ACTUAL VERSUS BEST PRACTICES FOR YOUNG CHILDREN WITH

CEREBRAL PALSY:

A SURVEY OF PEDIATRIC OCCUPATIONAL THERAPISTS AND PHYSICAL

THERAPISTS IN QUEBEC, CANADA

Maysoun Saleh

Degree of Doctor of Philosophy

School of Physical and Occupational Therapy

Faculty of Medicine

McGill University

Montreal, Quebec, Canada

February 2007

A thesis submitted to McGill University in partial fulfillment of the requirements of

the degree of Doctorate in Philosophy (Rehabilitation Sciences).

©Maysoun Saleh. 2007



Library and Archives Canada

Published Heritage Branch

395 Wellington Street Ottawa ON K1A 0N4 Canada Bibliothèque et Archives Canada

Direction du Patrimoine de l'édition

395, rue Wellington Ottawa ON K1A 0N4 Canada

> Your file Votre référence ISBN: 978-0-494-32380-9 Our file Notre référence ISBN: 978-0-494-32380-9

NOTICE:

The author has granted a nonexclusive license allowing Library and Archives Canada to reproduce, publish, archive, preserve, conserve, communicate to the public by telecommunication or on the Internet, loan, distribute and sell theses worldwide, for commercial or noncommercial purposes, in microform, paper, electronic and/or any other formats.

The author retains copyright ownership and moral rights in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

AVIS:

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque et Archives Canada de reproduire, publier, archiver, sauvegarder, conserver, transmettre au public par télécommunication ou par l'Internet, prêter, distribuer et vendre des thèses partout dans le monde, à des fins commerciales ou autres, sur support microforme, papier, électronique et/ou autres formats.

L'auteur conserve la propriété du droit d'auteur et des droits moraux qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

In compliance with the Canadian Privacy Act some supporting forms may have been removed from this thesis.

While these forms may be included in the document page count, their removal does not represent any loss of content from the thesis.



Conformément à la loi canadienne sur la protection de la vie privée, quelques formulaires secondaires ont été enlevés de cette thèse.

Bien que ces formulaires aient inclus dans la pagination, il n'y aura aucun contenu manquant.

ABSTRACT

Background and rationale: Cerebral palsy (CP) is one of the most common disabling disorders of childhood and constitutes a substantial portion of pediatric rehabilitation. This condition demands comprehensive rehabilitation using ageappropriate tasks and activities and encompassing aspects of body function and structure, activity and participation, and personal and environmental factors. Yet little is known regarding actual occupational therapy (OT) and physical therapy (PT) practices.

Objective: The primary objective of this doctoral thesis was to describe OT and PT practices for young children with CP in the Province of Quebec, Canada. Methods: This was a cross-sectional, multi-centered survey. All eligible and consenting pediatric occupational therapists (OTs) and physical therapists (PTs) were interviewed using a structured telephone interview based on vignettes of two typical children with CP at two age points – 18 months and 4 years. Reported practices were grouped according to the International Classification of Functioning, Disability, and Health (ICF). Literature review of pediatric assessments and interventions potentially used for CP was done to determine their *level of evidence of effectiveness*. In addition, two expert groups provided, for each vignette, *a best practice* problem identification list and a *best practice* intervention list.

Results: A total of 62 PTs (83.8% participation rate) and 85 OTs (91.4% participation rate) participated in the study. Overall, 91.9% of PTs and 67.1% of OTs reported using at least one standardized pediatric assessment for at least one vignette. OT and PT interventions focused primarily on impairments and primary function, with less attention to interventions related to play and recreation/leisure. Clinicians reported the need for more training and education specific to CP and to the use of research findings in clinical practice. Wide variations and gaps were identified in therapists' responses suggesting the need for a basic standard of PT and OT management as well as strategies to encourage knowledge dissemination regarding current best practice. Further, implementation of evidence-based practice necessitates more collaboration between researchers, clinicians and administrators.

ABRÉGÉ

Fond et raisonnement: La paralysie cérébrale (PC) est l'un des déficits neurologiques les plus communs chez les enfants et constitue une partie importante de la réadaptation pédiatrique. Cette atteinte requiert une réadaptation complète, faisant appel à des tâches et des activités appropriées à l'âge de l'enfant et englobant les fonctions physiques et structurelles, l'activité et la participation sociale, ainsi que les facteurs personnels et environnementaux. On en sait peu sur les pratiques actuelles des ergothérapeutes et physiothérapeutes qui travaillent auprès de cette clientèle.

Objectif: Le principal objectif de cette thèse de doctorat est de décrire les pratiques des ergothérapeutes et physiothérapeutes travaillant avec les jeunes enfants atteints de paralysie cérébrale (PC), au Québec (Canada).

Méthodes: Dans cette étude transversale multicentrique, les ergothérapeutes et physiothérapeutes spécialisés en pédiatrie admissibles et intéressés à participer ont été interrogés au cours d'une entrevue téléphonique structurée, basée sur deux histoires de cas clinique représentatives d'enfants atteints de PC de 18 mois et de 4 ans. Les pratiques rapportées ont été groupées selon la classification internationale du fonctionnement, de l'incapacité, et de la santé (CIF). Une recension des écrits portant sur les évaluations et les interventions pédiatriques utilisées pour la PC a été faite afin de déterminer la force des

iv

données probantes quant a l'efficacité de celles-ci. De plus, deux groupes d'experts ont identifié les problèmes et les interventions pour les deux vignettes en se basant sur les meilleures pratiques.

Résultats: un total de 62 des physiothérapeutes (taux de participation 83.8%) et 85 des ergothérapeutes (taux de participation 91.4%) ont participé à cette étude. 91,9% des physiothérapeutes et 67.1% des ergothérapeutes ont rapporté utiliser au moins une évaluation pédiatrique standardisée. Les interventions d'ergothérapie et de physiothérapie se concentrent principalement sur des déficits et incapacités. Les catégories de professionnels accordent peu d'importance aux interventions liées au jeu et au loisir. Les cliniciens rapportent nécessiter davantage de formations et d'enseignement spécifiques à la PC et à l'utilisation des résultats de recherches scientifique dans la pratique clinique. Une grande variabilité et certaines lacunes ont été identifiées dans les réponses des thérapeutes suggérant un besoin de gestion de base standard en ergothérapie et physiothérapie, ainsi que des stratégies pour encourager la diffusion des connaissances relatives aux meilleures pratiques actuelles. De plus, l'application des données probantes rend nécessaire la collaboration entre les chercheurs, les cliniciens et les administrateurs.

v

STATEMENT OF AUTHORSHIP

I certify that I am the primary author of the manuscript contained in this thesis. I claim full responsibility for the content and style of the text included herein.

ACKNOWLEDGMENTS

Through out my training, I have been most fortunate to have been surrounded by many individuals who; with their knowledge, generosity, help and support; have made this thesis enriching and enjoyable experience for me. The emotional and psychological support I received by these individuals while undertaking this challenge is invaluable.

First and foremost I wish to express my utmost gratitude and appreciation to my co-supervisors, Dr. Nicol Korner-Bitensky and Dr. Laurie Snider who both made this experience remarkable and exceptional. To both of them, I give my sincere gratefulness for their supervision, patience, guidance and tremendous support.

Nicol has been consistently giving me constructive feedback with encouragement and patience throughout the completion of this research project. Her vision, leadership, and support have helped me to grow both personally and professionally.

Laurie thank you for your expertise, guidance and encouragement which were instrumental in carrying out and completing this research. I thank you for always having believed in me and supporting me through out my training.

I would like gratefully acknowledge my committee members who have been so generous in sharing their knowledge and expertise: Dr. Francine Malouin for her guidance, expertise and her critical appraisal of my work; Dr. Barbara

vii

Mazer, for her support and insightful feedback; Eileen Kennedy, for her expertise and continuous involvement in all phases of this project. I was very fortunate to have had a thesis committee whose commitment and support have helped me achieving my goals.

I would like to express my sincere gratitude to the wonderful McGill research team for their precious assistance in carrying out this project. My thanks extend to all interviewers who help making this project possible. Special thanks to Marc-André Roy and Geoffroy Hubert, for their dedication and sincere help with the phone interviews and coding of therapists' responses. It was a pleasure working with them. I wish also to thank Dr. Julie Lamoureux for the data analysis and Lioudmila Khomenko for her help in creating the database.

I'm indebted to each and every physical therapist and occupational therapist who participated in this survey. I gratefully acknowledge their devotion and time which made this thesis possible.

My appreciation is also extended to those who financed this study. The Quebec Rehabilitation Research Network: (REPAR) and the Cerebral Palsy Axis of the Réseau de recherche sur le développement, la santé et le bien-être de l'enfant (RDSBE) du Fonds de la recherche en Santé du Québec (FRSQ). I'm very grateful for the scholarship awarded to me from the University of Jordan.

This achievement would not have been possible without the loving support and presence of family and close friends. Very special thanks goes to my parents, my sister and brothers who have always believed in me, always supported and encouraged me and always took such a pride in my accomplishments. I would also like to acknowledge the support of my loving husband throughout all the steps of this doctoral completion. Thanks for all his emotional support, compassion, encouragement and trust in myself and in my ability to complete this doctorate degree.

I also wish to extend my thanks to my close friends for their continuous support, encouragement and understanding throughout this journey.

Finally, I wish to give my thanks to the wonderful source of distraction, enjoyment, laughter and inspiration in my life; my children Zaid, Basil, and Qais. My passion and love for them was the greatest motivation behind my work and to them I dedicate this thesis.

PREFACE

Thesis format

According to the 'Guidelines for Thesis Preparation' prepared by the Faculty of Graduate Studies and Research, McGill University, a manuscriptbased format that contains original paper has been selected in the present thesis.

CHAPTER 1 provides a general introduction and a brief overview of this doctoral thesis.

CHAPTER 2 is a review of the existing literature in cerebral palsy (CP). The first section provides an overview of the definition and diagnosis of CP, clinical presentation and classification and associated disorders. It also describes risk factors and prevalence of CP among CP registers. The second section describes the wide range of health care services involved in the management of CP, with a special emphasis on the occupational therapy (OT) and physical therapy (PT) services for individuals with CP. The third section provides a brief description of the different theories and conceptual frameworks guiding OT and PT management for CP. The forth and fifth sections present an overview of pediatric assessments and interventions that are potentially used by occupational therapists (OTs) and physical therapists (PTs) for children with CP. The sixth section introduces the concept of Evidence-Based Practice (EBP) and section seven reviews studies which examine OTs' and PTs' attitudes towards EBP. Section eight provides a review of the literature on actual OT and PT practices for CP.

CHAPTER 3 provides the rational and objectives of the study.

CHAPTER 4 describes in full details the methodology of this study including research design, the systematic review of CP literature, the development of the clinical vignettes and the study questionnaire, the interview procedure, and data management and analyses.

CHAPTER 5 contains the manuscript of the paper to be submitted for publication. The paper describes the survey of all pediatric OTs and PTs working with young children with CP in the Province of Quebec, Canada. The manuscript includes sections of abstract, introduction, methods, results and discussion.

CHAPTER 6 provides summary of the main research findings with a general discussion and a statement of contribution to original knowledge. It also describes clinical relevance and implications of these findings as well as study limitations, and future directions.

The references for chapters 1-4 and 6 are compiled at the end of the thesis, followed by appendices containing various resources supplementing the main body of this thesis.

CONTRIBUTION OF AUTHOURS

The following manuscript is included in the thesis:

Saleh M., Korner-Bitensky N., Snider L., Malouin F., Mazer B., Kennedy E., Roy M-A (2007). Actual versus best practices for young children with cerebral palsy: a survey of pediatric occupational therapists and physical therapists in Quebec, Canada. Submitted to Developmental Neurorehabilitation Journal.

All of the work contributing to this thesis, including writing of the proposal for institutional scientific and ethical approval; construction of the study questionnaire; coordination of data collection; coordination and participation in the systematic review of cerebral palsy literature, coordinating experts groups and finalizing lists of best practice problem identification and interventions; preparing data for analyses, coding of practices according to the International Classification of Functioning, Disability and Health (ICF) and manuscript writing were carried out by the candidate. Technical assistance was provided by Marc-André Roy, and statistical analyses by Dr. Julie Lamoureux. This thesis proceeded under the direct supervision of the candidate's supervisors: Dr. Nicol Korner-Bitensky and Dr. Laurie Snider. The candidate is the primary author of the manuscript contained in this thesis and claims responsibility for the style and contents herein.

The manuscript describes the survey conducted in 2004, of all pediatric OTs and PTs working with children with CP in the province of Quebec, Canada.

xii

All results of the survey are included in the manuscript. The candidate developed the questionnaire in English, based on questionnaire used in previous studies (Korner-Bitensky et al., 2004; Mikhail, Korner-Bitensky, Rossignol, & Dumas, 2005). The candidate also participated in focus groups that created the study vignettes, coordinated data collection, participated in coding and administration of data in database, and prepared data for analyses. The candidate also prepared all tables and figures in the manuscript, performed and summarized the review of pediatric assessments and interventions for CP, as well as prepared experts lists of best practices for the study vignettes. The candidate prepared and wrote the manuscript under the direct supervision of the candidate's supervisors Dr. Nicol Korner-Bitensky and Dr. Laurie Snider. The co-authorships of N. Korner-Bitensky, L. Snider, F. Malouin, B. Mazer, E. Kennedy and M-A. Roy reflect their contribution to the work of the manuscript. N. Korner-Bitensky and L. Snider provided direct supervision to the candidate. N. Korner-Bitensky helped in the focus groups; gave her insightful comments on data analyses, the presentation and interpretation of results; and gave her input to the manuscript. L. Snider helped in the focus groups, the experts' group lists of best practices, and reviewed and gave her input on coding of practices according to ICF. She also contributed in the interpretation of the findings and reviewed the manuscript. F. Malouin participated in the focus group, the experts group and reviewed the manuscript. B. Mazer participated in the experts group, and gave her input to the

xiii

manuscript. E. Kennedy participated in the focus group and the experts group, and reviewed the manuscript. M-A Roy helped in the translation and validation of the study questionnaire. He also helped in study coordination, pilot testing of the questionnaire, interviews and coding of therapists responses. He also gave his input to the manuscript.

......

TABLE OF CONTENTS

ABSTRACTii
ABRÉGÉiv
STATEMENT OF AUTHORSHIPvi
ACKNOWLEDGMENTSvii
PREFACEx
CONTRIBUTION OF AUTHOURS
TABLE OF CONTENTS
LIST OF APPENDICESxviii
LIST OF TABLES
LIST OF FIGURESxx
LIST OF ABBREVIATIONSxxi
CHAPTER 1: GENERAL INTRODUCTION1
CHAPTER 2: LITERATURE REVIEW
2.1 Cerebral palsy
Definition and diagnosis
Clinical presentation, classification and associated disorders
Risk factors and prevalence9
2.2 Management of CP 12
2.3 Theories and conceptual frameworks guiding OT and PT practice 14
Neurophysiological theory
Motor learning theory17
The dynamic systems theory18
Family-centered approach21
The International Classification of Functioning, Disability and Health (ICF)
2.4 Assessments for children with CP23
2.5 Interventions used for CP27
Neurodevelopmental treatment (NDT)27
The Vojta method
Sensory integration therapy
Functional/task-oriented exercises
2.6 Evidence-Based Practice (EBP)
2.7 Physical therapists and occupational therapists attitudes towards
evidence-based practice
2.8 Actual OT and PT practices for CP 42
CHAPTER 3: STUDY RATIONALE AND OBJECTIVES

General objective	54
Specific objectives	54
CHAPTER 4: METHODOLOGY	
4.1 Research design	55
4.2 Subjects	55
4.3 Procedures	56
Development of the vignettes	56
The telephone-interview questionnaire	57
Tracing procedures	60
Interviewing procedures	61
The interview process	63
4.4 Data management and analyses	63
Best practice identification	64
Systematic review of the literature	66
Data analyses	68
CHAPTER 5: Manuscript	71
General introduction	71
Actual versus best practices for young children with cerebral palsy	74
1. Introduction	80
 Introduction 2. Methods 	80 84
 Introduction Methods Subjects 	80 84 84
 Introduction Methods Subjects Procedures 	
 Introduction Methods Subjects Procedures Data management 	
 Introduction Methods Subjects Procedures Data management Data analyses 	80 84 84 85 90 93
 Introduction Methods Subjects Procedures Data management Data analyses Results 	80 84 84 85 90 93 93 95
 Introduction Methods Subjects Procedures Data management Data analyses Results Clinicians' characteristics 	80 84 84 85 90 93 93 95 95
 Introduction Methods Subjects Procedures Data management Data analyses Results Clinicians' characteristics Problem identification, assessment and intervention use 	80 84 84 85 90 93 93 95 95 95 96
 Introduction Methods Subjects Procedures Data management Data analyses Results Clinicians' characteristics Problem identification, assessment and intervention use Best practice use 	80 84 84 85 90 93 93 95 95 95 96 90
 Introduction Methods Subjects Procedures Data management Data analyses Results Clinicians' characteristics Problem identification, assessment and intervention use Best practice use Factors related to the use of standardized assessments. 	80 84 84 85 90 93 93 95 95 95 95 96
 Introduction	80 84 84 85 90 93 93 95 95 95 96 100 101 102
 Introduction Methods Subjects Procedures Data management Data analyses Results Clinicians' characteristics Problem identification, assessment and intervention use Best practice use Factors related to the use of standardized assessments Duration and frequency of intervention Referrals and treatment goals 	
 Introduction Methods Subjects Procedures Data management Data analyses Results Clinicians' characteristics Problem identification, assessment and intervention use Best practice use Factors related to the use of standardized assessments Duration and frequency of intervention Referrals and treatment goals Desired intervention use and treatment intensity 	80 84 84 85 90 93 93 95 95 95 95 96 100 101 102 103 103 104
 Introduction Methods Subjects Procedures Data management Data analyses Results Clinicians' characteristics Problem identification, assessment and intervention use Best practice use Factors related to the use of standardized assessments Duration and frequency of intervention Referrals and treatment goals Desired intervention use and treatment intensity Barriers and enablers of EBP 	80 84 84 85 90 93 93 95 95 95 95 96 100 101 102 103 103 104 105
 Introduction Methods Subjects Procedures Data management Data analyses Results Clinicians' characteristics Problem identification, assessment and intervention use Best practice use Factors related to the use of standardized assessments Duration and frequency of intervention Referrals and treatment goals Desired intervention use and treatment intensity Barriers and enablers of EBP Discussion 	
 Introduction	80 84 84 85 90 93 93 95 95 95 95 95 96 100 101 102 103 104 105 106 107
 Introduction	80 84 84 85 90 93 95 95 95 95 95 95 96 100 101 102 103 104 105 106 107 109

•••.

Desired intervention use and treatment intensity	111
Referrals and treatment goals	112
Barriers and enablers of EBP	112
Study limitations	114
Conclusion	114
References	116
CHAPTER 6: GENERAL DISCUSSION	151
Study limitations	157
Conclusion	158
LIST of REFERENCES	

.

LIST OF APPENDICES

Appendix A:Gross Motor Function Classification System (birth to 4 years old)	175
Appendix B: Most common pediatric assessments in CP literature	177
Appendix C: Overview of ICF	182
Appendix D: PEDro scale	183
Appendix E: Levels of evidence	184
Appendix F: Clinical vignettes	186
Appendix G: Study questionnaire	194
Appendix H: Evidence of effectiveness of rehabilitation interventions for CP	221
Appendix I: Experts' best practice problem identification list	224
Appendix J:Experts' best practice treatment interventions list	227
Appendix K: Ethical certificates	229

LIST OF TABLES

÷.,

.....

