analytical reflexivity between physiotherapy specific understandings and the sociology of the therapeutic context.

The presence of a non-participating observer and video camera can potentially alter the field of study and interactions between study participants (Heath, Hindmarsh, and Luff,

2010; Taylor, Bogdan, and DeVault, 2015). At the onset of observations, many of the PTs expressed that they were nervous. The researcher reassured them that the observation was not a judgement of their professional performance. During debriefing after the completion of the sessions, the PTs said that they quickly forgot about the researcher's presence and were able to proceed with the session as usual. Overall, they felt that the observed sessions were representative of their encounters with the infant and parent(s). However, in three instances, the PTs explained that the parent was less involved, likely due to the researcher's presence. In a fourth instance, the parents expressed that the PT was more alert and attentive towards them when the researcher was present. The infants took little notice of the researcher at the youngest age. As they grew older, there were situations in which the infant wanted to interact with the researcher. In these situations, the researcher gave positive, yet minimal response and withdrew from interaction as soon as possible.

When it comes to the interviews, some of the PTs expressed that they were concerned about being tested on their professional knowledge and competence. The researcher encouraged them to rather perceive of the interview situation as a collaborative discussion about their experiences with physiotherapy for the infant and family. During debriefing, the PTs said that the interview setting provided a relaxed atmosphere and welcomed them to speak their opinions and thoughts.

RESULTS

The CR process - improvisation, individualization and reflection

Within each PT-infant-parent constellation, the PTs explored and reasoned about the appropriateness of treatment. Their CR was a matter of employing adequate therapeutic measures and doing them the correct way and at the right time. In this process, the PTs continuously evaluated the infant's and parents' characteristics and responses, the therapeutic

process and their own actions. However, intrinsic to this CR was a recurring doubt about the adequacy of the physiotherapy intervention.

During the interviews, the PTs described how the interactions with the infant and parent(s) guided them through each treatment session. They had to be sensitive to and grasp situations as they occurred and develop their therapeutic actions in what became *"very much like a workshop"* (PT6). Using their improvisational skills, the PTs decided where they wanted to go, and discovered ways to get there in collaboration with the infant and parent. PT5 said:

> *But it's often in the situation that you catch onto it. (…) It probably doesn't seem very organized, but that's just how it is sometimes I think, when you work with children.*

However, this improvisation took place in familiar territory. Based on their existing knowledge; i.e. their professional judgment, current goals and experience from previous sessions with the infant and parent(s), the PTs knew what they wanted to achieve and reasoned about how to fulfill these achievements. PT4 explained:

> *I sort of know what I'm getting at. And I think it through in my head – 'Did I say **this** to Mom, or **that**?' or 'Should I have thought of **that**?', kind of.*

The PTs expressed that the improvisation and individualizing of treatment for the infant and parent(s) was a persistent challenge with no guarantee of success. In each new encounter, the infant's fields of interest could have changed significantly or there could be new issues that the PT needed to address. Furthermore, the PTs described that once therapeutic goals were achieved, a vacuum arose in which they had to reconsider their strategy and set a new course for the continuation of therapy.

The PTs displayed and argued for a variety of treatment approaches. Some of the PTs worked by primarily inducing environmental changes and refrained from therapeutic handling

that they thought could disturb the infant's ongoing activity. Others preferred to use therapeutic handling, explaining that this gave the infant positive bodily experiences and helped to resolve the infant's motor impairments. During observations, the PTs' choice of treatment approach had consequences for their CR. When the PTs worked via the infant's environment, they were less engaged in interactions with the infant. An emphasis on infant resources and furthering of established motor skills made the PTs less attentive toward the infant's specific motor impairments. On the contrary, when the PTs become preoccupied with details in their assessment and treatment procedures, they were less attentive to the interaction with the infant and parent(s). The key to success was a balancing act in which the infant's engagement and the PT's targeted therapeutic actions could co-exist and co-contribute to the PT's developing CR.

Moving beyond the individual therapy session, the PTs CR also extended to an overall reflection about the expediency of physiotherapy for the infant and family. When evaluating the effects of physiotherapy, the PTs all came up with issues they believed could have caused a less desirable development. PT4 elaborated:

> *I do think that if I hadn't been there with some input, it might have turned out a bit different. (…) She could have become this very frustrated child, who was just sitting there. (…) But maybe because she has such a good drive in her, that she would have moved on quickly from sitting? But then maybe she wouldn't have crawled? And then, that would probably be all right too (…), but now at least she's got a bit more.*

However, some of the PTs expressed doubts about the fundaments of their clinical practice. They questioned if physiotherapy was the correct, or necessary intervention for the infant and pondered about the importance of motor skills as compared to mental, cognitive and social development. PT2 said:

And then motor development becomes a very big part of the follow-up. (…) No special education teacher or psychologist. (…) Is that really the right thing to do? To let motor development be the first priority? Because I'd say that's fairly concrete and easy.

