Background

Cerebral palsy (CP) is the most common motor disability in children and covers a very heterogeneous group of disabilities with variations in severity, including ambulatory dysfunction, clumsiness and delayed acquisition of motor skills, often accompanied by disturbances in communication, cognition, perception and sensation [1]. The process of physiotherapy interventions in general includes assessment, goal-setting, the planning and implementation of therapeutic, pedagogical and environmental interventions, and the evaluation of the results [2]. Physiotherapy interventions focusing on children with CP should be based on not only the perception of the child’s disability, and the associated consequences, from a functional and environmental perspective, including not only impairments, but also the child’s own motivation, the family’s expectations, and the support they receive [3-8]. This approach is known as Family-Centred Service (FCS) and has been proven to be effective not only regarding the outcome for the child and his or her family, but also for the service delivery system [9,10]. FCS focuses on client-centredness [11] and on empowerment, with the goal of enhancing and optimising capabilities, ensuring family and child participation in clinical decision making, and instilling power and control in the family and child [12].

FCS requires a perspective in which disability is regarded as a social construction involving the interaction of the child with his or her environment [9,10]. The World Health Organization’s International Classification of Functioning, Disability and Health (ICF) [13] is a conceptual biopsychosocial model of health. A child and youth version of this model, ICF-CY, has been developed [14]. Many physiotherapists working with children with CP incorporate the ICF into practice as it focuses on health rather than the consequences of disease or disability. The components of body function and body structure, activity and participation interact dynamically with each other and with personal and environmental
factors. The ICF identifies relevant impairments, activity limitations and participation restrictions, and determines cause-and-effect relationships between the components of health and personal and environmental factors, and can also be helpful in identifying primary goals and evaluating the effects of intervention [15-17].

Physiotherapy intervention strategies for children with CP vary, but the main aim is to enhance motor ability and improve capacity so that the child can perform the tasks necessary to participate actively in everyday life [3-8]. In physiotherapy, movement is understood as the fundament of an individual’s function, adapted to its purpose to achieve goals in relation to the surrounding environment [2]. Movement is the result of the interaction of the individual, the task and the environment. The movement patterns and the movement strategies used by individuals to achieve their goals are their own solutions to the motor problem in interaction with the environment [18]. The definition of motor learning is based on the concept that learning is a process resulting in the capability to perform skilled actions that contributes to relatively permanent changes in behaviour. It cannot be measured directly, and is the result of experience or practice undertaken in order to learn new strategies for sensing and moving [19]. Learning is a process of acquiring knowledge about the world [20,21]. The socio-cultural context in which the action is assumed to be performed influences the child’s learning process and the child’s opportunity to develop strategies for action. The action requires interpretation and creativity, but is not always explicit or even conscious. The way in which a child acts in different situations is dependent on their knowledge, experience and understanding of the situation, as well as what action is called for and if it is possible. Learning how to cope and how to be an active problem solver are based on previous experience and knowledge [22].
Task-specific functional activity and motor learning processes based on the child’s capability to learn should be emphasized in physiotherapy interventions for children with CP [22-27]. The environmental factors are important as these children may have difficulties in generalising movement in different settings, i.e. the skill should be learned and practised where it is to be used [28]. To enhance motor learning and increase the child’s capability the physiotherapist can identify constraints in the environment and the child, modify the task, give feedback, adjust the environment to promote performance, stimulate different strategies for problem solving, and offer new opportunities for the child to develop new solutions to a motor problem as an active problem solver [22-28]. Regarding the child as being able to think and act according to his/her own capability is an empowering learning strategy. In this way the child develops autonomy and responsibility by reasoning [29].