Table 1: Characteristics of occupational therapists and settings	129
Table 2: Characteristics of the physical therapists and settings	131
Table 3: Common typical referrals for other services recommended by clinicians	144
Table 4: Clinicians' desired processes and interventions	148

LIST OF FIGURES

---.,

Figure 1A: Practices reported by occupational therapists for an 18-month old child with
hemiplegia
Figure 1B: Practices reported by occupational therapists for a 4-year old child with hemiplegia.
Figure 2A: Practices reported by occupational therapists for an 18-month old child with
quadriplegia134
Figure 2B: Practices reported by occupational therapists for a 4-year old child with quadriplegia
Figure 3: Occupational therapists' use of standardized assessments136
Figure 4A: Practices reported by physical therapists for 18-month old with hemiplegia138
Figure 4B: Practices reported by physical therapists for 4-year old with hemiplegia139
Figure 5A: Practices reported by physical therapists for 18-month old child with quadriplegia140
Figure 5B: Practices reported by physical therapists for 4-year old child with quadriplegia141
Figure 6: Physical therapists' use of standardized assessments142
Figure 7: The most prevalent goals indicated by occupational therapists145
Figure 8: The most prevalent goals indicated by physical therapists146
Figure 9: The top three barriers to desired use of interventions among occupational therapists and
physical therapists149
Figure 10: The top three enablers of evidence based practice

LIST OF ABBREVIATIONS

ADLs	Activities of daily living
AIMS	The Alberta Infant Motor Scale
ΑΟΤΑ	American Occupational Therapy Association
BFMF	Bimanual Fine Motor Function.
BOTMP	Bruininks-Oseretsky Test of Motor Proficiency
CIT	Constraint-induced therapy
CNS	Central nervous system
СР	Cerebral palsy
CRIR	Centre de recherche interdisciplinaire en réadaptation
DST	The Dynamic Systems Theory
DTVP	Developmental Test of Visual Perception
EBP	Evidence-based practice
EDPA	Erhardt Developmental Prehension Assessment
GMFCS	The Gross Motor Function Classification System
GMFM	The Gross Motor Function Measure

21**1** N.

- ICF The International Classification of Functioning, Disability and Health
- MACS The Manual Ability Classification System
- MAI The Movement Assessment of Infants
- MAP Miller Assessment for Preschoolers
- MVPT Motor-free Visual Perception Test
- NDT Neurodevelopmental treatment
- OEQ *l'Ordre des ergothérapeutes du Québec*
- OPPQ *l'Ordre Professionnel de la Physiothérapie du Québec.*
- OTs Occupational therapists
- OT Occupational therapy/therapist
- PDMS The Peabody Developmental Motor Scales
- PEDI The Pediatric Evaluation of Disability Inventory
- PEDro Physiotherapy Evidence Database
- PNF Proprioceptive neuromuscular facilitation
- PTs Physical therapists

PT Physical therapy/therapist

- RCTs Randomized clinical trials
- SCPE The Surveillance of Cerebral Palsy in Europe
- SLP Speech language pathology/ pathologist
- VLBW Very low birth-weight
- VMI Developmental Test of Visual-Motor Integration
- WeeFIM The pediatric Functional Independence Measure
- WHO World Health Organization

.....

CHAPTER 1: GENERAL INTRODUCTION

Children with cerebral palsy (CP) represent one of the most frequently treated client groups in pediatric rehabilitation centers (Dzienkowski, Smith, Dillow, & Yucha, 1996; Steultjens et al., 2004). The condition is associated with variable combinations of motor, cognitive, vision, hearing, speech, language, and learning impairments (Dzienkowski et al., 1996; Scherzer & Tscharnuter, 1982). As a result of these chronic multiple impairments, affected children typically present with functional disabilities and lifelong limitations in social participation (Rosenbaum, 2003); highlighting the need for comprehensive, multidimensional and multidisciplinary care for them and their families. Rehabilitation specialists (including occupational therapists, OTs and physical therapists, PTs) are key members in the health care team caring for CP and play an important role in the lifelong care of these children, therefore, they are constantly challenged to offer evidence based practice (EBP) and to be accountable for their treatments. In the light of the recent advances in neurobiology, innovations in neuromotor theories and changes in the disability models; rehabilitation specialists are constantly asked to revisit their approach to CP (Rosenbaum, 2003). Indeed, CP literature is growing with more studies being conducted to examine the effectiveness of different rehabilitation interventions for children with CP (Siebes, Wijnroks, & Vermeer, 2002). While the use of research findings in clinical practice, is expected to improve client care, advance the profession and

strengthen therapists' professional image (Brown & Rodger, 1999); it is not clear from the existing literature what a typical young child with CP may actually receive in terms of occupational therapy (OT) and physical therapy (PT) practices, what factors affect treatment choices, and how close these practices are to EBP. Therefore, the purpose of this multi-centered, cross-sectional study was to examine the different assessment and treatment practices used by OTs and PTs in the management of young children with CP in the province of Quebec, Canada. In addition, these practices were compared with the currently available evidence for 'best practice'.

This doctoral thesis will proceed by reviewing the literature on CP, including the definition of CP, the clinical presentation and associated disorders. Management of CP with particular emphasis on OT and PT approaches is also described. The rationale for conducting this study and the study objectives will be outlined. The methodology and the manuscript of the study will follow. Finally, a summary of the main findings, clinical relevance, limitations and future directions, will be presented.

CHAPTER 2: LITERATURE REVIEW

In this section, a description of the condition of CP and its worldwide prevalence is presented. In addition, the major motor manifestations and other associated problems are described. Next, an overview of typical North American services provided to these children is presented, with a special focus on OT and PT. Then, the main theoretical frameworks influencing OT and PT practices for children with CP are touched upon. The concept of EBP is then explained with its application to OT and PT. Finally, studies examining actual OT and PT practices for children with CP are reviewed.

2.1 Cerebral palsy

Definition and diagnosis

Historically, it has been a challenge to define CP. The classical definition -"a disorder of movement and posture due to a defect or lesion of the immature brain" (Bax, 1964) - described CP as being mainly a motor problem. A more recent definition of CP by Mutch et al. - "an umbrella term covering a group of non-progressive, but often changing, motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stages of development" (Mutch, Alberman, Hagberg, Kodama, & Perat, 1992), also emphasized the motor impairment as the main feature of CP. However, other associated impairments experienced by children with CP (such as sensory, behavioural, cognitive and/or perception impairments) were overlooked by these two early definitions. Indeed, the functional limitations experienced by individuals with CP are related to overall central nervous system (CNS) dysfunction and not only to movement disorders. Therefore, a more comprehensive definition has recently been proposed by the International Workshop on Definition and Classification of Cerebral Palsy (Bax et al., 2005). Guided by more contemporary perspectives on health (i.e.: impairments, functional activities and participation. (See section 2.3), and in light of advances in the understanding of the development of infants with brain damage; the group revisited the classical definition and classification of CP and proposed the following definition:

Cerebral palsy (CP) describes a group of disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and/or behavior, and/or by a seizure disorder. (Bax et al., 2005) p572

This definition recognizes the multidimensional impact of motor impairments and the secondary activity limitation. In addition, it places an emphasis on other accompanying disorders such as intellectual disability, epilepsy, and attention difficulties that can seriously affect functional activity and participation in the affected child.

The diagnosis of CP does not specify a particular etiology or pathology, but rather, is established through clinical examination of the motor skills of the child, medical history as well as other diagnostic tests in order to exclude other neurological diseases and/or hereditary conditions (Shevell & Bodensteiner, 2004; Surveillance of Cerebral Palsy in Europe, 2000). However, diagnosis of CP is complicated by the immaturity and plasticity of the developing brain that results in a constantly changing clinical presentation. Therefore, while severely affected infants with CP may be diagnosed within the first months of life, the mildly affected child may not have a confirmed diagnosis until three-to-four years of age (Dzienkowski et al., 1996). Thus, infants who present with signs of developmental delays or who are at high risk for CP need to be regularly followed up. Children with a recognized syndrome, chromosome anomaly, metabolic disorder or degenerative disorder of the CNS and who present with motor impairments cannot be diagnosed with CP (Bax et al., 2005; Shevell & Bodensteiner, 2004).

Clinical presentation, associated disorders and classification

Clinical manifestations of CP vary markedly depending on the location, extent and character of the brain lesion (Dzienkowski et al., 1996). The major neuromuscular and musculoskeletal abnormalities include spasticity, excessive co-activation of antagonistic muscles, movement incoordination, muscle contractures, muscle weakness, inappropriate timing of muscle activation, and bony deformities (Chambers, 2002; Gormley, 2001). In addition, children with CP

usually have problems with balance which may interfere with their overall level of functioning including ambulation and daily living routines (Chambers, 2002; Gormley, 2001).

Associated disorders include: seizures (reported in 25-35% of children with CP), intellectual impairment including mental retardation (50-70%), and sensory deficits of the upper extremities (97%). In addition, visual problems such as strabismus, amblyopia, myopia, nystagmus, and blindness are found in 50% of children (Dzienkowski et al., 1996). Furthermore, depression and emotional problems are not uncommon (Dzienkowski et al., 1996; Scherzer & Tscharnuter, 1982). Other problems include expressive and receptive language impairments, learning and perception disorders, gastrointestinal and feeding problems with risk of aspiration, and poor linear growth (Chambers, 2002; Dzienkowski et al., 1996). Respiratory problems may result from immobility, restrictive posturing and the inability to clear secretions (Dzienkowski et al., 1996).

The traditional classification of CP is based on the distribution of body parts affected: hemiplegia (limbs on one side of the body are mostly involved), diplegia (the two lower limbs are mostly involved), and quadriplegia (the four limbs are almost equally involved) (Surveillance of Cerebral Palsy in Europe, 2000) . However, individuals with CP who have a predominant disability on one side of the body (hemiplegia) or in both lower limbs (diplegia) usually have mild motor disability on the 'non-affected' part(s) of the body. Therefore, in many

instances, the distinction between these classifications may be difficult (Himmelmann, Beckung, Hagberg, & Uvebrant, 2006).

Usually, a modifier to the classification term is added to describe the predominant type of muscle tone such as: spastic (increased muscle tone and persistence of pathological reflexes), dyskinetic (involuntary, uncontrolled, recurring, occasionally stereotyped movements), or ataxic (loss of orderly muscular coordination) (Bax et al., 2005; Chambers, 2002; Surveillance of Cerebral Palsy in Europe, 2000). Other qualifiers describing the severity of motor impairment include: mild (minimal functional limitation), moderate (diminished use of the most affected limb), and severe (lack of any functional use of the most affected limb) (Wu, Croen, Shah, Newman, & Najjar, 2006).

Classification systems cannot be considered reliable unless they are operationally defined. Therefore, standardized classification schemes covering different dimensions related to CP such as motor abnormalities, functional motor abilities, and associated disorders (Bax et al., 2005) are needed. Indeed, reliable classification systems will allow health care professionals to identify the problem and its severity, predict the current and future services needed, compare series of cases of CP in different places, and evaluate change over time within the same individual (Bax et al., 2005; Himmelmann et al., 2006). The Surveillance of Cerebral Palsy in Europe (SCPE) guideline provides a system of classification with operational definitions of each subtype of CP (Himmelmann et al., 2006;

Surveillance of Cerebral Palsy in Europe, 2000). In addition, the guide classifies spastic CP into unilateral or bilateral CP according to whether one side or both sides of the body are involved. This classification helps to eliminate confusion and variation in the classification of quadriplegia and diplegia among clinicians and researchers. The guideline also operationally defines the terms describing muscle tone and motor disability (Surveillance of Cerebral Palsy in Europe, 2000). However, this guideline does not describe the child's functional status or other associated disorders.

Many classifications related to functional motor abilities have been developed recently. The Gross Motor Function Classification System (GMFCS) (Palisano et al., 1997), classifies children with CP into five functional levels according to their abilities and limitations in functional mobility. The GMFCS has a good interrater reliability of 0.75, and established content and predictive validity (Palisano et al., 1997; Palisano et al., 2000). See Appendix A for the description of the different levels of the GMFCS at two age intervals.

A parallel classification scale, the Bimanual Fine Motor Function (BFMF) Scale, has very recently been developed to correlate to the levels of the GMFCS (Beckung & Hagberg, 2002; Himmelmann et al., 2006). While a strong correlation of 0.74 between the two scales was found (p< 0.0001) (Beckung & Hagberg, 2002), the BFMF still needs further validation.

The Manual Ability Classification System (MACS) has been developed to classify how children with CP use their hands when handling objects in daily activities (Eliasson et al., 2006). The MACS has been shown to have good construct validity of classifying manual ability of children with CP and excellent interrater reliability between therapists and between therapists and parents (Intraclass Correlation Coefficient: 0.97 and 0.96 respectively).

Risk factors and prevalence

Currently, we do not have a full understanding of causal pathways and mechanisms underlying CP (Bax et al., 2005; Wu et al., 2006). As CP is recognised as a heterogeneous group of brain disorders, it may have several potential risk factors and causal pathways. Wu et al (2006) used neuroimaging to define the type of underlying brain injury and demonstrated that different subgroups of CP had different profiles in terms of risk factors.

CNS injury resulting in CP can occur pre, peri, or post-natally (Scherzer & Tscharnuter, 1982; Siebes et al., 2002; Stanley, Blair, & Alberman, 2000). Prenatal events include: congenital brain malformations, maternal bleeding, exposure to radiation or environmental toxins, and intrauterine infection. Perinatal events that potentially lead to CP include: prematurity, asphyxia, and breech presentation. Common postnatal factors consist of: very low birth weight (less than 1,500 grams), head trauma and CNS infection (Dabney, Lipton, & Miller, 1997; Dzienkowski et al., 1996).

The risk of CP among live births is 1.5-3.0 per 1000 live births as reported by CP registers worldwide (Paneth, Hong, & Korzeniewski, 2006; Surveillance of Cerebral Palsy in Europe, 2000). In addition, preterm survivors with birth weights less than 1500g show a higher occurrence: 32.7-83.7 per 1000 live births (Olney & Wright, 2000; Stanley et al., 2000).

Two recent studies have examined the prevalence of CP in two different areas: one in the West of Ireland (Mongan, Dunne, O'Nuallain, & Gaffney, 2006), the other in Nova Scotia, Canada (Vincer et al., 2006). Mongan et al (Mongan et al., 2006) described the establishment of a CP register in the West of Ireland and presented retrospective data on the epidemiology of CP in the region from 1990-1999. They used the guidelines of the SCPE (2000) to guide their inclusion and exclusion criteria. Only children who were at least 5 years of age at the time of data collection and whose mothers were resident in the region at the time of birth were included. Prevalence of CP was examined for the total number of neonatal survivors and for a specific high-risk group, namely very low birth weight (VLBW) with birth weight < 1500g. Prevalence of CP was found to be 1.88 per 1000 neonatal survivors. Birth-weight-specific prevalence of CP was 39 for birth weights less than 1500g, 8.2 for birth weights 1500 to 2500g and 1.3 for birth weights greater than 2500g per 1000 neonatal survivors.

The study of Vincer et al (Vincer et al., 2006) in Nova Scotia, Canada used different criteria to identify the prevalence of CP among very preterm infants in

the province over two 5-year periods: 1993-1997 and 1998-2002. Their definition of cohorts of high-risk infants was based on gestational age (24-30 weeks' gestational age) rather than the VLBW criteria generally used in European registers (Surveillance of Cerebral Palsy in Europe, 2000). Further, they followed surviving infants up to 24 months' corrected gestational age as opposed to SCPE guidelines which state that the child should be at least 4 years old (when the diagnosis of CP is usually confirmed) to be included in a CP registry. A comparison between the two time periods showed significant decline in very preterm infant mortality between 1993 and 2002 (p=0.003) with significant increase in CP prevalence (p=0.002). Prevalence of CP among the very preterm infant was 44.4 per 1000 live births in 1993 and increased to 100 per 1000 live births in 2002. The increase in the prevalence of CP was also significant when the sample was restricted to neonatal survivors.

Obviously, the results of the two above-mentioned studies are not comparable due to the differences in the definition of high-risk infants and in the inclusion and exclusion criteria. Indeed, reaching a consensus over the definition of CP, age of inclusion, and the different classifications and subtypes of CP will allow comparisons among the prevalence of CP in different regions and monitoring of the trends and variations in the high-risk-specific prevalence of CP. Once agreement on guidelines for CP registers worldwide is established,

databases are expected be useful for CP research on the etiology of CP and on the impact of health care changes on its prevalence.

2.2 Management of CP

The diverse range of problems, as well as the complex and chronic nature of the multiple impairments encountered in CP, have a substantial impact on the functional level and quality of life of the child (Rosenbaum, 2003). In addition, a considerable burden on the affected families has been reported, as even children with mild symptoms may experience serious problems regarding social and emotional adjustments (Scherzer & Tscharnuter, 1982; Wanamaker & Glenwick, 1998). Typically, families seek a wide range of health care services in order to find timely, simple, and effective therapy (Adams & Snyder, 1998).

Obviously, CP cannot be cured; therefore, management usually focuses on care of the affected child and family. It involves a collaboration of a multidisciplinary team that includes neurologists, orthopedic surgeons, gastroenterologists, nurses, rehabilitation specialists, dietitians, psychologists, and special educators (Dzienkowski et al., 1996).

Pharmacological interventions (i.e. oral medications, neurolytic blockers) are typically used for the treatment of seizures, muscle spasticity, and gastrointestinal problems (Dzienkowski et al., 1996; Gormley, 2001). Neurosurgery (i.e. selective dorsal rhizotomy, pump implantation for the administration of intrathecal baclofen), and orthopedic surgery (i.e. soft-tissue
lengthening, bony fusions and derotation osteotomy) may be indicated to correct dynamic or fixed deformities, balance muscle power in agonist/antagonist muscles, and/or stabilize uncontrollable joints (Chambers, 2002; Dzienkowski et al., 1996; Gormley, 2001; Patrick, Roberts, & Cole, 2001). Supportive services such as social services, counselling, respite care for parents, educational and vocational programs for the adolescent or young adult with CP and transportation services vary across different geographical locations and according to the amount of available funding (Dzienkowski et al., 1996). Interventions by speech language pathologists (SLP) aim at enhancing verbal and non-verbal communications and may also play a role for children affected by dysphagia (Dzienkowski et al., 1996). OT and PT services, which are the main focus of this thesis, are described in detail below.

OTs and PTs are core members of the health care team involved in the management of children with CP. Service provision includes: screening and assessment, intervention, case management, consultation, inter-agency collaboration, and advocacy (Adams & Snyder, 1998). OTs and PTs provide differing services to children with CP and their families but typically work in close collaboration. Generally, OT interventions seek to enhance occupational performance by establishing a 'best fit' between the child and the environment (Steultjens et al., 2004; Stewart & Neyerlin-Beale, 1999). More specifically, these interventions may be aimed at enhancing oral motor function, visual-perception,

activities of daily living (ADLs) and instrumental activities of daily living (IADLs). PTs commonly address impairments in posture, mobility and ambulation (Barry, 1996; Campbell, Vander Linden, & Palisano, 2006; Olney & Wright, 2000). They usually use exercises to improve muscle strength and endurance, joint range of motion as well as balance and postural control. Both OTs and PTs assist the child and the family in learning how to use mobility devices and adaptive and seating equipment to enhance function, promote independence and prevent deformity (Dzienkowski et al., 1996). Typically, a combination of splints, serial casting and range of motion exercises are used by both disciplines to prevent or reduce contractures and improve functioning (Gormley, 2001).

OT and PT practices and the emphasis placed on specific interventions have differed from one era to another and are largely influenced by the different theories explaining motor development. Indeed, several assessments and treatment approaches have directly grown out of these different theories.