CR and interactions with the infant – Motivation, connectivity and compliance

The PTs expressed that a key component of their CR was to develop their understanding of the infant; i.e. his or her personality, motivational factors and responses to therapeutic measures. Overall, these insights complemented the PTs' perception of what drives development for the individual infant and enabled the PTs' therapeutic work together with the infant.

The PTs attended to the infant's motivation during therapy and considered it a requirement for the infant's learning and transferal of therapeutic achievements into everyday activities. PT4 said:

If you don't catch onto [the infant's] enthusiasm and motivation, then you don't get the same learning. (…) No effect whatsoever.

Furthermore, the PTs emphasized that their own attunement to the infant's motivation was key to successful therapeutic interactions. They had to make instant and continuous modifications in their therapeutic strategy to accommodate the infant and prevent interactional failures. PT5 elaborated:

If you take the wrong step when you work with children, and you've got your own project going, then suddenly the session is over. (…) We're finished. We might as well pack up and leave. (…) You've ruined it. So to interact and connect, I think that's the best thing to happen in a treatment session.

During therapy sessions, this connectivity between the PT and infant was not always successful. Both infant and PT personalities affected the ongoing interactions. Furthermore, the infants' abilities and interests toward interactional activities differed across age and developmental stage. Similarly, the PTs' engagement fluctuated between observation, action and interaction. Noteworthy were situations in which an infant preferred solitary play. If the PT in these situations maintained an observer stance, social interaction was sparse and the infant rarely explored new motor abilities. However, if the PT took an active role, i.e. altered the infant's solitary play via handling techniques or modifications to the task or environment, they were often able to induce motor improvements for the infant. Thus, confinement to an observatory role constrained CR; the lack of action and interaction hampered the PT's exploration of the infant's motor abilities and emergence of new skills.

Interacting with the infant was a matter of bodily understanding and interaction. The PTs explained how the interpretation of the infant's bodily movements and expressions entered into their CR. Perceptions from observation and handling of the infant, together with the testing of movement strategies with their own bodies, all contributed to the PTs' evolving therapeutic strategy. PT3 said:

> *Then I have to reason with myself, try a little bit for myself, what does it actually take for him to move the way he does? And what will it take for him to maybe move in a different way? And then I try and adjust a bit, trial and error you know.*

During observations, the infants' response to therapeutic measures were closely monitored by the PTs. Reciprocally, the PT's response to the infant's bodily signs of engagement, disengagement and distress enabled the infant's compliance and facilitated the accomplishment of therapeutic actions (see appendix, situation A and B). In interviews, the PTs explained how the infant's bodily expressions enabled their CR concerning the infant's

motor capacity, stamina and compliance. E.g., PT3 explained her CR based on two infants' differences in response:

> *When he's done, and I try to facilitate, you know Steve he just 'AAAAHH!' (loud voice), gets frustrated and then he does the job. But Lennard, he has no strength left. Like in the end when I wanted him to lift his head, no! No matter how much I would have pushed him, I don't think I could have made him do it. Because when he's done, he's done. There not a muscle left that he can move.*

CR and interactions with parents – Support, education and involvement

A pivotal element of the PTs' CR was their comprehension of how to support the parents and enable them to be facilitators of the infant's development in everyday life. All the PTs felt that it was important to involve the parents in the treatment of the infant. However, cautiousness regarding the parents' expectations and perceptions hampered collaboration with parents and distracted the PTs' CR. On the contrary, when the PTs succeeded with their education and involvement of parents and their sharing of knowledge, ideas and experiences, this enriched the PTs' CR and helped them discover new therapeutic possibilities.

During observations, the education of parents was primarily done via the PTs' verbal communication of information and professional opinions. Within these events, explicit and individualized guidance generated a richer dialogue with parents. Said guidance entailed the PT's descriptions and explanations of their observations of the infant, suggestions of therapeutic activities that could help the infant, and collaborative resolving of how the parents could work with these activities into everyday life (see appendix, situation A and B).