Different paradigms of health and disability lead to different strategies for the assessment and treatment of children with CP. Clinical decision making in the practice of evidence-based physiotherapy requires awareness of theoretical frameworks and the use of appropriate clinical skills based on the physiotherapist’s ability to reflect in and on action [3]. Articulating and documenting the use of theory, instrumentation and research design and the assumptions underlying the intervention are important and present a challenge to physiotherapists [3,30]. Physiotherapy research concerning interventions for children with CP during the past decade has focused on collecting evidence of the superiority of particular therapeutic methods or treatment modalities [30]. However, no conclusive evidence has been found that one modality of treatment of children with CP is better than another in randomized controlled trials [30,31]. Essential aspects such as the expertise and skill of the physiotherapist, the interaction between the child and the therapist, the parents’ and the child’s satisfaction with the therapy, parental support, activities at home during leisure time and the child’s overall subjective well-being,
have not been considered [30,32]. From the FCS perspective it is important that the child’s and their parents’ voices can be heard. Physiotherapeutic interventions must, therefore, coordinate the norms and values of scientists and clinically active physiotherapists with those of the client [33]. The aim of this study was to describe how physiotherapy interventions for children with CP are described in scientific physiotherapy publications written by physiotherapists, i.e. to identify variations in the underlying assumptions and theory of physiotherapy interventions focusing on CP

Method

A qualitative phenomenographic approach was used. The aim of phenomenography is to identify and to describe various ways of experiencing, conceiving and understanding a phenomenon [20,21]. The phenomenon investigated in this study was physiotherapy interventions for children with CP, as reported in previously published scientific articles, written by physiotherapists. In a phenomenographic study data can consist of previously published scientific articles not originally intended for the purpose of phenomenographic analysis, and with goals other than describing the phenomenon [21,34].

It is important to distinguish between the first- and second-order perspective in qualitative research [20,21]. If a researcher is interested in describing the essence of the phenomenon as an aggregated mental construction with the aim of interpreting the respondent’s statements and describing what the phenomenon is, the first-order perspective is used. In phenomenographic research, on the other hand, the objective is to elucidate the second-order perspective, i.e. describe the underlying causes of experiencing the world, the phenomenon and the situation. When writing scientific articles with the aim of testing or describing different physiotherapy interventions for children with CP, physiotherapists are aware of a number of aspects that are important to them and, therefore, direct their awareness towards
these. Different combinations of these aspects contribute to the way in which physiotherapists experience health and the world, influencing their experience of what physiotherapy research for children with CP is about. This in turn leads to differences in how physiotherapy interventions for children with CP are experienced and understood [20,21].

Material

PubMed was searched for articles with the keywords physiotherapy OR physical therapy AND cerebral palsy AND treatment. Limitations were patient age 0-18 years, human, clinical trials, English language, abstract available, written between 1 January 2001 and 31 December 2009. The inclusion criteria were: quantitative methods, currently accepted clinically based, traditional therapeutic motor interventions and physiotherapy. The exclusion criteria were: qualitative methods, reviews, lack of diagnosis of CP, and adjuncts to physiotherapy including surgical interventions, acupuncture, psychotherapy and pharmacotherapeutic interventions. Fifty-five articles were found to be relevant according to the search criteria. From these a strategically selected sample of twenty-one articles was chosen (see Appendix) according to the maximum variation strategy [20,21]. Selection was based on the variations described below.

- **Year of publication:** 2001-2009
- **Modalities:** Functional therapy, strength training, strength training aided by electrical stimulation, Bobath therapy, hippotherapy, constraint-induced therapy, antispastic positioning, partial body-weight-supported treadmill training, functional electrical
stimulation, electric stimulation in addition to passive stretching, use of virtual reality, exercise training, intermittent versus continuous physiotherapy, balance training.

- **Countries:** The Netherlands, Turkey, USA, Taiwan, Iran, UK, Sweden, Denmark, Australia, and Brazil.

**Analysis**

The experience of the phenomenon forms a whole through separation, differentiation, demarcation and organisation of the material, which requires analysis and some interpretation of the material [20,21]. The experience described in one article cannot be understood in isolation from the others. The meaning of a quotation lies in the utterance itself, but it should also be interpreted in relation to its original context. Thus, each quotation was interpreted in two contexts: in relation to the article from which it was taken, and in relation to the group of experiences to which it belonged. The experience of the physiotherapy intervention was abstracted and formed by separating the quotations from the articles, analysing them according to their differences and similarities, and demarcating these groups from each other. The category system of a phenomenographic study is not definitive, but the variations between experiences within the investigated group are described. The quotations from one article together with quotations from others, form a description of the different ways in which physiotherapy interventions are experienced [20,21].