2.3 Theories and conceptual frameworks guiding OT and PT practice

Many theories attempt to explain motor development and the abnormalities associated with CP. Each theory makes assumptions about how the CNS controls movement in children with CP. In this section, a brief overview of the main theories and conceptual frameworks that have been guiding OT and PT practice is presented.

Neurophysiological theory

Neuromaturational /neurophysiological theory has guided PT and OT treatments for many years. This includes the work of the Bobaths (Bobath & Bobath, 1975; Bobath, 1980), Rood (Rood, 1956), Fay (Fay, 1954), and Kabat, Knott and Voss (Knott & Voss, 1963), whose intervention approaches shared common assumptions based on the neurophysiological theory. These assumptions formed the *facilitation model* of rehabilitation. This model assumes that different muscles are linked together in 'movement patterns'. Therefore, in order to produce skilled movements, the brain controls whole movements not just individual muscles. Thus, a lesion in a specific area of the CNS will lead to abnormal movement patterns, rather than to paralysis or weakness of individual muscles (Bobath & Bobath, 1975; Bobath, 1980; Gordon, 2000).

Therapeutic approaches based on this model assume that normal movement patterns can be facilitated through the continuous application of sensory stimulation to produce permanent changes in the CNS (Gordon, 2000). In addition, maturation of motor skills is presumed to follow a hierarchical order of the CNS in which lower centers of the CNS (e.g. spinal cord and mid brain) control simpler function (e.g. reflexes), while higher centers (e.g. the cortex) control complex functions (e.g. skilful movements). As the CNS matures, higher centers of the CNS inhibit lower centers, and dominate behavior so that refined and coordinated movements replace reflexive immature movement patterns

(Bobath & Bobath, 1975; Bobath, 1980). Therefore, a lesion of higher centers leads to loss of inhibitory control of lower centers. The affected individual moves at a more primitive level, with a concomitant inability to inhibit automatic movements and primitive reflexes (Adams & Snyder, 1998; Case-Smith, 1996; Case-Smith & Rogers, 1999). Treatment is focused on regaining the inhibitory control of higher centers. Recovery is thought to occur in a predictable fashion that follows the normal developmental sequence (Gordon, 2000). This last assumption has led, at times, to rigid application of a developmental sequence when performing therapeutic exercises with children.

Examples of therapeutic approaches that are based on the neuromaturational perspective are: neurodevelopmental treatment (NDT) (Bobath & Bobath, 1975; Bobath, 1980), proprioceptive neuromuscular facilitation (PNF) (Knott & Voss, 1963), sensory-integration therapy (Bumin & Kayihan, 2001; Cohn, 2001), and Vojta therapy (Bauer, Appaji, & Mundt, 1992; Brandt et al., 1980; Jones, 1975) (these interventions are briefly described in section 2.5).

Assessments based on this theory examine tone, primitive reflexes, postural and righting reactions, and voluntary movement (Adams & Snyder, 1998; Case-Smith & Rogers, 1999). Assessment tools which address these constructs are thus helpful in the early diagnosis of motor impairment and in identifying whether the infant's performance is normal or abnormal. One example is the Movement Assessment of Infants (MAI) (Chandler, Andrews, & Swanson, 1980)

which was developed as a screening tool for infants to assess neurological integrity and to identify motor patterns that indicate the possibility of neurological impairment . This test assesses muscle tone, primitive reflexes, automatic reactions, and voluntary movements and organizes information in a manner that reflects the hierarchy of brain function (Chandler et al., 1980).

Overall, assessments based on neurophysiological theory focus on motor impairment but do not give a comprehensive picture of the infant's motor function and the variability of performance across environments and tasks. In contrast, more contemporary theories of neuromotor development, such as motor learning and dynamic systems theories (see next sections) have emphasized task-specific and functional perspectives which provide rich possibilities for the exploration of how the CNS controls movement.

Motor learning theory

This theory examines how the CNS controls movement in order to carry out a certain task (Gordon, 2000). According to this theory, the motor system holds a large number of degrees of freedom; meaning that a particular movement can be carried out by an infinite number of combinations of muscle actions. The CNS links together two or more degrees of freedom (muscles or joints), in a single unit. Then, it coordinates different joint movements in a synergy to produce a skilful motor task (Carr & Shepherd, 2000; Gordon, 2000).

The emphasis in a motor learning approach is on training individuals with neurological lesions to improve functional motor performance through learning or relearning (Carr & Shepherd, 2000). Therefore, this model stresses on use and experience through spending more time in daily practice and exercise in order to optimize function. A motor learning approach goes hand-in-hand with *task-specific exercise* and *training*, which emphasize the role of task and environment in motor development and learning and are thought to help in transferring treatment effects from the clinic into real life, thereby improving the effectiveness of motor performance.

The Dynamic Systems Theory

The Dynamic Systems Theory (DST), proposed by Thelen and colleagues (Thelen, 1989; Thelen, 1995; Thelen & Spencer, 1998), is another example of the influence of the task-specific approach. Similar to the neurophysiological theory, DST considers the contribution of the neuromotor system to the infant's development. However, it also considers the contribution of other subsystems. According to DST motor development is both task and context oriented and is the result of the interaction of multiple subsystems including sensory subsystems (somatosensory, visual, and vestibular) and motor subsystems (musculoskeletal, neuromuscular). The child is considered as an active, rather than passive, contributor to the movement through the use of anticipatory processes and adaptive mechanisms; that is, the planning and anticipation of movement before beginning the task and the adaptation of movement during the task to efficiently meet the demands of that task within a changing environment (Thelen & Spencer, 1998). For example, during walking, movement patterns can be modified to change direction or avoid obstacles (McFadyen, Malouin, & Dumas, 2001). Thus, normal development is explained by the active and dynamic interaction of systems in a task-specific context rather than the result of the unfolding of a series of hierarchically organized and predetermined reflexes and reactions within the CNS. Contextual factors that influence development include environmental, biomechanical, psychological and social factors.

DST, thus, supports treatment guidelines that promote interactions between child, task, and environmental variables within the context of functional activities. The emphasis is on child's ability to produce motor synergies that are flexibly assembled during play and movement within a variety of environments (Case-Smith, 1996; Case-Smith & Rogers, 1999; Darrah & Bartlett, 1995). Such treatment principles include: age-appropriate and goal-directed tasks (which emphasize how the person achieves the task rather than how movement is produce), practice (i.e. optimizing motor function by increasing time spent in daily practice and exercise and emphasizing on experience to produce changes in all body system), and transfer of learning (transfer of experience into real life situation) (Adams & Snyder, 1998). Recent studies have examined the application of these principles to children with motor disorders and disabilities

such as CP (Richards et al., 1997; Thorpe & Valvano, 2002; Valvano, 2004; Valvano & Newell, 1998; Van der Weel, Van der Meer, & Lee, 1991; Volman, Wijnroks, & Vermeer, 2002; Wann & Turnbull, 1993).

Assessments based on DST usually address three areas: 1) the individual's subsystems, 2) the environment, and 3) the task. The interaction between the child and the environment is analysed through naturalistic play opportunities. Postural alignment, base of support, center of gravity, and control of limbs against gravity are key aspects of motor control that are considered. In addition, the ability of child to make transitional movements between postures and positions, as well as the quality of these movements are emphasized. One example of an assessment that captures the construct put forth by the DST is the Alberta Infant Motor Scale (AIMS) (Darrah, Piper, & Watt, 1998). The AIMS is a standardized, normative evaluative observational measure intended to identify motor delays and evaluate motor development in infants (birth to 18 months). The infant is observed in an unobtrusive environment with minimal handling. The test is made up of items that describe postural control in different positions (e.g. prone, supine, sitting), and movement patterns (e.g. rolling, moving from sit to stand) (Darrah et al., 1998).See Appendix B.

Family-centered approach to service delivery

Family-centered service is a philosophy of care that recognises the family as a constant in a child's life. Therefore, it emphasizes the active involvement of the child and family in identifying functional problems and planning interventions that are meaningful to them, with the goal of building a partnership between the family and professionals (Helders, Engelbert, Gulmans, & Van Der Net, 2001; Rosenbaum, King, Law, King, & Evans, 1998; Wiart & Darrah, 2002). This partnership facilitates the collaboration between family and professionals and encourages effective communication between both parties regarding the child's needs and goals (Shelton & Stepanek, 1994). Family-centered service is widely accepted now as best practice in pediatric rehabilitation. It has been shown to promote the psychosocial well-being of children with disabilities and their parents and to lead to more satisfaction with service delivery (Darrah, 2001; King, 2004; Law, 1998).

The International Classification of Functioning, Disability and Health (ICF)

The ICF belongs to the World Health Organization (WHO) 'family' of international classifications developed for application to various aspects of health. The WHO family of international classifications provides a framework to code a wide range of information about health (e.g. diagnosis, functioning and disability, reasons for contact with health services). It uses a standardized common

language and framework for communication about health and health care across the world in different disciplines (World Health Organization, 2001).

ICF organizes information in two parts: 1) Functioning and Disability, 2) Contextual Factors. Each part has two components. Components of Functioning and Disability include the Body component (body functions and structures) and the Activities and Participation component (aspects of functioning from both an individual and a societal perspective). The term disability refers to problems of health or health-related conditions e.g. impairments, activity limitations and participation restrictions. However, functioning refers non-problematic or neutral aspects of health (World Health Organization, 2001).

Components of Contextual Factors include Environmental Factors, extending from the individual's most immediate environment to the general environment, and affect all components of functioning and disability. Environmental Factors include physical, social and attitudinal factors that are external to an individual but that can have a positive (e.g. availability of adaptive sports) or negative (e.g. inaccessible buildings) influence on the individual's performance in the society. Although Personal Factors are the second component of Contextual Factors, they are not classified in ICF due to their large social and cultural variation (See Appendix C for an overview of the ICF components).

The above-mentioned theories and frameworks have influenced OT and PT management for CP and have resulted in a wide range of assessments and interventions that are associated with the assumptions of each theory. In the following sections brief reviews of pediatric assessments and treatment interventions potentially used by OTs and PTs for children with CP are presented.

2.4 Assessments for Children with CP

This section provides an overview of the definition, types and classification of assessments. Then, a brief review of pediatric assessment tools for CP created by PTs and OTs is presented.

Assessments are tools (standardized or non-standardized) used to gather information about the strength, weaknesses, and function of a child and/ or family and for programming for intervention. Standardized assessments are objective, structured measurement instruments that have published information on their use, scoring and psychometric properties. Non-standardized assessments typically include clinical observations, home-grown assessments created by individuals for use in their settings, and checklists with little or no published information on their scoring and/or psychometrics.

The psychometric properties of an assessment tool are important in determining its usefulness. *Validity* of an assessment tool is a measure of the extent to which a tool measures what it is intended to measure and its usefulness for its intended purpose. *Reliability* is its ability to give a consistent responses on

repeated assessments in the absence of change in the characteristic being measured (Boyce et al., 1991; P. L. Rosenbaum et al., 1990).

Responsiveness relates to the ability of a measurement tool to detect changes when a patient improves or deteriorates. It is an important feature of an evaluative tool (see below), which is designed to detect a minimal clinically important change over time (Boyce et al., 1991; P. L. Rosenbaum et al., 1990)

A therapist may assess a client for varying purposes: 1) to establish the level of function, 2) to establish a diagnosis, 3) to assess an indication for treatment, 4) to plan a treatment program, or 5) to evaluate therapy and monitor progress (Ketelaar, Vermeer, & Helders, 1998; Reid, 1987). Although many pediatric assessments are available, various factors may affect therapists' choice of an assessment for a particular child such as: availability of the assessment, its psychometric properties, having the time needed to carry out the assessment, needs and age of the client, and therapist's expertise (Rodger, 1994).

Generally, assessments can be classified into three categories according to the purpose of their use (Boyce et al., 1991; Ketelaar et al., 1998; Msall, Rogers, Ripstein, Lyon, & Wilczenski, 1997; P. L. Rosenbaum et al., 1990):

Discriminative assessments distinguish between individuals with or without a particular characteristic or function. The Peabody Developmental Motor Scales (PDMS) (Boulton et al., 1995; Palisano, Kolobe, Haley, Lowes, & Jones, 1995) is an example of a pediatric discriminative scale. It identifies children with delayed motor development and provides percentile rank scores, standard scores or age-equivalent scores.

Predictive assessments classify individuals into categories according to their expected future status. The Bleck Scale (Bleck, 1975) is an example of predictive test that predicts future ambulation status of a child based on the presence of certain postural and tonic reflexes. More recently, Rosenbaum et al (Rosenbaum et al., 2002) have created Motor Development Curves with the purpose of predicting rates and limits of motor function for a child with CP based on her current GMFCS level of function.

Evaluative assessments (outcome measures) measure change in function over time or after treatment. The Gross Motor Function Measure (GMFM) (Russell et al., 2000) is an example of an evaluative test that is responsive to change in gross motor function in children with CP (Bjornson, Graubert, McLaughlin, Kerfeld, & Clark, 1998; Nordmark, Hagglund, & Jarnlo, 1997; Russell et al., 2000).

Assessments are typically developed and validated to serve one of the above purposes and, therefore, should not be used for another purpose without being so validated. Similarly, an assessment should only be applied to the population on which it was designed and for which it was validated (Boyce et al., 1991; P. L. Rosenbaum et al., 1990). While the tool may be used with a different

clientele or age group, its original psychometric properties should be reevaluated.

An assessment may cover one or more of various ICF components (Ketelaar et al., 1998): 1- impairments (problems in body function or structure such as a significant deviation or loss of joint mobility), 2- activity limitations (difficulties an individual may have in executing activities of daily living), 3participation restrictions (problems an individual may experience in involvement in life situations such as socialization with peers), and 4- environmental factors (e.g. parental stress, architecture barriers) (see Appendix C for an overview of the ICF components).

The multidimensional impairments and functional limitations of CP require a comprehensive evaluation of the affected child including impairments, functional limitations and participation restriction. Equally important are the environmental factors such as family needs and burden of care, home and nursery/school environment, and accessibility of community services. Appendix B presents a review of the most common pediatric assessments found in the CP literature and classifies them based on their purpose, as well as the ICF domains they assess.

2.5 Interventions used for CP

This section briefly reviews some of the most common pediatric interventions potentially used by OTs and PTs to treat children with CP.

Neurodevelopmental treatment (NDT)

The Bobath or neurodevelopmental treatment (NDT) approach was established by Karel and Berta Bobath in the United Kingdom in 1943 (Graves, 1995; Harris, Atwater, & Crowe, 1988). Their approach was based on the assumption that in CP, the brain lesion interferes with normal development and causes loss of inhibition of abnormal and primitive reflexes (a hierarchical CNS model). Therefore, their treatment focused on three primary goals: normalizing muscle tone, inhibition of primitive or abnormal reflexes and movement patterns, and facilitation of autonomic reactions (righting and equilibrium reactions) and normal movement patterns (Bobath & Bobath, 1975; Bobath, 1980). Handling and positioning strategies (such as the use of reflex-inhibiting postures, and providing normal kinesthetic input), early intervention and family involvement are features of NDT (Finnie, 1974; Graves, 1995; Harris et al., 1988; Levitt, 1995). NDT has been widely used by OTs and PTs for children with neurodevelopmental disorders including CP (Berry & Ryan, 2002; Chiarello et al., 2005; Craig, 1999; Kaminker, Chiarello, O'Neill, & Dichter, 2004; Lawlor & Henderson, 1989).

The Vojta method

The Vojta method encourages early detection and intervention to stimulate functional movement in infants at high risk for CP (Backstrom & Dahlgren, 2000; Bauer et al., 1992; d'Avignon, Noren, & Arman, 1981; Jones, 1975). Vojta strongly believes that his method of stimulation can prevent the development of CP in infants at high risk for CP (Graves, 1995; Jones, 1975). According to Vojta, movement in children with abnormal/delayed postural reflexes stems from and ends in an abnormal posture. Therefore, Vojta's principle of intervention is directed at stimulating the 'at-risk for CP' child to make a normal active movement that begins and ends in a normal posture. He believes that by stimulating normal movement patterns, it is possible to direct the CNS into replacing the abnormal movement patterns with normal ones (Jones, 1975). The Vojta therapeutic approach uses proprioceptive trigger zones in the trunk and extremities to facilitate various movement patterns namely reflex creeping and reflex rolling (Jones, 1975; Levitt, 1995). The affected child is held firmly and consistently in the required posture, which is often uncomfortable and sometimes painful. Parents are trained to carry out the treatment program at home four times a day for ten minutes a session for at least six months (Harris et al., 1988; Jones, 1975). Vojta's method seems to be relatively unpopular in North America as the literature review of actual pediatric OT and PT practices for CP reported in this thesis did not indicate that it is being used (see section 2.8).

Sensory integration therapy

Sensory integration therapy (including tactile and vestibular stimulation) is based on the work of Ayres, developed in the early 1970s and primarily directed at preschool and school-aged children with learning disabilities. Through specific, controlled sensory input, the main goal of this approach is to improve the child's capacity to organize and integrate sensory input (Harris et al., 1988). Ayres assumed that, in children with CP, the vestibular system is unable to provide the appropriate input because the child does not integrate sensory inputs from the trunk and limbs properly. Controlled vestibular stimulation is one of the sensory integration techniques that has been used by PTs and OTs for those with CP (Chee, Kreutzberg, & Clark, 1978; Graves, 1995; Harris et al., 1988). Our literature review has shown that sensory integration has been used by pediatric OTs and PTs for children with neurodevelopmental disorders including CP in North America (Chiarello et al., 2005; Lawlor & Henderson, 1989) (see section 2.8).

Functional/task-oriented exercises

Task-oriented interventions involve the use of structured practice and repetition of functional actions to enhance learning motor tasks and promote independence and participation in daily routines (Valvano, 2004). Functional/taskoriented exercises emphasize the role of task and environment in motor development and learning. The functional goals for the child are best determined

by the positive collaboration between clinicians and parents/family to assess the needs and potentials of the child and family (Ketelaar, Vermeer, Hart, van Petegem-van Beek, & Helders, 2001).

With this wide variety of assessment and treatment options available it is sometimes difficult for clinicians to know which are the most appropriate, given the needs of the child and family and the realities of clinical practice. Indeed, clinicians are increasingly challenged to justify their interventions, and be more accountable in the treatment they provide to their clients (Curtin & Jaramazovic, 2001). Specifically, clinicians are being told to base their daily practice on EBP. In the field of rehabilitation, the use of EBP is expected to improve client care, advance the profession and strengthen professional image (Brown & Rodger, 1999). Nonetheless, the question arises as to the quality of the evidence of the effectiveness of treatment interventions for clients with CP.

2.6 Evidence-Based Practice (EBP)

In this section, the concept of EBP is discussed, with specific reference to PT and OT interventions for CP.

EPB refers to the clinical decision-making process of weighing the available evidence for an intervention and integrating it with the clinician's experience, the needs of the patient and the demands and the resources of the health system (Perleth, Jakubowski, & Busse, 2001; Taylor, 2000). The term 'best practice' refers to the use of EBP both in individual client care as well as in

health service delivery for the population (Silagy & Weller, 1998; Taylor, 2000); and the subsequent monitoring of the outcomes of these interventions to improve the performance of the health care system and the overall health of the general population (Perleth et al., 2001).