In addition to verbal education, the PTs expressed that they wanted the parents to be involved in therapeutic activities during sessions. They viewed it as an opportunity for the parents to learn about their infant. PT5 elaborated:

It's very helpful, those situations when we try out - 'just look if I do this', and then they can try on their child and then, 'oh yes, then this happens with my child'.

Moreover, the PTs viewed the parents' involvement as an opportunity to observe the parents' handling of the infant and suggest alternative handling techniques if needed. However, both the interviews and observations confirmed that such involvement was difficult to achieve. The PTs explained that the infant could become irritable or that the parents withdrew themselves from situations. Setting these arguments aside, the PTs admitted that their lack of involvement with parents was also a matter of breaking with their own established habits. PT5 said:

I wish I could find a way where I could make the parents do more. (…) Because I can see that it slips. (…) I'm caught in a pattern that I would actually like to get out of.

Upon further probing of why this was difficult, the PTs realized that there was a stressful side to involving parents; they did not want to be perceived as critical or judgmental of the parents' skills. PT2 explained:

PT2: It kind of depends on the parents, because some of them are very shy. (…) Doing things with their child is one thing, but (…) to start correcting on what they are doing…

The observations lent little support to these concerns. When the parents were invited to try out therapeutic activities, they gave positive responses and willingly explored the PTs' suggestions on how to handle the infant (see appendix, situation B). Embedded, however, in such successful involvement of parents were sequences in which the PTs tried out handling techniques themselves. Once the PTs had decided on the most suitable way to support the infant, they could proceed with their education of the parent.

Successful education, either verbal or including practical assignments, enabled the parents to associate them with everyday situations. Parents gave ample feedback on how they worked with assignments between sessions and discussed detailed observations of the infant's motor performance (see appendix, situations A and B) from everyday life. In doing so, the parents became collaborators in the therapeutic process; their suggestions and opinions on how to work with the infant were acknowledged and explored together with the PT. Thus, the embedding of educational measures into the interaction with the infant facilitated parent involvement in the PTs' CR processes and created a mutual, problem-solving environment in which they could explore and develop new treatment strategies together.

DISCUSSION

The findings illustrate CR as relying on the distinctiveness of the situation and the emerging interactions with the infant and parent(s). By attending to the infant's and parents' expressions, both bodily and verbally, the PTs adapt and individualize their therapeutic approach. Thus, this interactional understanding supplements the PT's factual knowledge as a foundation of CR. As interaction unfolds, the PTs evaluate the infant's motor performance, parental needs, therapeutic measures and their own performance and make decisions about how to proceed with therapy. However, this interactional CR is vulnerable; infants' disengagements, parents' expectations and PTs' preoccupations can obfuscate interaction and hamper CR.

Improvising CR – what are the challenges?

The clinical encounter is a meeting between individuals, each with their own autonomies and inherent vulnerabilities. Within these interactions between infant, parent(s) and PTs, the PT's CR emerges and develops. Furthermore, the interaction itself develops its own dynamics, with inherent autonomies and vulnerabilities (De Jaegher, Peräkylä, and Stevanovic, 2016). Thus,

every encounter holds a novelty that shapes the PT's CR. For the PTs, answering to this novelty demands an ability to improvise and catch situations as they occur and allow the infant and parent(s) to be active participants in the co-creation of meaning and action. If they fail, by "taking the wrong step or sticking to their own project", the interaction can break down.

The emphasis on interaction does not exclude the fact that there are also higher-level cognitive processes involved in the PTs' CR, as described in the literature (Edwards et al., 2004; Higgs, 2008; Øberg, Normann, and Gallagher, 2015). This is exemplified by the PTs description of a vacuum once therapeutic goals are achieved. In these instances, the PTs' CR processes on a higher cognitive level have priority and need to be resolved before they can re-engage in interaction with the infant and parent(s). Nonetheless, interactional aspects are foundational to said cognitive processes. Informed by the interactions during the therapeutic encounter, the PTs make their CR explicit to themselves; they make decisions, employ therapeutic actions and evaluate the results of these actions and their own performance. These processes of mind, although founded on embodied experiences and interactions can simultaneously preclude the PT's attention and interactional capacity. They can become pre-occupations that hamper the PT's spontaneous involvement and create a drift toward disengagement (De Jaegher, Peräkylä, and Stevanovic, 2016). Thus, pre-occupancies such as the vacuum following goal achievement or the PT's priority of details in the assessment and treatment procedures might impede the PT's ability to interact with the infant and parent(s).