Each article was analysed resulting in iterative evaluation back and forth between the whole and the different parts of each article. The material was analysed in seven steps according to accepted phenomenographic procedure [35]. The first author analysed the articles in continuous discussion with the other authors.
1. Familiarisation - The articles were carefully read several times, in order to become acquainted with the material and to obtain knowledge in relation to the focus and strategy of the intervention.

2. Condensation - Significant quotations from the articles were highlighted and cut out of the material using a pair of scissors.

3. Comparison - These quotations were compared to identify sources of variation and agreement within the interventions.

4. Grouping - Quotations that were similar were grouped for preliminary classification.

5. Articulation - The essence of the similarities in each qualitatively different and non-overlapping category was described by a limited and central content. Steps 3 - 5 were repeated several times. The authors discussed relevance, similarities and differences before the analysis was deemed to be satisfactory.

6. Labelling - Each descriptive category was assigned a tailored linguistic expression.

7. Contrasting - The final descriptive categories were compared with regard to similarities and differences.

Results

Three qualitatively different descriptive categories were identified in 21 scientific articles (see Appendix) regarding physiotherapists’ experiences of physiotherapy interventions for children with cerebral palsy. According to Marton & Booth [[21] there can be a standard, a specific way of experiencing the phenomenon, that can be more preferable than others i.e. is linked to theory and policy, or one experience may be more complex and multidimensional than another. The descriptive categories are thus hierarchically organised. In this study the descriptive category A is more preferable, complex and multidimensional than descriptive category B, which is more preferable, complex and multidimensional than descriptive category C.
A: Making it possible

The experience of physiotherapy interventions is based on the biopsychosocial paradigm of health from the perspective of empowerment. The intervention is functionally based and is directed towards reducing the child’s limitations in activity and restrictions on participation in the contextual environment. The physiotherapist uses the child’s environment, the parents’ participation, and the child’s creativity and resources to solve the motor problem, thereby empowering the child and parents to become active participants in the intervention process. Goals are discussed and set according to the needs of the family and child.

The collaborative goal-setting process involved the child’s physiotherapist discussing the problem with the child (if appropriate), the parents, carers, teachers, or nursery nurses, setting goals with them including establishing their base-line measurements, undertaking the intervention, and after a set period (three months) evaluating the goals to ascertain to what extent they have been achieved [Bower et al. 2001 p. 7]

The short-time goals are practiced in various natural settings..//.. practice takes place in natural situations (mostly at home or outdoors ..//..) The therapist and parents discuss how, when, and where to practice. They also discuss the amount of assistance, the reduction of assistance, the time of day that is most practical for practising the specific skill (fit into the daily routines..//..). The parents, child, and therapist together evaluate the goals [Ketelaar et al. 2001 p. 1539].

B: Making it work

The experience of physiotherapy interventions is influenced by a mixed health paradigm. The impairment is experienced as being the key factor in the child’s disability and the main focus of the intervention is on correcting the child’s disability influenced by the biomedical
paradigm. However, the goals are focused on both increasing body functions and on increasing the child’s activity and participation and the goals are thus also influenced by the biopsychosocial paradigm of health. The intervention takes place in the child’s environment and with parental support. In the intervention the child practises the exercises defined and controlled by the physiotherapist. The parents assist the physiotherapist who instructs, supervises, controls and evaluates the intervention and trains the child and their parents in how to carry out the exercises.

Each training session consisted of a 3 to 5 minutes aerobic warm-up, followed by plantarflexor stretches. The plantarflexor strengthening exercises were then performed. The functional scores increased slightly through the period of the study although the differences failed to reach significance. [McNee et al. 2009 p. 430 and 433]

A home-exercise program, consisting of functional and play activities, was to be performed while wearing the mitt. His mother was instructed to encourage his use of the mitt at home and during appropriate activities. [Pierce 2002 p. 1462]

At the end of each day, each child went home with an exercise program to practice with the involved upper extremity (without any restraint for 1 hour during the evening... and parents completed activity logs to monitor compliance. [Gordon et al. 2007 p. 365]

C: Making it normal

The experience of physiotherapy interventions is influenced by the biomedical health paradigm which, with a dualistic perspective, considers the body as an object of scientific study with normality as a standard. The physiotherapist uses his or her professional expertise to plan the intervention, which is strictly impairment-based and focused on the impairment
and its effect on the child’s body function. The child is exposed to the intervention which is based on repetition and facilitated by devices or physiotherapist’s hands-on treatment. The intervention takes place in a clinical environment with goals mostly related to the body function component of the ICF. Few goals are related to the activity component and none is related to the component of participation. Neither the family nor the child participates in goal-setting or evaluation.