Establishing the evidence regarding EBP in a specific domain requires a series of steps. First, the intervention literature is scrutinized to determine the evidence of effectiveness (or non-effectiveness) of an intervention for a specific condition. Typically the query begins with framing a question for a specific type of clientele comparing one intervention to another or to no intervention: e.g.: 'Are strengthening exercises for lower limbs muscles more effective than conventional physiotherapy in improving gait in young children with CP? Then, the level of evidence (defined as the level of the quality and consistency of the research in a specific area of questioning based on the most current evidence available (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996)) is determined based on a coding scheme. Several coding schemes have been developed to serve this purpose (Foley, Teasell, Bhogal, & Speechley, 2003; Sackett, 1989; Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000). For example, Sackett's method (Sackett, 1989; Sackett et al., 2000) classifies evidence into five levels (I- Interventions investigated using scientifically rigorous randomized trials (e.g. well-designed placebo-controlled double blinded randomized clinical trials, RCTs) receive a high grade or a Level I rating. On the other hand, interventions

investigated using studies of case reports with no controls are given the lowest grade (Level V).

Several scales have been developed to assess the quality of evidence of an individual scientific study. For example, the Physiotherapy Evidence Database (PEDro) of the Centre for Evidence-Based Physiotherapy (*Physiotherapy*) Evidence Database, 2005; Sherrington, Herbert, Maher, & Moseley, 2000), assesses RCTs for internal validity on a ten-point scale. The PEDro scale considers two aspects of trial quality, namely the 'believability' (or 'internal validity') of the trial and whether the trial contains sufficient statistical information to interpret its results. Internal validity is assessed by rating items such as randomization; concealed allocation; baseline comparability; blinding of the subjects, assessors and therapists; intention to treat analysis and adequacy of follow up. Items addressing availability of sufficient statistical information include between-group statistical comparisons and the provision of both point estimates and measures of variability. The total achievable score is ten; however, an eleventh item is added but not included in the total score of a trial. This is because this item (eligibility criteria) is related to external validity and thus cannot be summed up with other PEDro scale items that assess internal validity (Physiotherapy Evidence Database, 2005; Sherrington et al., 2000). The PEDro Scale is found in Appendix D.

In addition to single studies, meta-analysis and systematic reviews are used to document the cumulative results of research evidence that examine the same type of intervention (Harris et al., 1988). A systematic review involves the application of scientific strategies, in ways that limit bias, to the assembly, critical appraisal, and synthesis of all relevant studies that address a specific clinical question (Cook, Sackett, & Spitzer, 1995). Meta-analysis is a form of systematic review that quantitatively aggregates and summarizes (using statistical methods) several research study results to evaluate the effectiveness of a treatment program where individual studies have small sample sizes and small effect sizes (Cook et al., 1995).

In the present study, 15 rehabilitation-based interventions potentially used by PTs and OTs in CP practice were systematically reviewed. Randomized controlled trials (RCTs) up to year 2003 (the studies that clinicians would have been expected to read given our survey was conducted in 2004-2005) were used to code the level of evidence of effectiveness for these interventions. The PEDro (*Physiotherapy Evidence Database*, 2005) was used to rate RCTs for its internal validity. Next, RCTs were interpreted using a quality assessment rating adapted from Foley et al (Foley et al., 2003), where six levels of evidence were considered based on Sackett's Levels of Evidence (Sackett et al., 2000) but modified to account for PEDro scoring. See Appendix E for levels of evidence. More details on the systematic review are in Chapter 4. With the concept of EBP emerging in the rehabilitation field, it is important to know how clinicians perceive this concept and what factors they perceive to be barriers or facilitators of EBP.

2.7 Physical therapists and occupational therapists attitudes towards Evidence Based Practice

Several studies have been conducted to examine the attitudes towards, and the perception of the concept of EBP by rehabilitation clinicians (Curtin & Jaramazovic, 2001; Dysart & Tomlin, 2002; Humphris, Littlejohns, Victor, O'Halloran, & Peacock, 2000; Metcalfe et al., 2001) . The majority of the therapists in these studies had a positive view of EBP and agreed on the importance of research for their professional practice and development. However, several barriers were felt to prevent or delay the implementation of research findings into clinical practice.

Curtin and Jaramazovic (2001) surveyed OTs in the south and west region of England to identify their views and perceptions of EBP. The survey also explored barriers and enablers of EBP from the point of view of the OTs. Focus group methodology was used to design the questionnaire, which was mailed to a sample of 653 OTs who supervised students from the School of Health Professionals and rehabilitation Sciences. Therapists in the sample were working in a wide variety of settings in urban and rural areas. Multiple postings (where non-respondents would receive the questionnaire three times in two months)

were used to achieve the maximum response rate, which was 76.5%. The majority of respondents (69.6%) were senior OTs, 18.6% were head therapists and 5.8% were employed as basic grades. Two-thirds of respondents had graduated with diploma with the majority (88.4%) did not have or were not studying for a postgraduate degree. Generally OTs had positive attitude towards EPB. They considered it as a professional duty and responsibility and indicated that EPB should be a goal for the OT profession, as it would raise the profile of the profession. However, respondents considered clinical experience to be more important than research and felt that EBP was time consuming and hard to do. Time was rated by 94.5% of respondents as the most important barrier that prevented EBP. Other barriers were the lack of appropriate resources, departmental issues (e.g. large workloads, insufficient staff numbers), the lack of training or knowledge to implement EBP, lack of support from either managers or colleagues and finally personal reasons. The same categories were identified by respondents to be enablers of EBP with the provision of support rated by the majority (87.7%) as the most important enabler. The second most important enabler was having access to relevant resources, followed by personal reasons (such as self-motivation, willing to work on their own time, doing postgraduate studies). Other enablers included having time to read, time to find the evidence, time to implement evidence into practice (30%); and finally training (28%) and departmental issues (18.4%). While this study showed the enthusiasm of OTs

towards EPB, it only examined OTs who supervised students from the School of Health Professionals and Rehabilitation Sciences (with the majority being senior or head OT). However, it is interesting to note that the majority of these therapists viewed clinical experience to be more important than research.

Another British study by Humphris et al. (2000) surveyed all 100 OTs employed in seven acute National Health Service (NHS) Trusts (including two teaching hospitals) in the South Thames region of England. The study aimed at exploring factors that inhibit and facilitate the use of research evidence by OTs. The study had two phases. In Phase One a qualitative investigation of these factors took place in one acute hospital NHS trust. Phase Two was quantitative and used a questionnaire that was created based on the results from an extensive literature review and Phase One to evaluate the importance of the above factors. The questionnaire was mailed to OTs with a follow up of nonresponders at two and four weeks by a reminder letter. The response rate was 78%. Regarding their participation in research-related activities, 86% of participants reported reading research projects in professional journals. Almost the same percentage participated in clinical audit. However, less than one third reported involvement in research. Concerning their attitudes towards research, 58% of participants reported using research results to guide their clinical practice and 73% indicated seeking out research related to their clinical practice. Overall, participants had positive attitudes towards research with over 90% agreeing on

most of the items such as: 'research is needed to continually improve practice', 'research helps to build a scientific knowledge base for practice', and 'clinical practice should be based on research'. Surprisingly, only 12% agreed that research findings were too complex to use in practice. The three most discouraging factors to research uptake were workload pressures, time limitations and insufficient staff resources. The most helpful factors were dedicated time in the working week for research activities, the need for frequent educational sessions on the utilization of research findings and specific additional staff to enable the implementation of research evidence. Although this study showed the positive attitude of OTs towards EBP and their willingness to use research in their clinical practice, we should interpret the results about their actual use of EBP in their clinical practice with caution. As with other self-reported data, social desirability bias may have affected the OTs' responses. Furthermore, the questionnaire was potentially leading and designed in such a way that may have resulted in socially accepted responses.

A similar British study was conducted by Metcalfe et al. (2001) studying the attitude of therapists towards EBP from four health professions: dieticians, OTs, PTs, and SLP. Two validated questionnaires were used. One was originally designed and validated in nursing, measuring barriers to implementing research findings. The other questionnaire was validated on an American PT population to measure barriers to conducting research. Both questionnaires were validated

again in two separate pilot studies. The study questionnaire was mailed to a sample consisting of 20% of the four professions in the North and Yorkshire region of the National Health Service (using a sequential selection of listed names). A high (80%) response rate was achieved (PTs composed 50.2% of the sample). Respondents were from a wide variety of working settings (hospitals, social services, community services and private and academic sectors). The majority of the respondents (71%) were working at senior level. Although 97.4% of the respondents perceived research as important, 58.3% of them thought that treating patients was more important than doing research. Highly significant differences were found between different professional groups on these items (p<0.001) with SLPs and dieticians showing higher interest in research than OTs and PTs. For the perceived barriers, the top three were 'statistical analyses in papers is not understandable'; 'literature not compiled in one place' and 'literature reports conflicting results'. However, the greatest barrier overall was reported to be 'insufficient time' followed by 'inability to evaluate research'. This scale showed high internal consistency (Cronbach's alpha =0.78). Since almost half of the subjects in this study were PTs, results should be interpreted with care by other professions who were represented by a smaller sample.

All the above studies have investigated therapists' attitude towards EBP and the barriers and enablers to its use. However, none have examined factors related to EBP such as years of experience of the therapist, educational degree

and research activities. An American study by Dysart and Tomlin (2002) examined how OTs access clinically relevant research results, how they incorporate research findings into practice, and what factors are related to this professional process. A two-page questionnaire was developed for this purpose including three sections: demographics, current use of EBP, and factors related to its use. The final version of the questionnaire was mailed to 400 OTs randomly selected from the most recent American Occupational Therapy Association (AOTA) memberships list. OTs who were currently practicing or who had practiced within the previous 3 months in a clinical setting were included in the study. Response rate was low (58%) compared to the previous studies reported above. However, respondents represented the range of clinical work experience, region of practice (urban/ rural), academic degrees (baccalaureate, master, doctoral), and practice settings (e.g. schools, rehabilitation facilities, hospitals). Results showed that the majority of respondents reported having access to all listed sources of information (ranging from 100% of subjects having access to journals and continuing education workshops to 79% having access to full text electronic databases). However, the majority did not use computer resources that they had access to, except for Internet websites, which 71% used at least a few times a year. For example, full-text electronic databases were never used by 80% of respondents, although 79% reported that they had access to them. The most frequently used resources by OTs were journal articles, in-services, and

discussion meetings. Furthermore, the majority (95%) reported attending continuing education workshops. The frequency of use of these resources was associated with the highest academic degree obtained, region of practice, and research experience. For example, a greater proportion of respondents with Bachelor's degrees felt less confident using electronic databases than those with Master's degrees. Furthermore, years of working experience was inversely related to confidence using the Internet: respondents with more than 5 years of experience felt less confident using the Internet as a research tool than those with less experience. In addition, 57% of the respondents reported using current research information to alter or develop one to five research-based treatment plans in the past year. The frequency of research implementation was associated with greater research experience, but not with any other demographic variables. Although many respondents (46%) valued clinical experience over research and theory, a greater percentage of respondents with master's degree than with bachelor's degrees strongly believed that more therapists should be using research. Factors that enable or prevent therapists from using EBP were similar to those identified in the British studies. For example, 38% of the respondents reported that research results were unclear or difficult to understand, and almost the same percentage believed that research conclusions do not usually translate into useful treatment plans for individual patients.

This study provided significant information about factors that may enhance research knowledge up take into clinical practice. For example, although the majority of respondents reported having access to resource information, and occasional and sometimes frequent use of these resources, only half of them had altered or developed 1-5 treatment plans based on research results. Interestingly, skill level, one's value of research and administrative support did not correspond with frequency of research implementation. However, clinician's perception of clinical relevance of research was associated with having more than 11 researchbased treatment plans altered or developed. The authors recommended that improving clinical relevance of research and making scientific terminology more accessible might help in using EBP. Other recommendations were to change the entry-level academic degree requirement to post-baccalaureate and to decrease time required to obtain research information. Random selection of subjects ensured a fairly representative sample, however, the low response rate should be considered when attempting to generalize the results of this study.

With the majority of therapists showing positive attitudes towards EBP, important questions are arising regarding clinicians' practices for children with CP in daily practice. How closely does clinical practice resembles EBP? What factors affect the choice of these practices? Given an ideal world of unlimited time and resources, what practices would clinicians' preferred practices be?

2.8 Actual OT and PT Practices for CP

A review of the literature found four surveys which examined OTs' use of pediatric assessments (Burtner, McMain, & Crowe, 2002; Crowe, 1989; Reid, 1987; Rodger, 1994), but none were specific to the CP population. Reid (1987) surveyed 69 Ontario OTs working with children with disabilities to identify their current practice regarding assessment approaches, methods and knowledge about the assessments used. Written questionnaires (developed and pre-tested) were mailed to 99 OTs. Seventy-seven questionnaires were returned (response rate 78%). Of those who returned the questionnaire, 69 therapists were eligible. Ninety-nine percent of respondents thought that 'program planning' was the most important reason for conducting an assessment. Other reasons included: to establish the level of function (94%), to monitor a child's progress (86%) and for program evaluation (74%). Fifty-seven (83%) of respondents indicated using standardized assessment tools, and more than half indicated that they using them regularly. The top six standardized assessments reported to be used by 50% or more of respondents included: Developmental Test of Visual-Motor Integration (VMI; 81%), Southern California Sensory Integration Test (SCSIT; 65%), Bruininks-Oseretsky Test of Motor Proficiency (BOTMP; 63%), Developmental Test of Visual Perception (DTVP; 63%), Miller Assessment for Preschoolers (MAP; 60%), and the Motor-free Visual Perception Test (MVPT; 53%). On the other hand, over 80% of respondents stated that they used other

non-standardized assessments such as checklists and informal tests to complement standardized assessments.

In Australia, Rodger (1994) (Rodger, 1994) surveyed 60 Queensland pediatric OTs in 32 pediatric OT departments to identify which standardized assessments were used and the frequency of their use. Fifty-two (86% participation rate) responses were obtained. Therapists were given a list of 33 formal or standardized assessments and asked to indicate those which were available in their departments. Most frequent assessments (mostly discriminative assessments of impairment and basic functional activities) available included: the Revised Gesell Developmental Schedules (RGDS; 79%), the MVPT (77%), the TVPS (77%), the Erhardt Developmental Prehension Assessment (EDPA; 73%), Ayres' clinical observations (71%), the VMI (71%), the BOTMP (65%), the DTVP (63%) and reflex testing charts (62%). Of these, the tests most frequently used by OTs were: the RGDS (83%), the VMI (81%), the TVPS (72%), the BOTMP (59%) and EDPA (53%).

An early survey (Crowe, 1989) of 293 OTs working in the Northwestern school systems of the USA reported the use of evaluative functional assessments for school-age children such as: PDMS (83%), and BOTMP (69%).

A more recent American survey (Burtner et al., 2002) used a five page mailed questionnaire to survey 406 practicing therapists (OTs and OT assistants) in four Southwestern states in the USA. With a response rate of 74.1%

respondents reported use of motor and visual perception tests most frequently in their practice including VMI, TVPS, TVMS, DTVP-2 and MVPT. Functional assessments reported in this study included the Pediatric Evaluation of Disability Inventory (PEDI) and the School Function Assessment and Evaluation Tool of Children's Handwriting.

Studies described above provided early information on OT assessment practices for children. Most of the measures used were discriminative measures of motor and visual perception, with a trend towards the use of evaluative functional assessments can be observed (Burtner et al., 2002; Crowe, 1989). However, no specifications were made as to the application of assessments for specific conditions (e.g. CP). Indeed, generic assessments developed for a general pediatric population may not be sensitive to changes in specific populations (e.g. children with CP). Furthermore, in the pediatric population, the age of the child is highly important in choosing the appropriate assessment tool. Assessments that have been validated for school-age children cannot be used for younger ones with any confidence. To date, no published research is available on OT assessment practices for young children with CP. PT assessment practices for CP were examined in combination with treatment practices and are discussed in the following paragraphs.

The use of pediatric treatment interventions were examined by several surveys. A pilot study on PT interventions for children with CP within a Scottish

rural environment by Craig (Craig, 1999) surveyed 17 PTs working at two rural community PT environments in Scotland: the rural pediatric PT service and the specialized child development unit. Sixteen out of the 17 PTs surveyed were members of a multidisciplinary team. OTs, SLP and pediatricians were identified as core members within the team. General practitioners, social workers and psychologists were only identified as a part of the team by PTs working at the rural pediatric service. All PTs surveyed in this pilot study indicated that they used NDT in treatment of CP. Nine PTs were using outcome measures with these clients, with the GMFM being the most common. Only 55% of these (5/9) used outcome measures on a regular basis.

Chiarello et al. (Chiarello et al., 2005) used a research roundtable discussion in 1999 to gather information on practices used by 62 pediatric PTs and PT assistants in the management of mobility for children with spastic diplegia. Clinical vignettes of one child at five different ages and developmental stages (from early age to high school) were presented. Clinicians reported using a variety of standardized developmental and functional tests for the child from birth to 15 years of age (e.g. the PDMS and GMFM), as well as measures of social interactions, play, environment, and equipment (e.g. the pediatric Functional Independence Measure, WeeFIM; Hawaii Early Learning Profile and PEDI). However, for older age group (15-21 years), clinicians reported the use of adults measures as fewer tests are available for this specific age group. Intensity

of treatment differed widely, with a reported frequency of one to five times per week. Conceptual frameworks guiding practice included a family-centered philosophy and functional approach, with direct intervention strategies including: motor learning principles, functional training, environmental adaptations, NDT and sensory integration. Although this round table discussion provided a picture of pediatric PT practices in the late 1990's, seven years has passed. In addition, the results may have been affected by the lack of random sampling of clinicians and social desirability bias towards reporting acceptable or recommended professional practices.

Kaminker et al. (2004) conducted a nationwide survey in the United States to explore decision making among school-based PTs and recommendations regarding PT service delivery. The survey used a self-administered questionnaire and four case studies (clinical vignettes) to elicit information about service delivery models, context of therapy, frequency and intensity of services, additional services clinicians would recommend, and factors they considered important in making these decisions. Two of the vignettes described 4-year-old girls with similar physical functional impairment levels but one of the children was described to have moderate cognitive impairment, while the cognitive level of the second was within normal limits. The other two vignettes described a boy with CP at 6 and again at 12 years of age. A total of 626 clinicians returned completed questionnaire with a response rate of 61.6%. Results related to the child with CP

showed that 92% of clinicians recommended individual direct services for the 6year-old; this mode of service was recommended by only 52% of clinicians for the same child at 12 years of age. The recommended monthly frequency of direct services for the 6-year-old was more than twice that recommended when the child was 12 years of age (mean [SD] = 5.8 [3.3], 2.4 [2.9] respectively) with 30minute sessions being the preferred duration. For both age groups, most clinicians preferred a combination of context of service delivery: natural (integrated in his own environment) and isolated (e.g. therapy room). Interestingly, more than two-thirds of PTs were concerned with the child's social participation and had recommended adaptive physical education and community recreation programs (at both ages: 6 and 12 years). The most important factors in decision-making regarding treatment were the child's functional level and goals. While the use of vignettes in this survey helped in exploring variation in PT practices for a specific child, the child with CP described in the vignette was a school-aged child and therefore, results may not be applicable for young children with CP.

Two surveys examined OT interventions: one (Lawlor & Henderson, 1989) looked at OT practices for young children, and the other (Berry & Ryan, 2002) focused on OT interventions for children with CP. The survey by Lawlor and Henderson (1989) described clinical practice patterns of OTs working with infants and young children using a telephone interview method. An 80-item

questionnaire and a preparatory work sheet (to be mailed to therapists prior to initial phone contact) were developed, validated and pilot tested. Questionnaire administration procedures were standardized by developing a standardized interview instrument. OTs who had reported working primarily with infants aged birth to one year or with young children aged one year to four years in the AOTA 1986 Member Data Survey formed the sample population from which 234 therapists were randomly selected. Telephone contacts were established with only 180 of the potential 234 occupational therapists, 119 of whom were eligible for the study. No replacement for ineligible or lost OTs was allowed, and there was only one refusal (99.4% response rate).