As part of the PTs' treatment of the preterm infant, they provide support and education for parents who are known to be in a vulnerable situation (Brett et al., 2011; Campbell and Sawyer, 2007; Jansen, Ketelaar, and Vermeer, 2003). The PTs are aware of this vulnerability and the parents' need for support. However, this awareness instigates a defensive attitude and sense of vulnerability with the PTs themselves. Concerned that they might be perceived as

critical of the parents, the PTs refrain from sharing their professional opinions and advice. However, because withholding of information can reinforce uncertainty for the parents (Håkstad, Obstfelder, and Øberg, 2015), this combination of parent and PT vulnerabilities might propagate into a self-maintaining, counterproductive spiral. Related to CR, this failure to respond to the parents' needs might be caused by a misconception of the parents' narrative (Higgs, 2008) and the uncertainty of the situation (Higgs, 2008), which in turn causes a breakdown in the PT's narrative reasoning, decision making and consequent actions during the clinical encounter.

The PTs explain that the challenge of involving parents is also a matter of changing their own habitual behavior in which PT-infant interactions are given priority, and instead allow for the parents to practice and perform therapeutic activities together with the infant. From the enactive view (Fuchs and De Jaegher, 2009), this established behavior represents habits and skills that determine the PTs' directedness and predispose them to act in a certain way. Therefore, although the PTs express that they want to involve parents and value the principles of FCC, their predispositions toward PT-infant interactions rather than parent-infant interactions might obstruct their collaborative work processes and impede their enablement of parents.

Together, the PTs' predisposition toward old habits and their concern about being critical uphold their behavioral traits. These findings relate to the interlacing of autonomy and vulnerability (De Jaegher, Peräkylä, and Stevanovic, 2016) as well as the multidimensional artistry of PTs' CR (Higgs, 2008) during clinical encounters. The PTs' behavior, instigated by their vulnerability and autonomy as health care providers, leads to breakdowns in the mutual interaction and sense-making processes which in turn renders the parents more vulnerable and maintains their uncertainty regarding the condition and treatment of their child.

CR as co-creation of meaning and action

However, the PTs can also be enablers of the parents' autonomy. The PTs in our material provide support and education via verbal explanations and advice, welcome the parents' feedback and opinions and provide the parents with practical assignments. By doing this, the PTs allow for a mutual problem solving and exploration of the infant, enabling the parents to become engaged participants. In accordance with enactive theory (De Jaegher, Peräkylä, and Stevanovic, 2016; Fuchs and De Jaegher, 2009), this enablement is an interplay between autonomies in which the parent can make sense of the therapeutic actions as they become relevant activities that can be integrated into their everyday life. From the PTs' perspective, these mutual explorations of the infant give access to the parents' opinions and knowledge concerning the infant. These insights serve to enrich the PTs' CR regarding therapeutic possibilities and allows for more collaborative decision making processes. Thus, successful improvisation depends on mutuality and engagement in interactions with the infant and parent(s). In doing so, the PTs can allow the autonomy of interaction to emerge and develop the therapeutic project in collaboration with the infant and parent(s).

The infant's signs of attention and motivation inform the PT during assessment and is decisive to the PT's approach and achievement of treatment goals. What the infant is willing to engage in and the extent of this engagement demonstrates how the infant's autonomy can shape the content, extent and development of interactions (De Jaegher, Peräkylä, and Stevanovic, 2016). The PTs are aware of this autonomy and the vulnerability that comes with it; they emphasize the need to coordinate themselves with the infant and grasp situations as they appear. This fluctuating synchrony is a matter of interchanging *coordination to and with* the infant (Fuchs and De Jaegher, 2009). Through their perception of the infant's vocal and bodily expressions, the PTs learn and reason about the infant's motivation, attention and endurance. Thus, the PTs need to be sensitive to the infant's coordinative behavior and

engage in mutual cooperation with the infant. This sensitivity in interaction depends on the PTs' own body perceptibility (Øberg, Normann, and Gallagher, 2015). Via the use of their own body, the PTs perceive the infant's capacity and compliance upon which they make their decisions, implement therapeutic measures and evaluate their effects (Higgs, 2008). Furthermore, it is the PT's embodied self that engages in information, communication and collaboration with the infant and parent(s) (Øberg, Normann, and Gallagher, 2015). For example, the PTs' communication of CR is founded on their bodily perceptions of the infant, and it is their own embodied experiences that enable them to educate the parents about supportive ways to engage and interact with the child. By acknowledging and utilizing these bodily interactions as a source of knowledge, the PTs facilitate the parents' sense-making and enable the infant's and parents' roles as co-constructors of meaning and action. In addition, the PTs are themselves provided with more opportunities to engage with the infant and discover new ways to facilitate learning and development.