Patients were supported by a physiotherapist at a straight sitting position as hips were abducted at nearly a 45° angle and externally rotated, and the knees were extended to 90° of the ankles. Patients were kept in this position for 20 min without changing the degree of support. The head was held in a neutral position in order to prevent asymmetrical tonic neck reflex. [Aybarack et al. 2005 p.442]

A licensed physical therapist and two research assistants facilitated the children’s gait pattern on the treadmill during the training process. The treatment goal was to reproduce a normal gait cycle throughout the sessions: attention was paid to appropriate gait kinematics, emphasizing heel strike at initial contact, knee extension at stance phase, and hip extension at terminal stance. One training facilitator was positioned behind the child to provide stabilization at the hip while the other facilitators assisted leg movements as needed in order to assist the child to achieve normal gait kinematics [Provost et al. 2007 p. 6].

The outcome space of the three descriptive categories identified is illustrated in Figure 1.

**Discussion**

In this study three qualitatively different descriptive categories were identified describing various ways in which physiotherapy interventions for children with CP were experienced in scientific physiotherapy publications. Critical variations in the way in which physiotherapy
interventions were found in the descriptive categories regarding health paradigm, intervention focus, the role of the physiotherapist and the goal-setting procedure, all of which have implications for FCS [9,10] and strategies for motor learning [22-29] (see Figure 1).

The descriptive category A: *Making it possible*, is based on a biopsychosocial paradigm and takes all the interacting components in the ICF into consideration [13,14]. In this descriptive category it is not the child that must be changed, i.e. made stronger or have his/her range of motion increased in order to fit into their environment. Instead, the environment has to be changed in order to make it possible for the child and their families to participate in activities that are important to them. The role of the physiotherapist is collaborative and is based on empowerment, as also described in previous studies concerning physiotherapy interventions [36,37]. This approach, which is centred on the child and their family, is based on a holistic view of the child and their family with the conception of physiotherapy knowledge as the ability to interact and use professional competence in the intervention process [38]. Jensen et al. recognised this interactive approach as a keystone in expert physiotherapy [39]. The role of the parents is to be active partners and to help the child to incorporate new treatment-related behaviour into everyday life [12]. The biopsychosocial paradigm facilitates goal-setting with the focus on the child’s potential, which are relevant according to the components activity and participation in the ICF. In this patient-centred goal-setting [40] the power and control over interventions and evaluation are shared between the child, the family and the physiotherapist, thereby employing the paradigm of FCS [9,10], strategies for empowerment [12], and motor learning [22-29]. This is important for both the child and the family, and will make therapy more effective and meaningful [41-47]. The child’s motor learning process is encouraged as the child is recognised as, and invited to be, an active problem solver influencing the intervention, thereby enabling the child to learn new ways of solving their motor problems in their own environment [22-29]. According to Valvano the practice of meaningful tasks based
on the child’s individual ability and the environment in which it is to be used is essential in the development of motor control and coordination of the child [23].