Respondents' mean years of experience since certification was 11.00 (ranging between 2-40 years). Total pediatric experience ranged from 2-29 years with a mean of 5.68 years. Half of respondents had earned advanced certifications: 29.7% had completed the basic NDT certification course and 30.5% had certifications in sensory integration. The most common reason for referral to OT was developmental delay (47.5%) followed by cerebral palsy (17.8%). All but one respondent evaluated children, with 72.9% of the respondents administered one or more standardized or published assessments to children aged four years or younger. However, 59.3% of respondents reported using home-grown assessments for reasons such as: no standardized assessments available for needed areas of evaluation; no assessments available for the population they
served; no time to perform standardized test batteries and needed quicker clinical tool. The majority of respondents were not satisfied with their current evaluations. Parent training, and gross and fine motor training were the most frequent treatment services provided by respondents in the past three months for young children. When respondents were asked to choose the one frame of reference that they considered to be their primary reference, 43% selected developmental approach while 34% chose neurodevelopmental. It is worth noting that of all surveys reviewed in this literature review, this one is the only one used a structured telephone-interview and standardized administration procedures. Although all surveys reviewed here reported good response rate, this survey reported the highest rate of 99.4%, suggesting the effectiveness of their method of using structured telephone-interview with standardized administration procedures.

Berry and Ryan (2002) examined which OT frames of reference (functional, neurodevelopmental, biomechanical, developmental, sensory integration) were used, and why and how they were used by members of the National Association of Pediatric Occupational Therapists in the United Kingdom. Using a self-administered questionnaire with both closed- and open-ended questions, 180 randomly selected OTs who worked with children with CP were contacted. Of these, 120 (66.6%) completed the survey. From a list of frames of reference OTs were asked to choose the frame(s) that they used during

treatment of CP. A multi-theoretical approach was used by 91.7% of respondents with the top three frames used being: functional (86.7%), neurodevelopment (80.8%) and biomechanical (74.2%). Reasons for using these frames of references included: suitability for the population, valuable clinical effectiveness, and, they are basic to OT.

In summary, the literature has shown that OT and PT assessments and interventions for children with CP were mainly focusing on impairments and basic functions, with less emphasis placed on family and social participation. In addition, no study had specifically examined actual practices for the preschool age group. Furthermore, the majority of these surveys do not allow for comparison of the treatment provided to a specific child with CP across respondents as they do not ask all clinicians to respond to the same cases. Specifically, only two surveys used vignettes to compare therapists' practices for a specific child (Chiarello et al., 2005; Kaminker et al., 2004). Indeed, vignettes have been shown to be useful and inexpensive method for assessing the 'process of care' and comparing the 'quality of care' among a group of physicians as compared to the 'gold standard' method of using standardized patients (Peabody, Luck, Glassman, Dresselhaus, & Lee, 2000). Furthermore, the use of vignettes was found to be a valid method for measuring and predicting variation in preventive care when compared to the standardized patients method (Dresselhaus, Peabody, Luck, & Bertenthal, 2004). In addition, vignettes were

found to be superior to record abstraction in measuring the quality of clinical practice (Peabody et al., 2004).

The question arises as to whether two identical children with CP would receive similar PT or OT management. An exhaustive systematic review of the literature did not find a recent comprehensive population based study exploring PT and OT practices specific to young children with CP (1-5 years old). Specifically, we do not have information on OT and PT practices a young child with CP can expect to receive, how similar or different these practices may be, and how close or far they are from EBP. In addition, clinicians' perceived barriers and enablers of EBP have not been investigated before in the Province of Quebec. We do not know how similar or different these factors may be from those reported in the literature.

, - <u>-</u> - ,

CHAPTER 3: STUDY RATIONALE AND OBJECTIVES

Children with CP constitute a substantial portion of pediatric rehabilitation, with a potentially increasing prevalence. Indeed, the heterogeneous nature of CP and the recent advances in understanding this nature (such as recognition of causal pathways, revisiting and updating its definition, improvements in measurements and classification) demand comprehensive multidimensional rehabilitation based on EBP (Brown & Rodger, 1999; Curtin & Jaramazovic, 2001). Therefore, clinicians are expected to provide the best available practice for these children within the context of their experience, the needs of the client, and the demands and the resources of the health care system (Perleth et al., 2001; Taylor, 2000). While studies and textbooks have provided a wide range of assessments and treatment interventions for CP rehabilitation, we still have little knowledge of what young individuals with CP are offered in the clinic, how close these practices to EBP and what factors affect the choice of practices. Specifically, in Quebec, we have no information on what a child with CP can expect to receive, how similar or how different the assessments and interventions are in different parts of the province for a specific child with CP. In addition, we have little understanding of the factors that influence the types of assessments and interventions chosen by therapists. Therefore, this study was the first to provide a better understanding of what a typical young child with CP can expect to receive in terms of problem identification, assessments and treatments,

treatment goals and referrals and how these practices vary across the Province of Quebec for a given type of client. The study was also the first to examine the prevalence of use of best practices among PTs and OTs.

In addition, this study explored clinicians' desired practices given an ideal world with unlimited time and resources and provided an understanding of perceived barriers to their use. Further, since clinicians are expected to play a major role in EBP, this study also reported on perceived enablers of using research evidence by PTs and OTs for children with CP.

General objective

The global objective of this study was to describe OT and PT practices for young children with CP (1-5 years old) in the Province of Quebec.

Specific objectives

The specific objectives were:

1. To describe the actual practices (problem identification,

assessments, treatment goals, treatment interventions and referrals to other services) used by OTs and PTs for two typical children with CP, one with hemiplegia, the other with quadriplegia, at two age points, 18 months and 4 years.

2. To identify factors related to the client, the clinician, and the working environment that are associated with the use of best practice.

3. To identify desired practices of OTs and PTs given an ideal world as well as barriers to use of desired practices.

4. To identify factors considered by OTs and PTs as enablers of EBP.

CHAPTER 4: METHODOLOGY

4.1 Research design

This study was part of a cross-sectional, multi-centered provincial survey investigating OT and PT services for young (1-5 years) and school-aged (6 and 7 years) children with CP in Quebec, Canada. Data were collected through a structured telephone interview to elicit information on typical practices for two children with CP as depicted in two case descriptions (vignettes) that were provided to the therapist. The project received ethics approval from the *Centre de recherche interdisciplinaire en réadaptation* (CRIR), the Research Ethics Institution Review Board - McGill University, Montreal, Canada and, when requested, individual sites.

4.2 Subjects

Eligible candidates included all OTs and PTs working in the province of Quebec in pediatric rehabilitation who: worked in the same setting for ≥ 3 months, treated ≥ 1 child per month between the ages of 1-5 years with the diagnosis of CP or at high-risk for CP, were members of their respective professional Order, spoke either French or English and agreed to participate in the study. Exclusion criteria included: participation in the creation of the vignettes or in pilot testing of the study questionnaire, or working with children with CP only in research-related assessment and treatment. Sample size calculations were not

performed, as the goal was to identify practices of the entire population of OTs and PTs in the province who treat young children with CP.

4.3 Procedures

Development of vignettes

The research team held two focus groups of experienced pediatric therapists to create four vignettes depicting two typical children seen in rehabilitation each with a different classification of CP. Children with different classifications and different functional levels may require different treatment strategies. The Gross Motor Function Classification System (GMFCS) (Palisano et al., 1997) which classifies children into five functional levels on the basis of their abilities and limitations in functional mobility, was used to guide the vignette creations. (See Appendix A). While we acknowledge the heterogeneity of CP, we attempted to represent the wide range of children with CP by describing two typical children with two distinct classifications: hemiplegia and quadriplegia, at two functional levels: GMFCS-level II and GMFCS-level IV respectively. In addition, to best represent the age group of 1-5 years, the two children were described at two age points: 18 months and 4 years.

Specifically, the first focus group created two vignettes in English depicting a child with a spastic right hemiplegia (GMFCS-Level II) at 18 months (Hemi-18m) and again at 4-years of age (Hemi-4y). The second group created two vignettes in French describing a child with spastic quadriplegia (GMFCS-Level

IV) (Palisano et al., 1997) for the same age points (Quad-18m and Quad-4y). Participants were instructed to describe the child in terms of the following: gross and fine motor function, sensory function, behavior, language, psychoeducational and cognitive function, activities related to participation, family structure, and physical and social environment. Once created, the vignettes underwent the first step in the validation process by having the focus group members review the final versions and recommend revisions and clarifications. Next, each vignette was translated into English (or French), using formal forward and backward translation methods (Bullinger et al., 1998). To ensure conceptual equivalence with the original version, the researchers and clinical colleagues then compared the two versions and where necessary, corrections were made. The English and French versions of the four vignettes are presented in Appendix F.

The telephone-interview questionnaire

A telephone-interview questionnaire was created based on two questionnaires used in earlier studies (Korner-Bitensky et al., 2004; Mikhail et al., 2005). Formal questionnaire design methodology (Cummings, Strull, Nevitt, & Hulley, 1988) was used to develop the questionnaire in English and then translate it into French using the same formal forward and backward translation to ensure comparability of the two versions (Bullinger et al., 1998). Both versions were pilot tested on a convenience sample of six therapists. Based on feedback, clarifications were made and redundancies were eliminated. The final versions

were then piloted on two therapists. To maintain clinician's interest, questions that are easy to answer were asked first, while questions that may seem threatening to clinicians and questions that were deemed to influence how they would respond regarding their current practice were asked towards the end of the interview. The questionnaire had seven sections. (See Appendix G).

Section One: Included socio-demographic and professional variables. Therapists were asked about eight variables related to themselves, their educational background (degree and year of graduation), and their clinical variables including years of clinical experience with young children with CP, work status (full-time/part-time) their weekly case load of children with CP and time spent weekly in assessing and treating young children with CP.

Section Two: This section examined environmental variables related to the setting where the therapist primarily assesses or treats children with CP. These variables included: the type of facility where the therapist works (e.g. acute/rehabilitation, academic/non-academic, urban/suburban/rural, in-patient/out-patient), whether CP rehabilitation research was being conducted in the setting, source of funding of the setting, number of therapists working in the setting and whether the therapist was working in a multidisciplinary team that focuses primarily on assessment and treatment of young children with CP.

Variables included in the above two sections were used to identify factors associated with clinicians' use of best practice in the data analysis.

Section Three: This section included questions related to the first vignette randomly assigned to the therapist and it included eight subsections examining actual practices (problem identification, assessments, interventions, intensity and frequency of interventions), desired practices and barriers to the use of desired practices, referrals to other services and the top three goals for the child. Answers to the questions covered in this section were used to describe actual practices of OTs and PTs and the prevalence of their use.

Section Four: This section included questions related to the second vignette. Here clinicians were asked only to identify problems in this child and actual assessments and interventions that he/she would typically use with this child. For the purpose of keeping the length of the questionnaire reasonable, other subsections described in section 3 were not repeated with the second vignette.

Section Five: This section examined clinicians' working environments in relation to ongoing learning about CP. Four items in this section assessed whether or not the working environment was supportive of on-going professional learning, if access to new information on CP was easily available at work, and whether or not the working environment provided time and funds for continuing education.

Section Six: This section explored the therapist activities related to continuing education including time spent a month on professional learning,

specialty certificates, and involvement in university teaching. Items in sections 5 and 6 came towards the end of questionnaire because of the potentially threatening or leading nature of these items.

Section Seven: This section included a list of nine factors that can be enablers of evidence-based practice. Clinicians were asked to chose from the list the top three factors they thought would be most helpful for a clinician in making use of research findings in clinical practice, and to rate them from 1-3, 1 being the most helpful factor. Clinicians were given the choice of adding other factors not on the list which they may have thought were most important.

The response format for each of the sections on the questionnaire used a combination of close-ended and open-ended responses. The questionnaire had a clear, easy to read and user-friendly format for the interviewer to use it easily.

Tracing procedures

Rigorous tracing procedures were implemented using multiple sources to ensure that not only 'easy-to-reach' therapists were recruited. OTs and PTs working in pediatrics in the Province of Quebec were identified through the public listings (2003) provided by the provincial licensing bodies: *l'Ordre des ergothérapeutes du Québec* (OEQ) and *l'Ordre Professionel de la Physiothérapie du Québec* (OPPQ). Information contained in these public listings included clinicians' names, places of employment, telephone number(s) at work and the type of professional practice (e.g. orthopedics, pediatrics, neurology). Two lists

of names, of OTs and PTs respectively, working in the field of pediatrics were created. Therapists were then assigned sequential identification numbers.

In addition, a snowball sampling method was used to identify therapists who may have been missed by asking contacted therapists for the names and coordinates of their colleagues working in pediatric OT or PT practice in Quebec.

Contact attempts were made at different times of day and local telephone directories and Internet websites such as Canada 411 and Google were searched to locate those no longer working within the organization. If a therapist was not reached after 12 attempts and the secretary or voicemail indicated that the therapist was indeed working in the organization, this was considered *a passive refusal*. A therapist who could not be located was coded as *nontraceable*.

Interviewing procedures

Once contacted by telephone, the trained research interviewer described the purpose of the study and enquired about therapist's eligibility and willingness to participate. A recruitment checklist covering the inclusion and exclusion criteria was used to establish eligibility. If the therapist met the eligibility criteria and agreed to participate, the procedure of the study was further described. In addition, therapists were asked whether the 'typical' children with CP that they usually see included those with hemiplegia and quadriplegia. This was done in order to assure that they would be asked about their typical client and not about a

client that they rarely see. Therapists working with both types of CP (hemiplegic and quadraplegic) and both age groups (18m and 4y) were randomized to receive two of the four possible vignettes, with the order of presentation also randomized, for example:Hemi-18m then Quad-4y. Those who worked with only one type of CP or one age group were assigned the corresponding vignette(s).

Next, a convenient time for a 30-to-45 minute telephone interview was scheduled. Therapists had the choice of their preferred language of interview (English/French).

To keep therapists unaware of the questions to be posed, only designated sections of the questionnaire including the vignettes, the list of potential barriers to desired use of interventions, and the list of enablers of EBP were sent to therapists by fax or e-mail 24-to-48 hours before the interview. To additionally reduce potential contamination, this time arising from therapists consulting with colleagues, therapists within an organization were interviewed either simultaneously or, if not possible, in close succession and were asked to keep the interview confidential.

Six interviewers, fluent in either English or French or both, were trained to elicit information in a standardized way to ensure consistency of questioning and of responding to clinician inquiries. Interviews were administered using elements that have been shown to significantly improve response to telephone surveys (Dillman, 1978; Sutherland, Beaton, Mazer, Kriukov, & Boyd, 1996).

The interview process

Before beginning the interview, the interviewer provided a brief reminder about the general purpose of the study, which was to identify current practices in the OT/PT management of children with CP. In addition, clinicians were clearly instructed to report their actual practices for a child with CP that has clinical picture similar to the one depicted in the vignette. However, they were not provided with information about research evidences for the effectiveness of these practices. Then, the interviewer ensured that the therapist had the selected sections of the questionnaire in hand including the vignettes and the two lists of barriers to desired use and enablers of EBP; and that vignettes had been read by the clinician. If the clinician did not read the vignette the interviewer gave her the time to read it while waiting on the phone. To encourage a smooth flow from one section of the questionnaire to another, bridging sentences and introductory phrases were used. If an interviewee expressed interest in knowing the results of the study, their names and addresses were recorded.

4.4 Data management and analyses

After verification of the completeness of the questionnaire, a research assistant directly entered data into a computerized database system. Anonymity was be preserved by assigning a unique identifier for each clinician. The database was kept under lock and key and was accessible only to the research team using a pin number.

Best practice identification

Several steps were done to identify best practices for each child depicted in the vignettes:

First, each assessment used by clinicians was reviewed to identify if it: was CP-specific or pediatric-generic, was appropriate for the child's age, was standardized or non-standardized, and covered the various ICF components (Battaglia et al., 2004). Standardized assessments were defined as validated tools with published information on their use, scoring, and psychometric properties. Non-standardized assessments included clinical observations and checklists with little or no information on its psychometrics. A clinician who used at least one standardized assessment appropriate to the age group, in at least one vignette, was defined as a standardized assessment user.

Second, an extensive review of the literature was performed on the various treatment interventions used by OTs and PTs in the management of children with CP (these will be described in detail shortly). Interventions found to have the highest levels of evidence of effectiveness included: strengthening exercises (1b), functional therapy on mobility and self-care (2a), ankle-foot orthoses on gait (2a), and constraint-induced therapy (CIT) on hand function (2a) (Appendix H). However, the highest level of evidence was often based on a single randomized clinical trial of only fair quality (Level 2a); or on one or more well designed non-experimental studies (Level 2b).

Third, to identify the problems in each vignette that would be considered 'best practice problem identification' two groups of experts in CP rehabilitation, each including highly experienced clinicians and researchers, were convened to read each vignette and identify key problems. Their responses were grouped according to ICF and formed the best practice problem identification list for each vignette (Appendix I).

In addition, where the scientific evidence regarding interventions was lacking, the expert groups were again convened to indicate, where possible, the 'best practice interventions' for each vignette (Appendix J).

Finally, an operational definition of 'best practices' for the study vignettes was created in four key areas of OT practice - oral function, fine motor skills, activities of daily living (ADL) and parental support – and four key areas of PT practice - gross motor developmental delay, postural control, mobility and gait function- given these were deemed serious problems, and standardized assessments and, best practice interventions are available. Specifically, best practice was defined as: 1) identifying the problem e.g. for oral function: feeding problem, difficulty drinking fluids, dysphagia, no regular diet, risk of aspiration, choking, swallowing, and still drinking from bottle; 2) indicating one or more standardized or non-standardized assessments specific to the problem e.g. for oral function: clinical observation of feeding or the use of a standardized tool such as the Behavioral Assessment Scale of Oral Functions in Feeding (Ottenbacher,

Dauck, Gevelinger, Grahn, & Hassett, 1985) and, 3) describing one or more best practice interventions specific to the problem as indicated by the literature or by the expert group e.g. for oral function: a feeding recommendation, referral to dysphagia clinic, or referral to SLP.

Systematic review of the literature

Textbooks and professional journals were reviewed to generate a list of interventions potentially used by OTs and PTs for children with CP. Then, an experienced health science librarian trained the team of researchers (n=2), doctoral student (n=1) research assistants (n=2) and summer students (n=2) on conducting systematic reviews. The team, lead by myself, performed extensive searches to identify literature on the following interventions/terms: NDT, Rood, Vojta, sensory integration, conductive education (Peto), play, neurobehavioral, client-/family-centered, electrophysical agents, constrain-induced/restrain therapy, biofeedback, practice, hyperbaric oxygen therapy, strengthening exercise, sports and swimming, horse back riding/hippotherapy, botox, rihzotomy, feeding, assistive devices, home adaptations, orthosis, casting, special seating, wheelchairs and powered mobility. In addition, literature on intensity, frequency and duration of therapy was also explored. These terms were combined with the following keywords on CP: cerebral palsy, athetosis, congenital, diplegia, hemiplegia, hypotonic, mixed, monoplegia, quadriplegia, infantile, spastic, little's disease, ataxia, dyskinesia, and dystonia. Studies in English or French only were

included. The search was further refined to focus on interventions earmarked for children at risk for or diagnosed with CP and who were aged from 1 to 18 years at the start of the program. Although we were concerned primarily with traditional PT/OT interventions, adjuncts to PT/OT (e.g. botox, rihizotomy, hyperbaric oxygen therapy) were also included. These interventions were included because therapists are involved in the evaluation of eligibility of their clients and making referrals for these interventions. In addition, therapists are involved in the preand post- therapy program associated with these interventions.

