A clinical decision framework for the identification of main problems and treatment goals for ambulant children with bilateral spastic cerebral palsy

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ABSTRACT

The primary aim of the study was to investigate how a clinical decision process based on the International Classification of Function, Disability and Health (ICF) and the Hypothesis-Oriented Algorithm for Clinicians (HOAC-II) can contribute to a reliable identification of main problems in ambulant children with cerebral palsy (CP). As a secondary aim, to evaluate how the additional information from three-dimensional gait analysis (3DGA) can influence the reliability.

Twenty-two physical therapists individually defined the main problems and specific goals of eight children with bilateral spastic CP. In four children, the results of 3DGA were provided additionally to the results of the clinical examination and the GMFM-88 (gross motor function measure-88). Frequency analysis was used to evaluate the selected main problems and goals. For the main problems, pair-wise agreement was calculated by the number of corresponding problems between the different therapists and using positive and negative agreement per problem. Cluster analysis using Ward's method was used to evaluate correspondence between the main problems and specific goals.

The pair-wise agreement revealed frequencies of 47%, 32% and 3% for the identification of one, two or three corresponding main problems. The number of corresponding main problems was higher when additional information of 3DGA was provided. Most of the specific goals were targeting strength (34%), followed by range of motion (15.2%) and GMFM-D (11.8%). In 29.7% of the cases, therapists could not prioritize and exceeded the number of eight specific goals. Cluster analysis revealed a logic connection between the selection of strength as a main problem and as specific goal parameters. Alignment as a main problem was very often associated with specific parameters like ROM and muscle length and with hypertonia as a main problem.

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The results show a moderate agreement for the selection of main problems. Therapists are able to use the proposed model for a logic and structured clinical reasoning. Setting priorities in the definition of specific goals is revealed as a remaining difficulty. Further research is required to investigate the additional value of 3DGA and to improve priority setting.

1. Introduction

Cerebral palsy (CP) describes a group of disorders of movement and posture, causing activity limitations. CP is attributed to non-progressive disturbances occurring in the developing foetal or infant brain (Cans et al., 2007; Rosenbaum, Paneth, Leviton, Goldstein, & Bax, 2007). Several research studies have demonstrated the positive effects of goal-setting in physical therapy (PT) of children with CP. It is accepted that involving both parents and children in the definition of realistic and acceptable goals improves motivation and thereby therapy outcome (Bower, McLellan, Arney, & Campbell, 1996; Bower, Michell, Burnett, Campbell, & McLellan, 2001; Löwing, Bexelius, & Carlberg, 2009; Löwing, Bexelius, & Brogren-Carlberg, 2010).

Another aspect in goal-oriented PT is the potential benefit from targeted interventions to enhance training specificity. Goal planning, in that context, is being used to identify the tasks and contexts of particular interest (Levack, Dean, Siegert, & McPherson, 2006). In children with CP however, this can be very challenging. Children with CP usually face a heterogeneous variety of problems. Primary problems like muscle tone, muscle weakness and many others usually have inevitable effects on activity and participation. Many research studies therefore praise the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) as a clinical framework and an important rehabilitation tool (WHO, 2008; Rosenbaum & Stewart, 2004). Physical therapists can use the model to organize the characteristics of children's functioning, to guide the selection of measurement tools and to determine meaningful outcomes (Lee, 2011; Steiner et al., 2002).

Still, recent research investigating the relationship between the different levels of the ICF do not demonstrate a clear and causal relationship between measures of impairments and functional outcome (Lee, 2011; Ohata, Haruta, Ichihashi, Kato, & Nakamura, 2008; Ross & Engsberg, 2007). Several studies identify spasticity and weakness as causal factors in gross motor function. Still, the amount of explained variance suggests that other variables should be included to explain functional outcome more fully (Kim & Park, 2011).

As a physical therapist, it might therefore be very challenging to determine factors that influence outcome of the PT program (Bartlett & Palisano, 2000). Setting priorities is an essential but complicated part of a targeted approach, requiring an adequate strategy for clinical reasoning. The hypothesis-oriented algorithm for Clinicians II (HOAC-II) provides a structured approach for science-based clinical practice. It is focused on functional deficits and how impairments relate to these deficits (Rothstein, Echternach, & Riddel, 2003). Unlike the ICF, the HOAC-II is directly strategy-oriented and is designed to guide the clinical reasoning process for the physical therapist. By generating a hypothesis as to why a problem exists, the HOAC-II supports the reduction of an often long problem list to a refined list of key problems (Rothstein et al., 2003). The ICF and the HOAC-II can therefore be considered as complimentary to each other.

Three-dimensional gait analysis (3DGA) is a commonly used measurement tool that supports the identification of main problems in ambulant children with CP. Still, the use of the results of 3DGA is mostly limited to the identification of key problems for orthopaedic surgery and botulinum toxin treatment. It is considered as an important additional measure that supports the selection of target muscles (Cook, Schneider, Hazlewood, Hillman, & Robb, 2003; DeLuca, Davis, Ounpou, Rose, & Sirkin, 1997).

To the best of our knowledge, no studies have investigated the role of a combined strategic approach and the use of 3DGA in the identification of specific PT goals. However, it is hypothesized that the results of the 3DGA can provide additional information to support the paediatric physical therapist to identify the main and key problems of the child. In that way, combined with a complete evaluation at all levels of the ICF and the clinical reasoning of the HOAC-II, it could provide a better understanding in the relationship between the impairments and functional outcome of an ambulant child with CP.

This study aims to investigate how a clinical decision process based on the HOAC-II and the ICF can contribute to a reliable identification of main problems and specific PT goals in ambulant children with CP. Additionally, it aims to evaluate how the additional information of three-dimensional gait analysis can influence the reliability of this information.

2. Methodology

The study was organized in different phases, starting from development of the clinical reasoning tool and validation by expert consensus to reliability testing by means of a larger scale agreement study (Fig. 1).

2.1. Phase 1 – development of the clinical reasoning tool

The clinical reasoning tool was developed by the first authors of this manuscript (IF and JD) and was based both on clinical experience as on the existing validated structures of the ICF and the HOAC-II (Fig. 2).