In doing so, the PTs' CR processes are not individual endeavors; they depend on interaction and develop as the PTs interact with the infant and parent(s). During the therapeutic encounters, the PTs need to attend to the participants' autonomies and vulnerabilities and develop a flexibility in their therapeutic approach that can mediate a fluency in interactional patterns (Fuchs and De Jaegher, 2009) that is also characteristic for the artistry of expert practitioners (Higgs, 2008; King et al., 2007). Bodily interactions, including hands-on treatment techniques, together with the involvement of parents provide the PTs with valuable information that cannot be obtained otherwise. It is via this embodied social engagement that the PTs can develop an integrative understanding based on knowledge from neuroscience and dynamic systems theory as well as practical, ethical, personal and interactional knowledge (Higgs, 2008; Øberg, Normann, and Gallagher, 2015) and translate this CR into meaningful actions for all three participants. Moreover, this reliance on the

pivotal role of bodily experiences and interactions makes the PTs more confident about their provision of physical therapy and their professional contribution to the development, learning and support for both the infant and parents.

Study limitations and future directions

The PTs who participated in this study were all eclectic in their therapeutic approach and did not adhere to a specific treatment regime. Thus, further investigations into the practices of PTs within different, contrasting therapeutic approaches might unveil more knowledge and new aspects regarding the connectivity between embodied interaction and CR in FCC.

In this study we have focused on micro-level interactional aspects of physical therapy encounters with infants and parents and their influence on the PTs' CR processes. We have only briefly mentioned the broader perspective of how the socio-cultural aspects (De Jaegher, Peräkylä, and Stevanovic, 2016) implied by the health care service setting can influence (and is influenced by) PTs' CR. Thus, further investigations of the PT-infant-parent(s) roles and relationships and how they affect PTs' CR and identity are warranted.

CONCLUSION

In this study we have investigated how interaction shapes PTs' CR in clinical encounters with preterm infants and their parents. We have extended the perspectives of embodied-enactive CR by uncovering how PT-infant-parent(s) interactions serve to promote collaboration, engagement and learning in FCC. Our findings indicate that observational, hands-off treatment approaches come at a price; when PTs refrain from using their own body as an instrument they diminish embodied interactional knowledge as part of their ongoing CR. Therefore, PTs need to allow for mutual and engaging bodily interactions to emerge and shape the translation of their CR into successful therapeutic actions and learning together with the infant and parent(s). We suggest that the benefits of triadic embodied-enactive CR need to

be acknowledged and utilized as a means of expanding and enriching PTs' repertoire in their collaborative work with children and parents.

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DECLARATION OF INTEREST

The authors report no conflicts of interest.