The following databases were searched: Medline (1965- to June 2003), CINAHL, Premed, PsycINFO, Cochrane library, Health star, Eric, PEDro, OT Seeker and Current Contents databases. All databases were searched from the earliest date each was established until June 2003. All articles were reviewed to identify those that described an intervention and included subject data. All studies examining an intervention were then put on a grid showing study design, population characteristics, intervention, outcome measures and change. Next, RCTs were rated on the PEDro score as follows: two reviewers rated each RCT independently and discrepancies in scoring were then discussed between the two reviewers that scored the same article. When agreement on certain points could not be reached a third reviewer, a senior researcher was consulted. Where an RCT already had a score on the PEDro, the existing score was used. The PICO concept (Population, Intervention, Control, and Outcome) was used to study the

quality of the evidence for each intervention and combined all the research in that area to achieve a Level of Evidence based on Sacket's classification of levels of evidence. Finally, the PEDro score and level of evidence were added to the grid.

For the purpose of the present study, RCTs up to the year 2003 (the studies that clinicians would have been expected to read given this survey was conducted in 2004-2005) were used to code the level of evidence of effectiveness for 15 of these interventions. Scores were retrieved for RCTs rated on PEDro (*Physiotherapy Evidence Database*, 2005). Next, RCTs that did not have PEDro scores were scored by two independent reviewers and interpreted using a quality assessment rating adapted from Foley et al. (2003) where the methodological quality of studies scoring 6-to-10 was considered to be 'high', 4to-5 was considered 'fair', and below 4 'poor'. Six levels of evidence were considered: strong, moderate, limited, consensus, conflicting and no evidence (Appendix E). These levels are based on Sackett's Levels of Evidence (Sackett, 1989; Sackett et al., 2000) method but modified to account for PEDro scoring. (See Appendix H for levels of evidence of effectiveness of the reviewed interventions)

Data Analyses

Descriptive statistics were used to describe the sample according to clinician, client and environmental characteristics. The frequencies of problem identification, assessment and intervention use, and desired intervention use

were calculated separately for each vignette and grouped according to the ICF components, namely: body function and structure, activity and participation, and environmental factors. We also anticipated performing univariate and multivariate analyses of the client, clinician and environmental factors associated with a clinician being a user of best practice: that is, a user of one or more ageappropriate standardized assessment(s); or one or more intervention(s) with high level of evidence of effectiveness. However, after extensive discussion amongst the research team, it was deemed impossible to classify clinicians into a dichotomous classification of best practice intervention use because of no high level of effectiveness. Conversely, because there are clearly defined standardized assessments available for use with children with CP of the age group in guestion, it was anticipated that it would be possible to identify best practice assessment use and subsequently perform univariate and multivariate analyses of the factors associated with a clinician being a user of standardized assessment. These analyses could not be performed for PTs, as the proportion of standardized assessment users for PTs was 91.9%. Thus, these analyses were performed for the OT group only. A clinician was defined as a 'user' of a standardized assessment if he/she used at least one standardized assessments in at least one vignette appropriate to the age group. Next, to explore the variables associated with a clinician being a 'user' of standardized assessments, Chi-square tests (with continuity corrections) were used for categorical variables,

Fisher's Exact Test when cell counts were less than five (Moore & McCabe, 1999), and Kendall's Tau-c test for ordinal data. For continuous variables, simple t-tests were used to compare means for users and non-users. A Bonferroni correction was employed to account for multiple comparisons with the level of significance set at p<0.01 (Moore & McCabe, 1999).

~~.

Next, variables identified through univariate analyses as potential explanatory variables of an individual being a user/non-user of standardized assessments (at p<0.10) were included in logistic regression analyses performed with backward stepwise elimination. Data analyses were done using the SPSS for Windows software.

Finally to identify the prevalence of best practice, that is, problem identification, assessment, and intervention, for the four OT and PT key areas, frequency distributions were generated.

CHAPTER 5

General introduction

This study was part of a multi-centered, province-wide, population-based survey investigating actual OT and PT services for children with CP in Quebec, Canada. A structured telephone interview (Appendix G) was used to elicit information on typical practices based on vignettes depicting two children with CP, one with hemiplegia and the other with quadriplegia, at two age points – 18 months and 4 years. See Appendix F for the complete vignettes.

The project received ethics approval from the *Centre de recherche interdisciplinaire en réadaptation* (CRIR), the Research Ethics Institution Review Board - McGill University, Montreal, Canada and, when requested, individual sites. (Appendix K)

The ICF classification was used to group OTs and PTs responses regarding problem identification, and assessments and intervention use. To establish best practices for each vignette, a series of steps were done. First, a systematic review of the literature for evidence of effectiveness of rehabilitationbased interventions for CP was conducted. Second, assessments used by clinicians were also reviewed to identify if it was: appropriate for the child's age, standardized or non-standardized, and covered the various ICF domains. Finally, two expert groups of experienced pediatric researchers and clinicians were

convened to read the vignette, identify key problems and indicate, where possible, the 'best practice interventions' for each vignette.

In addition to actual practices, OTs and PTs reported additional practices they would want to use, given an ideal world (where resources and time are available). Their perception of barriers to desired use of interventions and of enablers of EBP was also reported.

To further explore OTs' and PTs' practices, an operational definition of 'best practice' was created in four key areas of OT practice and four other key areas in PT practice. Specifically, best practice was defined as: 1) identifying the problem; 2) indicating one or more standardized or non-standardized assessments specific to the problem and, 3) describing one or more 'best practice' interventions or referrals specific to the problem as indicated by the literature or by the expert group.

Univariate and multivariate analyses of the clinician and environmental factors associated with a clinician being a user of best practice were not possible for PTs' responses, as the proportion of standardized assessment users was 91.9%. Therefore, it was not possible to classify clinicians into a dichotomous classification of best practice intervention use based on the current level of evidence of CP interventions.

However, the univariate and multivariate analyses of the clinician and environmental factors associated with an OT being a user of one or more ageappropriate standardized assessment(s) for at least one vignette were performed.

In this chapter, the manuscript, submitted for publication, reporting the results of this study is presented. Discussion of the results is included in this manuscript. Chapter 6 provides general discussion, summary of the findings as well as clinical implications and future directions of research.

Actual versus Best Practices for Young Children with Cerebral Palsy:

A Survey of Pediatric Occupational Therapists and Physical Therapists in

Quebec, Canada

Short title: OT and PT Practice for Cerebral Palsy

Submitted to Developmental Neurorehabilitation (formly Pediatric Rehabilitation)

Journal, February, 2007

Saleh M., Korner-Bitensky N., Snider L., Malouin F., Mazer B., Kennedy E., Roy M-A

MAYSOUN SALEH MSc PT, PhD candidate. School of Physical & Occupational Therapy, Faculty of Medicine, McGill University and Centre de recherche interdisciplinaire en réadaptation du Montréal métropolitain (CRIR), Montreal, Quebec, Canada.

NICOL KORNER-BITENSKY PhD OT, Associate Professor. School of Physical & Occupational Therapy, Faculty of Medicine, McGill University and CRIR, Montreal, Quebec, Canada.

LAURIE SNIDER PhD OT, Assistant Professor. School of Physical & Occupational Therapy, Faculty of Medicine, McGill University and CRIR, Montreal, Quebec, Canada.

FRANCINE MALOUIN PhD PT, Professor, Department of Rehabilitation, Laval University and Center for Interdisciplinary Research in Rehabilitation and Social Integration (CIRRIS), Quebec City, Quebec, Canada.

BARBARA MAZER PhD, Assistant Professor. School of Physical & Occupational Therapy, Faculty of Medicine, McGill University; CRIR; and Jewish Rehabilitation Hospital, Laval, Quebec, Canada.

EILEEN KENNEDY MSc PT, Professional Coordinator, Physiotherapy Department, Montreal Children's Hospital, McGill University Health Centre, Quebec, Canada. MARC-ANDRÉ ROY MSc, School of Physical & Occupational Therapy, Faculty

of Medicine, McGill University, Montreal, Quebec, Canada.

· .

Correspondence: Maysoun Saleh MSc, PhD candidate. School of Physical and Occupational Therapy, McGill University 3630 Promenades Sir-William-Osler Montreal, Quebec, H3G 1Y5 Email: maysoun.saleh@mail.mcgill.ca Telephone: (514) 398-5457/ Fax: (514) 398-8193

Acknowledgements and Funding

This project was funded in part by a grant from the Quebec Rehabilitation Research Network: (REPAR) and the Cerebral Palsy Axis of the Réseau de recherche sur le développement, la santé et le bien-être de l'enfant (RDSBE) du Fonds de la recherche en santé du Québec (FRSQ). We thank M. Levin, R. Birnbaum and F. Dumas for their help in the creation of best practices for the vignettes and J. Lamoureux for performing the statistical analyses. We also thank the interviewers and clinicians who participated.

ABSTRACT

Rationale: Cerebral palsy (CP) constitutes a substantial portion of pediatric rehabilitation, yet little is known regarding actual occupational therapy (OT) and physical therapy (PT) practices. This study describes OT and PT practices for young children with CP in Quebec, Canada.

Methods: This was a cross-sectional survey. All eligible, consenting pediatric occupational therapists (OTs) and physical therapists (PTs) were interviewed using a structured telephone interview based on vignettes of two typical children with CP at two age points – 18 months and 4 years. Reported practices were grouped according to the International Classification of Functioning, Disability, and Health (ICF).

Results: 91.9% of PTs (n=62; 83.8% participation rate) and 67.1% of OTs (n=85; 91.4% participation rate) reported using at least one standardized pediatric assessment. OT and PT interventions focused primarily on impairments and primary function. Both professions gave little attention to interventions related to play and recreation/leisure. Clinicians reported the need for more training and education specific to CP and to the use of research findings in clinical practice.

Conclusion: Wide variations and gaps were identified in clinicians' responses suggesting the need for a basic standard of PT and OT management as well as strategies to encourage knowledge dissemination regarding current best practice.

Key words: Occupational therapy; physical therapy; cerebral palsy; International Classification of Functioning, Disability, and Health (ICF); evidence based practice; pediatric rehabilitation.

1. Introduction

Cerebral palsy (CP) is a common cause of chronic childhood disability and constitutes a substantial portion of pediatric occupational therapy (OT) and physical therapy (PT) practice [1,2]. This condition demands comprehensive rehabilitation using age-appropriate tasks and activities [3] which encompass aspects of body function and structure, activity and participation, and personal and environmental factors [4].

In the past decade, numerous standardized pediatric assessments have been developed, e.g.: the Alberta Infant Motor Scale (AIMS) [5]; Peabody Developmental Motor Scales (PDMS) [6]; Pediatric Evaluation of Disability Inventory (PEDI) [7]; and Pediatric Functional Independence Measure (WeeFIM) [8]. Further, a number of tools have been created specifically for the CP population such as the Gross Motor Function Measure (GMFM) [9] and the Quality of Upper Extremities Skills Test [10]. In addition, numerous interventions are recommended in OT and PT curricula and textbooks [1,11-13]. With so many assessment and treatment options available it is sometimes difficult for clinicians to know which are the most appropriate, given the needs of the child and family and the realities of clinical practice. Indeed, clinicians are increasingly challenged to justify their interventions, and be more accountable in the treatment they provide to their clients [14]. Specifically, clinicians are being told to base their daily practice on evidence-based practice (EBP) which refers to the clinical

decision-making process of weighing the available evidence for an intervention and integrating it with clinical experience, the needs of the patient and the demands and the resources of the health system [15,16].

The question arises as to which assessments, interventions, and best practices are actually used by occupational therapists (OTs) and physical therapists (PTs) in the management of young children with CP.

A review of the literature found four surveys examining OTs' use of pediatric assessments [17-20], none specific to the CP population. Two [19,20] addressed the school-aged pediatric population and will not be reviewed here. Reid [17] found that 83% of the 69 pediatric OTs surveyed in Ontario, Canada reported using standardized assessment tools, with more than half using them regularly. These tools focus primarily on impairment and activity limitation. Similarly, an Australian survey of 60 OTs identified standardized assessments used in pediatric practice [18]. Most were discriminative measures of impairment and activity limitation that are typically used to identify a treatment plan, rather than evaluative measures capable of detecting change in a child's functioning over time.

Interventions used by OTs working with children have been examined for a general pediatric population aged 0-to-5 years [21], and for young children with CP [22]. Berry and Ryan [22] examined the OT frames of reference (functional, neurodevelopmental, biomechanical, developmental, sensory integration) used

by members of the National Association of Pediatric Occupational Therapists in the United Kingdom in managing children with CP. Using a self-administered questionnaire with both closed- and open- ended questions, 180 randomly selected OTs working with children with CP were contacted and 120 (66.6%) completed the survey. A multi-theoretical approach was used by 91.7% of respondents with the most common frames of reference being functional (86.7%), neurodevelopmental (80.8%) and biomechanical (74.2%). When asked why these were used, clinicians indicated suitability for the population, clinical effectiveness, or that they were basic approaches used in OT practice.

These surveys provide some information on OT approaches to treating children with CP. However, as they do not ask all clinicians to respond to the same cases, they do not allow for comparison of the OT practices provided for a specific child with CP across respondents.

Two surveys have examined assessment and treatment practices of PTs for CP [23,24]. Craig [23] surveyed 17 PTs (85% response rate) in Scotland. All respondents used neurodevelopmental therapy (NDT) while 9/17 used outcome measures, with the GMFM being the most common. Only 5/9 stated that they used outcome measures on a regular basis. Chiarello et al. [24] used a research round table discussion in 1999 to gather information on practices used by 62 pediatric PTs and PT assistants in the management of mobility for children with spastic diplegia. Clinical vignettes of one child at five different ages and

developmental stages (from early age to high school) were presented. Clinicians reported using a variety of standardized developmental and functional tests for the child from birth to 15 years of age, as well as measures of social interactions, play, environment, and equipment. Intensity of treatment differed widely, with a reported frequency from one to five times per week. Conceptual frameworks guiding practice included a family-centered philosophy and functional approach, with direct intervention strategies including: motor learning principles, functional training, environmental adaptations, NDT and sensory integration. Although this round table discussion provided a picture of pediatric PT practices in the late 1990's, seven years has passed. In addition, the results may have been affected by the lack of random sampling of clinicians and social desirability bias towards reporting acceptable or recommended professional practices. However, the use of vignettes in this study [24] helped in exploring the variation of practices among PTs for a specific child.

An extensive and systematic review revealed no comprehensive population based study exploring OT and PT practices specific to young children with CP (1-5 years old). Therefore, the global objective of the present study was to describe OT and PT practices for two typical children with CP, one with hemiplegia, the other with quadriplegia, at two age points, 18 months and 4 years. The specific objectives were to identify: 1) the prevalence of OT and PT practices including problem identification, assessments, treatment goals,

interventions, and referrals; 2) factors related to the client, clinician, and working environment, that are associated with the use of EBP; 3) desired practices of OTs and PTs given an ideal world; 4) clinicians' perceived barriers to use of desired practices; and 5) factors perceived by clinicians as enablers of EBP.

2. Methods

The present study was part of a multi-centered, province-wide survey investigating OT and PT services for children with CP in the province of Quebec, Canada. A structured telephone interview was used to elicit information on typical OT and PT practices for children with CP using case descriptions (vignettes). The project received ethics approval from the *Centre de recherche interdisciplinaire en réadaptation* (CRIR), the Research Ethics Institution Review Board - McGill University, Montreal, Canada, and when requested, individual sites. This paper presents the findings specific to young children with CP (1-5 years old).

Subjects

Eligible participants included all OTs and PTs working in pediatric rehabilitation in Quebec, Canada who: worked in the same setting for \geq 3 months, treated \geq one child per month between the ages of 1-to-5 years with the diagnosis of CP or at high-risk for CP, were members of their respective professional Order (a requirement for clinical practice), spoke French or English, and agreed to participate. Exclusion criteria were: participation in the creation of
the vignettes, or in pilot testing of the study questionnaire, or working only in research-related assessment and treatment. Sample size calculations were not performed as all eligible and consenting OTs and PTs in the province were surveyed.

Procedures

Development of vignettes

The research team held two focus groups of experienced pediatric therapists who were brought together to create cases of typical children with CP. The Gross Motor Function Classification System (GMFCS) [25], which classifies children into five functional levels was used to guide the creation of four vignettes depicting two typical children with different classifications of CP, at two different ages: a child with a spastic right hemiplegia (GMFCS-Level II) at 18 months (Hemi-18m) and again at 4 years of age (Hemi-4y); and a child with spastic quadriplegia (GMFCS-Level IV) for the same age points (Quad-18m and Quad-4y). The therapists were instructed to describe the child in terms of: gross and fine motor function, sensory function, behavior, language, psycho-educational and cognitive function, activities related to participation, family structure, and physical and social environment. Once created, the vignettes were translated into English or French depending on the language of creation. Then, the focus group members reviewed the final versions of the vignettes to ensure face validity. Excerpts from each vignette are presented here.

Child 'S' with hemiplegia at 18 months:

S is sitting leaning to one side. S enjoys watching the other children play. The right side of her body seems smaller than the left with slight increase in tone on the right. S scoots on her bottom. Standing, S's weight is on the left leg, with the right leg bent and the right heel not touching the floor. At home, S cruises along the length of the couch but cannot climb up onto it. To get from standing to sitting she drops down onto her bottom. S has a hard time picking up Cheerios. S cries when you try to move her

right arm. There is limited spontaneous use of the right hand. S stabilizes a book with the right forearm while turning several pages at a time with the left hand. S responds to her name, waves bye-bye, and has a ten-word vocabulary. S babbles spontaneously and moves quickly from toy to toy. Mom first became concerned when S wasn't sitting at 10 months, then a referral was made at the 12-month check-up. Mom is looking into daycare.

Child 'S' with hemiplegia at 4 years:

Parents have recently moved. They have another child, a 3-month-old baby. S walks independently with a hinged ankle-foot orthosis (AFO) on her right foot. S has asymmetrical gait pattern that deteriorates when not using the AFO at home. S can go up and down stairs in a reciprocal pattern using a railing on the left side. S goes shopping with mom, who brings a stroller for longer distances. When running, S has difficulty clearing the right foot off the ground. S becomes frustrated when trying to keep up with children, tantrums easily, and doesn't seem to understand the rules of simple games. S scribbles with a crayon using her left hand and uses scissors to try to snip paper. S requires help with dressing. S eats independently but is messy, uses a spoon and fork, but not a knife. Mom needs to remind S to use her right hand. S speaks in short sentences. Mom's main concern is on how to integrate S into nursery school.

Child 'V' with quadriplegia at 18 months:

The family recently moved into the area. V is sitting in a standard stroller leaning to the right, slipping out of the seat with stiff legs. Mother can't find an adequate sled. He smiles when spoken to. You note a slight "strabismus". V has been turning from his stomach to his back since the age of 12 months and does so by pushing his head into extension. He moves a little and reaches for a toy with his left hand. V is able to grab a toy and let it go. V makes little sounds. Sitting supported, V plays with toys, scribbles with a crayon but his right hand remains closed. When he gets angry he pushes into extension. Sitting in his adapted highchair, he can bring a cookie to his mouth with his left hand. He eats soft foods and has difficulty with solid food. V has started to drink from a sip-cup but he chokes from time to time. The parents don't go out often because V has a hard time going to sleep.