In descriptive category B: Making it work, a mixed paradigm of health that differs from the descriptive category above is applied. This is due to the influence of both the biomedical paradigm, which focuses on the impairment and is directed towards correcting the child’s disability, and the biopsychosocial paradigm, as the intervention is also directed towards making a difference in the child’s ability to participate actively in a particular environment. Valvano describes this as an impairment-focused intervention with activity-focused goals; a common combination in physiotherapy interventions for children with CP [23]. The role of the physiotherapist in this descriptive category is to train the child and family, and give special instructions as to what they should do, i.e. the role of a coach. The parents and the child have little influence over the intervention and its goals when physiotherapists use this mixed paradigm. The goal-setting procedure and the intervention is physiotherapist-led [36,37,40]. This is in accordance with the experiences of parents and children with CP in decision making in community-based paediatric physiotherapy [48] and with a study describing physiotherapists’ experience of client participation in physiotherapy interventions as guidance [36]. The physiotherapist takes full responsibility for enhancing health, avoiding risks and reducing complications without fully inviting the child and their families to be active in the process. This can be recognised as an ability to follow the demands on the profession [38]. The child’s motor learning strategies in this descriptive category are based on instructions given by the physiotherapist. Physical guidance can be used early in practice in order to help the child to feel the movement and to facilitate the development of the child’s action plan [23]. However, motor learning will not be achieved until the child is actively engaged in solving the problem to meet the challenge of the task [22-29].
Descriptive category C: *Making it normal,* has a biomedical paradigm as the intervention is directed towards the child’s disability with the belief that the surroundings, including the child’s motivation and the family’s needs, are of little importance. This descriptive category differs considerably from the descriptive categories previously described. The focus of the intervention on only specific parts of the child’s impairment implies a deductive, positivistic approach [38]. Different motor impairments within the spectrum of CP can be treated with different therapeutic exercises, but the functional benefits of impairment-focused interventions have yet to be proven effective in the long-term perspective. Thus, strictly impairment-focused physiotherapy interventions for children with CP may not be beneficial for the child. Physiotherapists should instead consider the functional task and not simply treat the impairment [30,31]. The role of the physiotherapist is that of an expert who has full control and power over the intervention process. This paternalistic approach, centred on the physiotherapist as an authoritative expert, has been described previously as one approach in physiotherapy [36-38]. The physiotherapist is regarded as being the best suited to understand the full consequences of the disability and to determine the needs of others from their own perspective as opposed to those of their clients [36,37]. The goal-setting procedure is centred on the physiotherapist [40] and the child and parents are marginalized and not invited to take part in the process at all. Instead of being active participants in the process the child and family are reduced to powerless recipients of medical decisions and treatment [12]. Children’s self-confidence and self-esteem can depend on how well they understand the reason behind physiotherapy interventions, in other words why they have to do the exercises [46]. This is important as children’s understanding also affects their ability to use their capacity in the challenges they face in everyday life, and thus their motor learning processes. The use of biomedical impairment-focused interventions in clinical settings, the lack of FCS and the
physiotherapist’s failure to enable the child to try to change his or her movement strategy contradicts the process of motor learning [22-29].

The family puts trust in the professional competence of the physiotherapist and must be sure of getting the best treatment available for their child. Thus, it is vital that the physiotherapy profession continues to study physiotherapy interventions for these children with appropriately designed clinical trials [33]. The physiotherapy profession has expertise in body function and structure from a functional point of view. Physiotherapists also have profound knowledge on how the disabilities associated with CP, i.e. problems in sensory-motor development and the development of cognitive functions, contribute to the child’s ability to perform the task in the environment where it is required, and they ought therefore to base their interventions on this knowledge [23]. The objective of interventions is to increase the child’s competence in their social and physical environment, and this requires the active participation of both the child and the parents [22-29]. However, it can be difficult to establish a true collaborative relationship, and the parents may need a highly competent physiotherapist who can help them make decisions [47]. Thus, physiotherapists should be able to satisfy the parents’ needs for support and information using empowerment and collaboration in the process, and not take control. Parents know what is best, and want the best, for their child based on their own unique view of life and parenthood, but they often require support to cope with their child’s disability and its impact on their everyday life. Several different ways of accomplishing goals are useful in everyday life to promote motivation, activity and participation in the intervention process. The parents and child should be instructed and supervised, but they must also be made to feel competent as parents.

**Methodological aspects**

The articles described different therapeutic methods and treatment modalities in physiotherapy interventions, thus variations were expected in the way in which the
phenomenon was experienced. Phenomenography was used as a powerful tool to identify these variations. This phenomenographic study may not identify the most typical or advanced way in which the authors of the published articles experience and understand physiotherapy interventions as a whole. However, it is possible to identify and describe the variation in experiences and understanding of physiotherapy interventions as it appears in the articles studied [20,21]. Studying relevant articles, commonly read by physiotherapists, reveals the underlying view of disability and health that physiotherapists use in their research. This influences their assumptions when treating children with CP, and thus their experience of physiotherapy interventions can be described. The experiences that physiotherapists use to study the effect of different treatment modalities for children with CP are complex and connected to the demands made by the different research paradigms and the environment, i.e. different contexts and times [22]. Thus, the ways in which the physiotherapy intervention is described in the articles may be related to the specific situation, i.e. routines and ready-made solutions as a tradition that is taken for granted [48].