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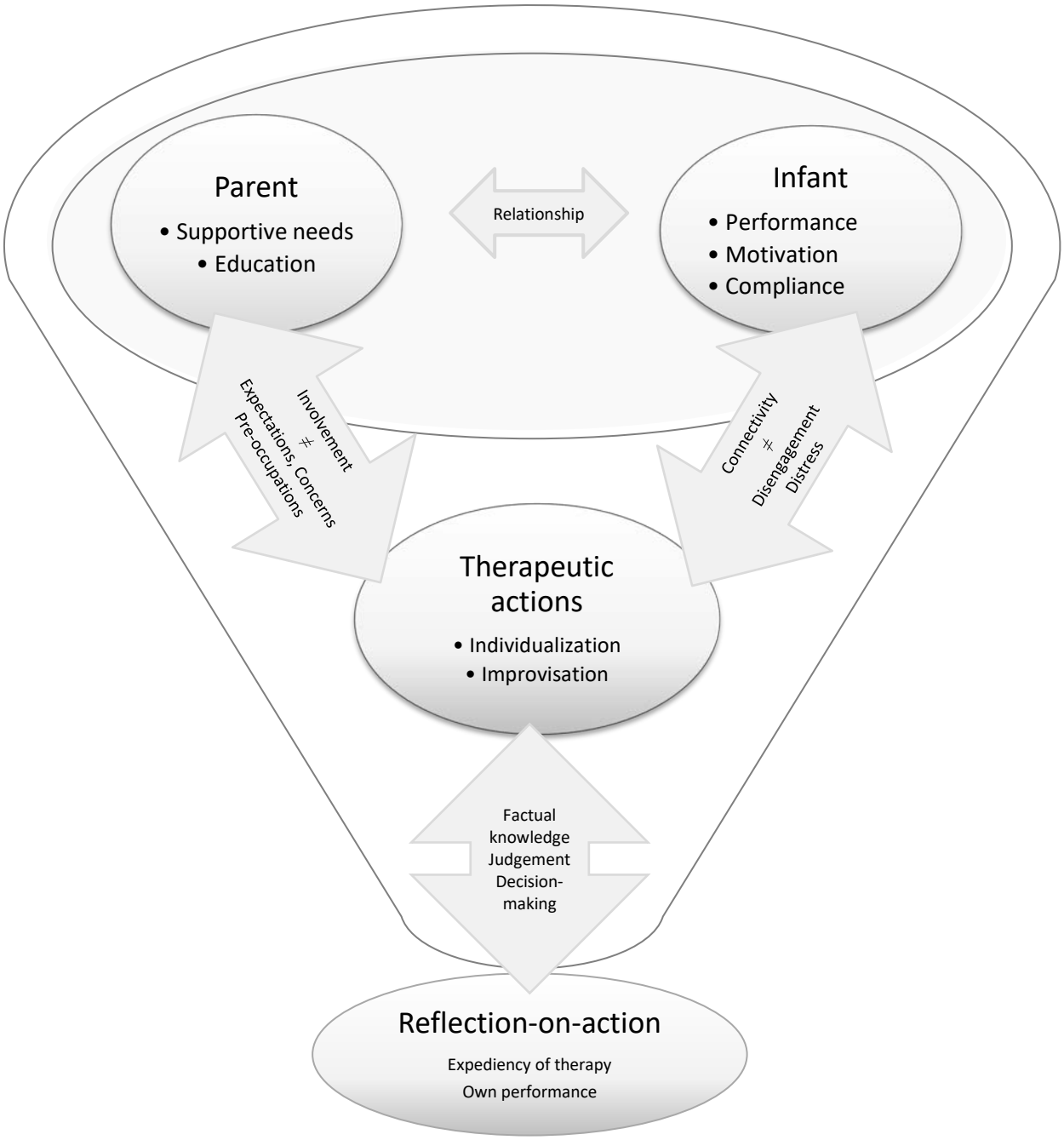
Table 1: Information about the PTs, infants and parents.

	Work experience	**The preterm infant**	**Infant's age at physical therapy sessions**	**Parents' presence at physical therapy sessions**
PT1	5-15 years, mostly with children 0-18 years of age.	Infant born at 29 weeks GA., diagnosed with CP at 6 months age.	5, 7 and 14 months	Sessions 1-3 with Mom.
PT2	5-15 years, mostly with children 0-18 years of age.	Born at 24 weeks GA. Typical motor development, minor deviations in movement quality.	8, 9 and 12 months	Session 1 and 2 with both parents. Session 3 with Mom only.
PT3	< 5 years, patients of all ages.	I: Born at 28 weeks GA. Delayed motor development. II: Born at 28 weeks GA. Delayed motor development during infancy, age adequate at 12 months CA.	4, 6 and 12 months	Session 1 and 3 with Mom. Session 2 with Dad.
PT4	15 years +, mostly with children 0-18 years of age.	Born at 26 weeks GA. Delayed motor development during infancy, age adequate at 13 months CA.	3, 8 and 13 months	Session 1-3 with Mom.
PT5	5-15 years, recent years with children 0-18 years of age.	Born at 29 weeks GA. Typical motor development, minor deviations in movement quality.	3 and 6 months	Sessions 1-2 with Mom.
PT6	5-15 years, recent years with children 0-18 years of age.	Born at 27 weeks GA. Delayed motor development during infancy, age adequate at 13 months CA.	6, 9 and 13 months	Session 1 and 2 with Dad. Session 3 with Mom.


Parent
• Supportive needs
• Education
Relationship
Infant
• Performance
• Motivation
• Compliance
Involvement
≠
Expectations, Concerns
Pre-occupations
Connectivity
≠
Disengagement
Distress
Therapeutic actions
• Individualization
• Improvisation
Factual knowledge
Judgement
Decision-making
Reflection-on-action
Expediency of therapy
Own performance