Child 'V' with quadriplegia at 4 years:

Parents work full-time; live in a bungalow with a playroom in basement. Mom is concerned about school as V is not yet walking and he still wets himself. Undressing him, he helps by lifting up his left arm. Talking to him, V responds with short sentences with effort. Strangers have a hard

time understanding him. Sitting, V supports himself with his right arm to reach for toys with left hand. V "bunny hops" to get to toys. V pulls up to stand using his arms to retrieve objects off the table. He plays with his brother in his adapted walker. On his adapted tricycle, V can peddle, but needs help steering. V enjoys playing with his friends but is easily distracted. V is able to make simple lines and to complete a four-piece puzzle. V uses an adapted spoon, eats small bite-size pieces and drinks from a straw. V is a messy eater especially with liquids. Family rarely goes out. The grandparents can no longer look after him because he has become too heavy. It is difficult to find other babysitters. V occupies himself with his computer games using an adapted mouse.

The telephone-interview questionnaire

A telephone-interview questionnaire was created based on a validated questionnaire used in a previous study [26], and piloted on a convenience sample of six pediatric therapists. Based on feedback, clarifications were made and redundancies eliminated. The final version was piloted with two therapists to verify its readability.

The questionnaire consisted of eight components: 1) clinician characteristics; 2) work setting; 3) the vignette(s); 4) open-ended questions related to the child described in the vignette including the problems identified by the clinician, the assessments and interventions (including referrals) typically used in clinical practice with this child, and three primary goals of treatment; 5)

desired intervention practices given an ideal world and barriers to their use; 6) perceived level of support within the work environment for educational activities; 7) clinician's activities related to continuing education; and 8) perceived enablers of EBP. See Tables 1 and 2 for the specific variables.

Tracing procedures

The listings (2003) provided by the respective provincial licensing body were used to identify OTs and PTs working in pediatrics in Quebec. To identify clinicians who may have been missed, a snowball sampling technique was used where clinicians were asked to indicate colleagues working with a CP clientele. If a clinician was not reached after 12 attempts and the secretary or voicemail indicated that the clinician was working in the organization, this clinician was considered a passive refusal. A clinician who could not be located after rigorous tracing efforts was coded as non-traceable.

Interviewing procedures

Once the clinician was contacted, found eligible, and agreed to participate, he/she was asked about his/her typical clientele with CP. Those working with both types of CP (hemiplegia and quadriplegia) and both age groups (18 months and 4 years) received two of the four vignettes, as per random assignment, for example, Hemi-18m and Quad-4y. Those who worked with only one type of CP or one age group were assigned the corresponding vignette(s). In order that clinicians remained unaware of the questions to be posed, only designated sections of the questionnaire (the vignettes, the list of potential barriers to desired use of interventions, and the list of enablers of EBP) were sent 24-to-48 hours before the interview. For specific sections (desired use of interventions, treatment goals, and referrals) responses were collected on only one vignette per clinician to avoid excessively long interviews.

Six interviewers were trained using elements that have been shown to significantly improve response rates [27]. To reduce potential contamination, the interviewer reminded the clinician to keep the interview confidential. In addition, those within an organization were interviewed in close succession. The clinicians were also reminded that there is no right or wrong answers and that we are interested in their actual practices for children described in the vignettes. Following each interview a research assistant verified the completeness of the questionnaire and if there was missing information, alerted the interviewer to recontact the clinician to ascertain the necessary responses.

Data management

Two research assistants coded the clinicians' open-ended responses regarding problems identified in the child, and the assessments and interventions they would use. The codes were reviewed and, where appropriate, grouped to eliminate redundancy. To verify consistency when the terms were ambiguous, a third person, an investigator on the project, verified the codes. A research

assistant entered the data into a computerized database system using a unique identifier for each clinician. Finally, codes were grouped according to the International Classification of Functioning, Disability and Health (ICF) [4]: body function and structure, activity and participation, and environmental factors. **Best practice identification**

To identify the problems in each vignette that would be considered 'best practice problem identification' two groups of experts in CP rehabilitation, each including highly experienced clinicians and researchers, were convened to read each vignette and identify key problems. Their responses formed the best practice problem identification list for each child. (See appendix A).

Each assessment used by clinicians was reviewed to identify if it: was CPspecific or pediatric-generic, was appropriate for the child's age, was standardized or non-standardized, covered the various ICF components [4]. Standardized assessments are defined as validated tools with published information on their use, scoring, and psychometric properties. Non-standardized assessments are clinical observations and checklists with little or no information on psychometrics. A clinician who used at least one standardized assessment appropriate to the age group, in at least one vignette, was defined as a standardized assessment user.

Each intervention described by clinicians was given a code. Next, 15 rehabilitation-based interventions potentially used by OTs and PTs in CP practice

were systematically reviewed. Randomized controlled trials (RCTs) up to the year 2003 (the studies that clinicians would have been expected to read given our survey was conducted in 2004-2005) were used to code the level of evidence of effectiveness for these interventions. On the Physiotherapy Evidence Database (PEDro) of the Centre for Evidence-Based Physiotherapy [28], RCTs are rated for internal validity on a ten-point scale. These scores were retrieved. Next, RCTs that did not have PEDro scores were scored by two independent reviewers and interpreted using a quality assessment rating adapted from Foley et al. [29] where the methodological quality of studies scoring 6-to-10 on PEDro scale was considered to be "high", 4-to-5 was considered "fair", and below 4 "poor". Six levels of evidence were considered: strong, moderate, limited, consensus, conflicting and no evidence. These levels are based on Sackett's Levels of Evidence [30,31] method but modified to account for PEDro scoring (Appendix B). Interventions found to have the highest levels of evidence of effectiveness include: strengthening exercises (1b), functional therapy on mobility and self-care (2a), ankle-foot orthoses on gait (2a), and constraint-induced therapy (CIT) on hand function (2a) (see Appendix C). Where the scientific evidence was lacking, the expert groups were again convened to indicate, where possible, the 'best practice interventions' for each vignette. (See appendix D).

Finally an operational definition of 'best practice' was created in four key areas of OT practice - oral function, fine motor skills, activities of daily living

(ADL) and parental support – and four key areas of PT practice - gross motor development, postural control, mobility and gait function- given these were deemed serious problems, as identified by the expert group, and best practice interventions are available. Specifically, best practice was defined as: 1) identifying the problem e.g. for oral function: feeding problem, difficulty drinking fluids, dysphagia, no regular diet, risk of aspiration, choking, swallowing, and still drinking from bottle; 2) indicating one or more standardized or non-standardized assessments specific to the problem e.g. for oral function: clinical observation of feeding or use of a standardized tool such as the Behavioral Assessment Scale of Oral Functions in Feeding [32] and, 3) describing one or more best practice interventions specific to the problem as indicated by the literature or by the expert group e.g. for oral function: a feeding-recommendation, referral to dysphagia clinic, or referral to speech language pathologist (SLP).

Data analyses

Descriptive statistics were used to describe the sample according to clinician, client and environmental characteristics. The frequencies of problem identification, assessment and intervention use, and desired intervention use were calculated separately for each vignette according to the ICF components. We also anticipated performing univariate and multivariate analyses of the client, clinician and environmental factors associated with a clinician being a user of best practice: that is, a user of one or more age-appropriate standardized

assessment(s); or one or more intervention(s) with high level of evidence of effectiveness. However, after extensive discussion amongst the research team, it was deemed impossible to classify clinicians into a dichotomous classification of best practice intervention use. Conversely, because there are clearly defined standardized assessments available for use with children with CP of the age group studied here, it was anticipated that it would be possible to identify best practice assessment use and subsequently perform univariate and multivariate analyses of the factors associated with a clinician being a user of a standardized assessment. These analyses could not be performed for PTs, as the proportion of standardized assessment users for PTs was 91.9%, and thus, were performed for the OT group only. A clinician was defined as a 'user' of a standardized assessment if he/she used at least one standardized assessments in at least one vignette appropriate to the age group. Next, to explore the variables associated with a clinician being a 'user' of standardized assessments, Chi-square tests (with continuity corrections) were used for categorical variables, Fisher's Exact Test when cell counts were < five [33], and Kendall's Tau-c test for ordinal data. For continuous variables, simple t-tests were used to compare means for users and non-users. A Bonferroni correction was employed to account for multiple comparisons with the level of significance set at p < 0.01 [33].

Next, variables identified through univariate analyses as potential explanatory variables of an individual being a user/non-user of standardized

assessments (at p<0.10) were included in logistic regression analyses performed with backward stepwise elimination. Data analyses were done using the SPSS for Windows software.

Finally to identify the prevalence of best practice, that is– problem identification, assessment, and, intervention - for OT and PT key areas, frequency distributions were generated.

3. Results

Clinicians' characteristics

A total of 433 OTs were contacted, 93 met eligibility criteria and 85 agreed and were interviewed for a 91.4% participation rate. A total of 156 vignette responses were elicited from OTs (Hemi-18m = 35; Hemi-4y = 38; Quad-18m = 42; Quad-4y = 41), with 71 providing information on two vignettes, and 14 on one.

For PTs, 411 were contacted, 74 met eligibility criteria and 62 agreed and were interviewed (83.8% participation). Overall, 112 vignette responses were elicited from PTs (Hemi-18m = 34; Hemi-4y = 26; Quad-18m = 27; Quad-4y = 25): 50 responded to two vignettes, and 12 to only one.

Characteristics of both clinician groups and settings are shown in Tables 1 and 2 with the OT group also presented according to users/non-users of standardized assessments. OTs and PTs were mostly females (96.5%, 91.9%), with Bachelor's degrees (97.6%, 95.2%), and working in public setting (91.8%, 87.1%), respectively. Almost one third of PTs (33.9%) graduated before the year 1985, while 21% were recent graduates (2000-2004). For OTs, 18.8% graduated before the year 1985, while 32.9% were recent graduates (2000-2004).

On average, in a typical week, OTs spent 13.9% (SD=18.0) of their work time assessing children with CP, and 31.4% (SD=29.8) treating these clients. The average time for PTs was 15.5% (SD=15.0) of work their time assessing and 42.0% (SD=29.2) treating.

In addition, 91.8% of OTs and 91.9% of PTs were working in a setting were students come for fieldwork placements with the same percentages perceived their work setting to be supportive of ongoing learning on CP. Working settings were reported by clinicians to provide funding for continuing education (OTs= 95.2%; PTs: 95.2%).

Problem identification, assessment and intervention use

Figures 1(A and B) and 2 (A and B) show responses regarding problem identification as reported by 10% of OTs or more, with reported actual assessments and interventions. OT practices focused largely on impairment and basic function, while play, leisure and social integration received the least attention across vignettes. The most frequently identified problems for the 18-month old children were: tone (80%) and fine motor skills (74.3%) for the child described as Hemi-18m; and positioning (88%) and feeding (86%) for Quad-18m. In the 4-year old children, ADL (Hemi-4y = 90%; Quad-4y = 83%) and walking

and moving around (Hemi-4y = 66%; Quad-4y = 68%) were the most frequently stated problems.

The most prevalent non-standardized OT assessment was the Talbot Battery [34]: Hemi-18m = 74%; Hemi-4y = 87%; Quad-18m = 77%; Quad-4y =76%. Overall 67.1% of OTs used at least one standardized assessment for at least one vignette, with age-trend: using more standardized assessments for the older children (Hemi-18m = 40%; Hemi-4y = 78.9%; Quad-18m = 28.6%; Quad-4y = 58.5%).The most prevalent standardized assessments used by OTs include the PDMS across all vignettes and the Developmental Test of Visual-Motor Integration (VMI) for the 4-year old children (Figure 3).

The most frequent OT intervention for both 18-month-old children was recommendation of adaptive equipment and assistive devices (50%). In addition, 47% of respondents for Hemi-18m indicated the use of a home program, while 41% of respondents to Quad-18m indicated interventions for feeding. For Hemi-4y, training on ADL and fine motor skills were the most frequent interventions (71%). Finally, for the Quad-4y vignette, 63.4% recommended adaptive equipment and assistive devices and 48.8% indicated ADL training. In many instances a high percent of OTs identified problems, but very low proportion reported interventions related to these problems. For example, of all OTs identified feeding as a problem for Quad-18m and Quad-4y, almost half of them reported interventions related to feeding. In addition, fine motor skills were always

assessed by OTs for Hemi-18m, while less than half them indicated relevant treatment.

Treatments based on neuro-facilitation approaches such as NDT, proprioceptive neuromuscular facilitation (PNF), and inhibition/facilitation techniques, were used by OTs more for the younger than for the older children (Hemi-18m = 38.2%; Hemi-4y = 21.1%; Quad-18m = 40.5%; Quad-4y = 31.7%). Similarly, OT interventions related to play were reported more for the younger children (Hemi-18m= 35.3%; Quad-18m = 31%) than for the older (Hemi-4y = 13.2%; Quad-4y = 12.2%). Interventions related to recreation/leisure were less prevalent: Hemi-18m = 5.9%; Hemi-4y = 2.6%; Quad-18m = 4.8%; Quad-4y = 0%.

Figures 4 (A and B) and 5 (A and B) show, for each vignette, the problems identified by 10% or more of PTs, along with the assessments and interventions they would use. Problem identification was almost directed to basic functions and activities with little attention to play, socialization, and recreation/leisure. The majority of PTs identified positioning as a problem for the younger children, and ADL and walking and moving around for the older children. In addition, as would be expected, problems of school integration were identified for the 4-year old children but not for the younger ones.

Overall, 91.9% of PTs used at least one standardized assessment for at least one vignette (Hemi-18m = 88.2%; Hemi-4y = 84.6%; Quad-18m = 85.2%;

Quad-4y = 88%), the most prevalent being the GMFM (Figure 6). The environmental factors domain of the ICF was infrequently assessed by PTs across vignettes: more clinicians assessed the physical environment for the two four-year old children than for the younger children (Figures 4 and 5).

The most prevalent interventions across vignettes were training to maintain body position (e.g. postural and balance training, and positioning), family involvement (e.g. parents education on how to handle a child with CP and home exercises), and recommendations of equipment and assistive devices (Figures 4 and 5). Discrepancy between problem identification and interventions may be noticed across vignettes. For example, more than 70% of PTs identified muscle tone as a problem for Hemi-18m (Figure 4A), while only 20% mentioned intervention(s) related to this problem. Conversely, only 15.4% of PTs identified problems related to body positioning for Hemi-4y (Figure 4B), whereas, 58% indicated interventions related to this problem. In addition, although the problem of muscle weakness was identified by less than 10% of PTs for Hemi-4y and 25.9% indicated these exercises for the Quad-18m.

Other interventions reported by PTs included stretching which was mentioned by almost two thirds of PT participants for Hemi-18m and Hemi-4y, while 37% and 40% indicated using it for Quad-18m and Quad-4y, respectively. Treatments based on neuro-facilitation approaches such as NDT, PNF, and

inhibition/facilitation techniques, were used by PTs more for the younger than the older children (Hemi-18m = 38.2%; Hemi-4y = 11.5%; Quad-18m = 33.3%; Quad-4y = 28%).

Best practice use

There were similarities in experts' 'best practice problem identification' and the problems identified by clinicians. For example, school integration, ADL and mobility were main problems identified by clinicians and experts for the two 4year-old children. In addition, both groups identified 'sleeping problems' for Quad-18m, 'pain with arm movement' for Hemi-18m, and 'positioning' for both Quad-18m and Hemi-18m. The terms task-specific training and functional exercises, interventions considered by the expert group to be best practice for all vignettes were only mentioned by 8.8% of PTs for Hemi-18m; 7.7% for Hemi-4y; 11.1% for Quad-18m and 20% for Quad-4y. As for OTs: Hemi-18m = 8.6%; Hemi-4y = 13.2%; Quad-18m = 9.5%; Quad-4y = 2.4%. The expert group also indicated upper limb constraint induced therapy (CIT) as a best practice for Hemi-4y, however, no OT or PT indicated using CIT for this child.

OTs' best practices for the four key areas were explored using frequency distributions. Of the 42 OTs who responded to Quad-18m, 37 (88%) identified feeding as a problem. Of these, only 18 indicated both an assessment and an intervention related to a feeding problem or possible dysphagia, or recommended a referral to an SLP for evaluation and treatment. For Quad-4y, no OT identified,

assessed and suggested interventions (including referral to services such as social work) for the problem of parental support. Seven of 35 OTs identified a problem in fine motor skills for the vignette Hemi-18m, assessed these skills and suggested treatment. For Hemi-4y, 14 of 38 OTs identified, assessed and suggested treatment for ADL.

As for PTs, 26 (96.3%) of the 27 PTs who responded to Quad-18m identified gross motor developmental delay as a problem with only 19 of them indicated both assessment and intervention related to a gross motor developmental delay problem, or recommended a referral to a positioning or assistive device clinic or for hydrotherapy. For Quad-4y, 12 of 25 PTs identified, assessed and suggested interventions (including referral to services such as assistive devices) for the problem in mobility. For the problems related to postural control, 17 of 34 PTs identified a problem in the vignette Hemi-18m, assessed this problem and suggested treatment. For Hemi-4y, 11of 26 PTs identified, assessed and suggested and suggested treatment for gait function.

Factors related to OTs' use of standardized assessments

Univariate analyses showed that 'having a specialty certificate' was the only clinician variable that was significantly associated with an OT being a 'non-user', χ^2 (1, N = 85) = 6.712, p = 0.01. The most prevalent specialty certificates were: sensory integration (25%), and neurodevelopmental treatment (21.4%).

The only work setting characteristic that approached significance for being a user was 'CP research within the setting', χ^2 (1, N = 85) = 3.343, p = 0.068.

The logistic regression model indicated that not having a specialty certificate (odds ratio = 4.461, p = 0.004, 95%CI = [1.6; 12.4]) was the only variable that explained being a user of standardized assessments, with CP research conducted in the setting approaching significance (odds ratio = 3.186, p = 0.054, 95%CI [0.98; 10.3]).

Duration and frequency of intervention

When OTs were asked to state the typical duration and frequency of their treatments for the child depicted in each vignette, the majority reported a duration per session ranging from 45-60 minutes (Hemi-18m= 80%; Hemi-4y= 97%; Quad-18m= 94.7%; Quad-4y= 85%), with a frequency of four to seven sessions per month (Hemi-18m= 58.8%; Hemi-4y= 86.1%; Quad-18m= 73.7%; Quad-4y= 55%). The most frequently indicated total durations of treatment were: 'up to school age' (Hemi-18m = 31.4%; Hemi-4y = 34.2%; Quad-18m = 40.5%; Quad-4y = 22%) or, 'for a year or less' (Hemi-18m= 22.9%; Hemi-4y= 18.4%; Quad-18m = 16.7%; Quad-4y = 22%). In addition, 19% of OTs reported treating Quad-18m up to adulthood.

Typical session duration of PT treatments ranged from 45-60 minutes (Hemi-18m= 97.1%; Hemi-4y= 96%; Quad-18m= 100%; Quad-4y= 96%), with a frequency of four to seven sessions per month (Hemi-18m= 67.6%; Hemi-4y=

52%; Quad-18m= 61.5%; Quad-4y= 70.8%). The most frequently indicated total durations of treatment were 'for a year or less' (Hemi-18m= 44.1%; Hemi-4y= 19.2%; Quad-18m= 22.2%; Quad-4y= 20%) or 'up to school age' (Hemi-18m = 14.7%; Hemi-4y = 26.9%; Quad-18m = 22.2%; Quad-4y = 32%).

Referrals and treatment goals

Table 3 indicates typical OTs' and PTs' recommended referrals according to vignette. The most common PTs' referrals for all vignettes were to OT services followed by SLP. OTs' first recommended referral across all vignettes was to PT services. The second most frequent for the younger children was social work, while for the older children was SLP.

Figure 7 presents the most prevalent treatment goals indicated by OTs as their top three goals for each vignette. The most frequent goal overall for each child included: mobility for Hemi-18m (50%) and Quad-4y (66.7%), and feeding for Quad-18m (57.1%). Although functional independence was the mot frequent treatment goal overall for Hemi-4y (81.4%), school integration was twice more frequently chosen as the first goal for this child.