The human factor is both the great strength and the fundamental weakness of qualitative research and analysis. Thus, the trustworthiness of the results in a qualitative study is dependent on the researchers’ methodological skill and competence, and how the results can be justified [49,50]. The researchers’ understanding and awareness of the phenomenon being investigated and of the context in which the phenomenon can be experienced and understood is important [21,49,50]. The first author had considerable clinical experience in treating children with CP and have shared the physiotherapeutic framework with the authors in the analysed articles. The results can be influenced by this pre-understanding, as well as her understanding of reality from her own cultural and ideological understanding of the phenomenon [49]. The authors were aware of this throughout the analysis and discussed it on
several occasions during the analysis process. To ensure trustworthiness quotations were used in illustrating each descriptive category [49,50]. The variations in the ways physiotherapy interventions are experienced, described in the results, may be limited. Other descriptive categories, not found in this study, may have been revealed in a larger sample and other material. However, these may have included the descriptive categories described in this study, as the phenomenographic approach assumes that the same descriptive categories can be found in other similar groups [20,21].

The results in this study confirm the findings in previous studies concerning health paradigms in relation to conceptions of knowledge and client participation/centredness [36,38]. An additional finding in this study was that different interventions may also have implications on the child’s possibility of enhancing motor learning.

A pragmatic criterion can be used to address practical concerns about truth in qualitative studies [49,50]. The practical consequences of this study may be that physiotherapists, working with children with CP and their parents, recognise the different working models they use, and can thus reflect upon which health paradigm they use in their interventions and what this may imply. Physiotherapists need to identify ways to help these children and their families cope in daily life. The authors believe that involving and challenging the child to maximize the child’s potential and autonomy in society, including the ability to solve problems and take control over their lives, must be the overall goal of physiotherapy interventions focusing on children with CP.

**Conclusions**
Three qualitatively different descriptive categories of experiences of physiotherapy interventions for children with CP, described in scientific physiotherapy articles written by physiotherapists, have been identified. The descriptive categories identified were: A: *Making it possible*, B: *Making it work*, and C: *Making it normal*. Critical variations were found between the three descriptive categories according to health paradigm, intervention focus, goal-setting, the role of the physiotherapist, FCS and motor learning strategies. The results may deepen physiotherapists’ understanding of how different paradigms of health influence the way in which different physiotherapy approaches seek to solve the challenge of CP. Some of the tacit knowledge within the profession of physiotherapy has been made explicit.

**Competing interest**

None

**Authors’ contributions**

Background (IL), Method & material (IL), Analysis (IL, KL, GG), Results (IL, KL, GG) Discussion (IL, KL, GG).
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**Figure 1: The outcome space**

Illustration of the outcome space of experiences of physiotherapy interventions for children with CP in a strategically selected sample of 21 scientific published articles (2001-2009), written by physiotherapists, with implications for family-centred service and possibilities for motor learning. PT = physiotherapist
Figure 1

Family-Centred Service

A: Making it possible
- Biopsychosocial health paradigm
- Functional-based intervention
- PT's role is collaborative
- PT negotiate goal-setting
- PT, child and family interact in intervention
- Motor learning is facilitated

B: Making it work
- Mixed health paradigm
- Impairment-based intervention
- PT's role is guidance
- PT leads the goal-setting
- Family is physiotherapist's assistant and carry out PT-directed interventions
- Motor learning is only to some extent facilitated

C: Making it normal
- Biomedical health paradigm
- Impairment-based intervention
- PT's role is the one of an expert
- PT determine the goals
- No family interaction
- Motor learning is not facilitated

Possibility for motor learning
Additional files provided with this submission:

Additional file 1: Additional file.doc, 33K
http://www.biomedcentral.com/imedia/5917232885332549/supp1.doc