PTs' most common treatment goals are presented in Figure 8. The majority of PTs focused on school integration for Hemi-4y, and gross motor function for the younger children. In addition, mobility was chosen always as the first goal for Quad-4, the gross motor function came always second and fine motor skill came always third.

Desired intervention use and treatment intensity

Table 4 presents OTs' and PTs' desired use of processes and interventions, given an ideal world where resources, time, and tools are unlimited, again according to vignette. The greatest OT desired practice was an increase in treatment duration and frequency as indicated by 34% of all OTs. A total of 24 OTs (28.2%) indicated no desired practices. In addition, of all OT participants, six wanted more training on NDT, eight wanted more specialized education, and 2 desired to use more specialized assessment. Eighty percent of PTs indicated a desire to add treatment practices. The most frequent desired practice was hydrotherapy (25.8% of all PTs); followed by increasing treatment duration and frequency (16.1%). Five PTs wanted more specialized training related to CP, three desired NDT training, and two indicated the desire for Botox treatment. The use of hyperbaric oxygen therapy, massage, osteopathy, and PNF, were indicated as desired practices by one PT each.

Of all 155 desired practices reported by OTs, desired services to be delivered at the child's home or school were mentioned 17 times, the need for assistive devices or specialized equipment was mentioned seven times, and desired support for the family mentioned seven times as well. Of all 106 desired interventions reported by PTs, six were treadmill with or without partial weight support; five were related to sports and swimming; and five were therapeutic horseback riding.

When OTs were probed further regarding desired session duration,

monthly frequency, and total duration of treatment in an ideal world, the majority desired durations of 45-to-60 minutes per treatment (Hemi-18m= 85%; Hemi-4y= 100%; Quad18m= 84%; Quad-4y= 71.4%), and a frequency of more than seven treatments per month (Hemi-18m= 70%; Hemi-4y= 53.7%; Quad18m= 76.9%; Quad-4y= 61.9%). The most frequently desired total duration of treatment was: 'up to school age' (Hemi-18m= 41.2%; Hemi-4y= 22.2%; Quad-18m= 28%; Quad-4y= 35%) or 'for a year or less' (Hemi-18m= 17.9%; Hemi-4y= 44.4%; Quad-18m= 24%; Quad-4y= 30%). For Quad-18m, 24% of OTs desired to treat the child up to adulthood.

Most PTs desired a duration of 45-to-60 minutes per treatment (Hemi-18m= 92.9%; Hemi-4y= 85.7%; Quad18m= 92.3%; Quad-4y= 100%), and a frequency of greater than seven treatments per month (Hemi-18m= 66.7%; Quad18m= 69.3%; Quad-4y= 66.7%), with the exception of the Hemi-4y child where 50% of PTs desired four to seven sessions per month. The most frequently desired total duration of treatment was: 'for a year or less' (Hemi-18m= 35%; Hemi-4y= 45.5%; Quad-18m= 46.2%; Quad-4y= 33.3%) then, 'up to school age' (Hemi-18m= 30%; Hemi-4y= 9%; Quad-18m= 46.2%; Quad-4y= 33.3%).

Barriers and enablers of EBP

When asked to indicate the primary three perceived barriers to desired use of interventions (Figure 9), the most frequently reported by OTs were: 'requires special training', and 'I do not have the necessary time' with the first coming more frequently in Rank number one. PTs' most prevalent overall reported barriers were time constraints, and child/parent compliance; with the 'need for training' and 'equipment availability' barriers frequently reported as the Rank number one barrier. Figure 10 indicates the most helpful factors for a clinician in making use of research findings in clinical practice. Overall, 'frequent educational sessions on the use of research findings in clinical settings' was the leading enabler for OTs (72.6%) and PTs (65%).

4. Discussion

This was a cross sectional survey investigating OT and PT practices for young children with CP as reported by OTs and PTs using a structured telephone interview questionnaire. It was the first study to use the ICF classification to classify actual OT and PT practices for these clients. The use of ICF in reporting research findings provides a standard language and framework for communication among researchers as well as among different health disciplines [35]. Furthermore, the use of vignettes helped in comparing practices among clinicians of the same health discipline for a given child with CP.

The standardized elements used in administering the telephone-interview questionnaire [27,36] helped in increasing the response rate of the present study. The response rate was comparable with previous studies [17-21,23]. However, the present study was a population-based study where all eligible and consenting

pediatric OTs and PTs working with young children with CP in the province of Quebec were interviewed.

Problem identification, assessment and intervention use

Most of the reported problems and interventions were each reported by less than 60% of clinicians reflecting variability among clinicians' practices for a specific child. The majority of clinicians (more than 67%) agreed on only two problems and on only one intervention per vignette. However, some similarities of practices across similar age groups were noticed, reflecting the different needs of children at different age groups. In addition, similarities in some practices occurred between the two professions. For example, the majority of both OTs and PTs identified tone as a problem for Hemi-18m, and positioning and feeding for Quad18m. As for the older children, the majority of clinicians identified problems of ADL and walking and moving around. Differences in interventions between the two clinician groups would reflect the nature of each profession.

Generally, OT and PT participants focused primarily on basic body functions and activity with play, leisure, and social integration receiving the least attention. These findings suggest that while the academic world is promoting the use of the ICF model to guide assessment and intervention practices [4], clinicians, at least those studied here, remain focused largely on impairment and basic function.

Clinicians in both groups identified other problems than they would typically address in their interventions for their clients. For example, a large proportion of OTs identified problems related to gait and mobility that would usually be addressed by PTs. Similarly, many PTs identified problems related to feeding and ADL. One explanation may be that clinicians were demonstrating an awareness of the need for referrals to other professional services to address these problems. The majority of our respondents worked in multidisciplinary teams, which may explain their comprehensive approach.

While, most OTs used the Talbot Battery, most PTs used the GMFM in assessing children with CP. Widely used by PTs [23,24], the GMFM is a standardized observational measure that evaluates change in gross motor function for children with CP [9]. On the other hand, the Talbot Battery is a nonstandardized checklist developed in French by a Quebec clinician in 1977 to assist clinicians in planning an individualized treatment program and provide a qualitative evaluation of the child's developmental performance. It examines gross and fine motor skills, ADL, behaviour, communication, and environment, for children from birth to 6-years of age [34]. Normative data were collected on 357 children from three to 72 months of age [34]. Considering its popularity with OTs in Quebec, further exploration of its psychometric properties is warranted. In addition, since there are equivalent English standardized assessment tools available, e.g. the PEDI [7]; and WeeFIM [8], it would be interesting to examine

why these assessments were not widely used by OT participants in this study: Is it a question of language or availability?

Factors related to the use of standardized assessments

Almost two-thirds of OTs indicated the use of at least one standardized assessment appropriate for the child's age for at least one vignette: the most frequently used measures being related to gross and fine motor development and to visual motor integration. OTs who did not have a specialty certificate were more likely to be users of standardized assessments. While specialty certifications described by OTs were most often related to treatment (NDT and sensory integration) rather than pediatric assessment, it is not clear why OTs with these speciality certificates were less likely to use standardized assessments. Best practice use

When compared to the experts' 'best practice lists', the prevalence of best practice when identified as problem identification, assessment, and intervention, was low in all identified OT and PT areas. The highest OT prevalence of best practice was in managing feeding problems, however, it was still low. Many OTs, especially those in the province of Quebec, are trained in feeding management. They detect and assess feeding problems and implement necessary interventions or make appropriate referrals for consultation. However, this expertise was not consistently reflected in the OT responses to the questionnaire. Similarly, the prevalence of family focus ,given that parents' perceived stress and

the amount of social support they receive affects their relationship with their child and may affect the child's developmental gains [37], was lower than expected. This is probably due to the low prevalence of use of assessments of family needs and parental stress, which was low across vignettes for both OTs and PTs.

Although, PTs' highest prevalence of best practice was in managing gross motor developmental delays, the prevalence was lower when more specific areas of gross motor function were examined (mobility, gait function, postural control).

Clinicians' problem identification was, most of the time consistent with the experts' group list of problems for each vignette. However, treatment interventions differed among the two parties, with the expert group recommending task-specific and functional exercises to address the various problems for each vignette. Family focus, adaptive sports and socialization, were also highlighted in the experts' list.

This variability in practices reported with low attention to participation and family needs and the low prevalence in best practice identified; highlights the need for guidelines for OT and PT management for CP that would use of the ICF model to guide assessment and intervention, emphasizing a comprehensive, but individualized approach to CP.

NDT and other neuro-facilitation interventions are still being used by OTs and PTs, with some even asking for more training on NDT. Previous studies have shown the popularity of NDT among pediatric OTs and PTs treating children with

CP [21,23,24], despite the fact that evidence of effectiveness of NDT for children with CP is still controversial [38,39]. Since clinicians are asking for more continuing education, it may be useful to organize courses for more contemporary approaches, as suggested by our expert group, such as motor learning approaches instead of NDT.

Treatment duration and frequency seemed to be similar for all vignettes and for both professional groups. However, large variability was reported in the total duration of treatment, although most of the clinicians were working in rehabilitation out-patient settings. The most frequent durations were 'for a year or less' or 'up to school age', which might indicate different management for the children as they enter the school-age period.

Desired intervention use and treatment intensity

The majority of clinicians in both groups desired additional practices. The desire to have more specialized education, expressed by some clinicians reflects their awareness of the new advances in CP rehabilitation and their sense of responsibility to provide best practice for their clients. Other desired practices (although less prevalent) included interventions recommended by our experts and were directed towards participation and family e.g. parental support, hydrotherapy, horseback riding. Further investigation of the effectiveness of these interventions is warranted as many of them have already showed positive results for CP (Appendix C).

More than one third of OTs desired an increase in treatment intensity. The long waiting time for rehabilitation services for children with disabilities in Quebec [40,41], may in part explain why these children are not getting the desired treatment frequency. Trahan and Malouin [42] have shown that, for severely impaired children with CP, combining intensive therapy four times per week for short periods of four weeks separated by eight-week rest periods accelerated motor skill acquisition and improved compliance with therapy with maintenance of gains during the rest period. Application of such a program may help decrease waiting times, be beneficial to children with CP and reduce OTs' frustration caused by an inability to provide desired intensity of treatment.

Referrals and treatment goals

Referrals reflect clinicians' awareness of the multidimensional needs of children with CP. Their agreement on the five disciplines (PT, OT, SLP, social work and special education) may suggest that these services are of the most used by young children with CP in Quebec.

Treatment goals reflect the nature of services provided by each profession as well as the needs of each child. More agreement on treatment goal priorities in Quad-4y and Hemi-4y can be noticed for PTs than OTs.

Barriers and enablers of EBP

OTs' and PTs' perceptions of barriers to desired use of interventions were consistent with the literature [14,43] in which participants perceived 'lack of time' as one of the main barriers. However, 'it requires special training' was of the most frequent barrier ranked as number one for OTs and PTs, reflecting their need for more training and continuing education on specific practices for CP. Surprisingly, more than one third of OTs and PTs perceived child and parent compliance as a barrier to desired use: a finding not reported previously in the literature [14,43-45]. This is notable given that clinical decision making is typically described as taking into account not only the current best evidence, but the needs of the client and family, and the demands and resources of the health system [15,16].

Perceived enablers of EBP were mostly related to research and continuing education. Previous literature [14,43] have shown that clinicians view research as difficult to understand and integrate into their clinical practice. Indeed, new knowledge is not automatically incorporated, creating a gap between knowledge production and knowledge utilization [46-48]. Several strategies for knowledge translation were described in the literature [47-49], however, the implementation process may vary among different clinical settings as each setting is unique. Indeed, the use of appropriate knowledge translation strategies that involve various formats including web-based support for learning, opinion leaders and interactive in-services, may help bring the most current evidence to pediatric clinicians [49].

Study limitations

Data presented in this study were clinicians' reports on their own practice. Social desirability bias can influence data collection when using self-reporting of practice behaviors. However, clinicians were clearly instructed to report their actual practices, and were unaware of the specific study questions prior to the interview. Another possible concern is the use of case studies. This methodology, has been found to be a valid form of treatment ascertainment [50] especially in examination of variations in practice [51]. Finally, it should be noted that this is a Quebec-wide study and may not be applicable to practice elsewhere in the world: Canada has a universal Medicare program that enables individuals to receive publicly funded rehabilitation services, albeit with serious concerns regarding waiting times and treatment intensity [41].

Conclusion

OT and PT practices for young children with CP were found to be focused more on ICF domains of ' impairments' and 'functional activities' with less attention to 'participation'. The large variations identified in these practices for children with CP highlight the need for guidelines for OT and PT management. In addition, gaps were found in the incorporation of evidence-based best practices into clinical practice for both professions. The problem is unlikely to be attributable exclusively to limited time or resources, but also to the slow uptake of EBP in daily clinical practice [46-48]. These findings suggest the need for

strategies to encourage knowledge dissemination regarding current best practices for children with CP.

. - مسمر

References

- Steultjens EMJ, Dekker J, Bouter LM, van de Nes JCM, Lambregts BLM, van den Ende CHM.
 Occupational therapy for children with cerebral palsy: a systematic review. Clinical Rehabilitation 2004; 18(1):1-14.
- Dzienkowski RC, Smith KK, Dillow KA, Yucha CB. Cerebral palsy: a comprehensive review. Nurse Practitioner 1996; 21(2):45-8.
- Valvano J. Activity-focused motor interventions for children with neurological conditions.
 Physical and Occupational Therapy in Pediatrics 2004; 24(1-2):79-107.
- Battaglia M, Russo E, Bolla A, Chiusso A, Bertelli S, Pellegri A, Borri G, Martinuzzi A. International Classification of Functioning, Disability and Health in a cohort of children with cognitive, motor, and complex disabilities. Developmental Medicine & Child Neurology 2004; 46(2):98-106.
- Piper MC, Pinnell LE, Darrah J, Maguire T, Byrne PJ. Construction and validation of the Alberta Infant Motor Scale (AIMS). Canadian Journal of Public Health. Revue Canadienne de Sante Publique 1992; 83(2):95-101.
- Boulton JE, Kirsch SE, Chipman M, Etele E, White AM, Pape KE. Reliability of the Peabody Developmental Gross Motor Scale in children with cerebral palsy. Physical & Occupational Therapy in Pediatrics 1995; 15(1):35-51.
- Haley SM, Coster WJ, Ludlow LH. Pediatric Evaluation of Disability Inventory (PEDI).
 Boston: New England Medical Center Hospitals; 1992.
- Msall ME, DiGaudio K, Rogers BT, LaForest S, Catanzaro ML, Campbell J, Wilczenski F, Duffy LC. The Functional Independence Measure for Children (WeeFIM): conceptual basis and pilot use in children with developmental disabilities. Clinical Pediatrics 1994; 33(7):421-30.

- Russell DJ, Avery LM, Rosenbaum PL, Raina PS, Walter SD, Palisano RJ. Improved scaling of the Gross Motor Function Measure for children with cerebral palsy: evidence of reliability and validity. Physical Therapy 2000; 80(9):873-85.
- DeMatteo C, Law M, Russell D, Pollock N, Rosenbaum P, Walter S. The reliability and validity of the Quality of Upper Extremity Skills Test. Physical and Occupational Therapy in Pediatrics 1993; 13(2):1-18.
- 11. Barry MJ. Physical therapy interventions for patients with movement disorders due to cerebral palsy. Journal of Child Neurology. 1996; 11(Suppl 1):S51-60.
- Stewart S, Neyerlin-Beale J. Enhancing independence in children with cerebral palsy...
 Symposium on cerebral palsy. British Journal of Therapy & Rehabilitation 1999;
 6(12):574.
- Olney SJ, Wright MJ. Cerebral Palsy. In: Campbell SK, Vander Linden DW, Palisano RJ, editors. Physical Therapy for Children. 2nd ed. Philadelphia: W.B. Saunders company; 2000. p 533-70.
- 14. Curtin M, Jaramazovic E. Occupational therapists' views and perceptions of evidence-based practice. British Journal of Occupational Therapy 2001; 64(5):214-22.
- 15. Perleth M, Jakubowski E, Busse R. What is 'best practice' in health care? State of the art and perspectives in improving the effectiveness and efficiency of the European health care systems. Health Policy. 2001; 56(3):235-50.
- Taylor MC. Evidence-Based Practice for occupational therapists. Oxford: Blackwell Science Ltd; 2000.
- Reid D. Occupational therapists' assessment practices with handicapped children in Ontario.
 Canadian Journal of Occupational Therapy 1987; 54(4):181-88.
- Rodger S. A survey of assessments used by paediatric occupational therapists. Australian Occupational Therapy Journal 1994; 41(3):137-42.

- Crowe TK. Pediatric assessments: a survey of their use by occupational therapists in northwestern school systems. Occupational Therapy Journal of Research 1989; 9(5):273-86.
- Burtner PA, McMain MP, Crowe TK. Survey of occupational therapy practitioners in southwestern schools: assessments used and preparation of students for school-based practice. Physical & Occupational Therapy in Pediatrics. 2002; 22(1):25-39.
- Lawlor MC, Henderson A. A descriptive study of the clinical practice patterns of occupational therapists working with infants and young children. American Journal of Occupational Therapy. 1989; 43(11):755-64.
- 22. Berry J, Ryan S. Frames of reference: their use in paediatric occupational therapy. British Journal of Occupational Therapy 2002; 65(9):420-7.
- Craig M. Physiotherapy management of cerebral palsy: current evidence and pilot analysis.
 Physical Therapy Reviews 1999; 4(4):215-28.
- Chiarello LA, O'Neil M, Dichter CG, Westcott SL, Orlin M, Marchese VG, Tieman B, Rose RU. Exploring physical therapy clinical decision making for children with spastic diplegia: survey of pediatric practice. Pediatric Physical Therapy 2005; 17(1):46-54.
- Palisano R, Rosenbaum P, Walter S, Russell D, Wood E, Galuppi B. Development and reliability of a system to classify gross motor function in children with cerebral palsy. Developmental Medicine & Child Neurology. 1997; 39(4):214-23.
- Mikhail C, Korner-Bitensky N, Rossignol M, Dumas J. Physiotherapists' use of interventions with high evidence of effectiveness in the management of low back pain. Physical Therapy 2005; 85:1151-67.
- 27. Sutherland HJ, Beaton M, Mazer R, Kriukov V, Boyd NF. A randomized trial of the total design method for the postal follow-up of women in a cancer prevention trial. European Journal of Cancer Prevention 1996; 5(3):165-8.

- Physiotherapy Evidence Database [Internet]. Centre for Evidence-Based Physiotherapy PEDro (2005, 6 November). Date Retrieved June, 2005, from: http://www.pedro.fhs.usyd.edu.au/index.html.
- Foley NC, Teasell RW, Bhogal SK, Speechley MR. Stroke Rehabilitation Evidence-Based Review: methodology. Topics in Stroke Rehabilitation 2003; 10(1):1-7.
- Sackett DL. Rules of evidence and clinical recommendations on the use of antithrombotic agents. Chest 1989; 95:2S- 4S.
- Sackett DL, Straus SE, Richardson WS, Rosenberg W, Haynes RB. Evidence-based Medicine. How to practice and teach EBM. London: Churchill Livingstone; 2000.
- Ottenbacher K, Dauck BS, Gevelinger M, Grahn V, Hassett C. Reliability of the Behavioral Assessment Scale of Oral Functions in Feeding. American Journal of Occupational Therapy 1985; 39(7):436-40.
- Moore DS, McCabe GP. Introduction to the Practice of Statistics. New York: W. H. Freeman and Company; 1999.
- Talbot G. Batterie D'Evaluation Talbot. Montreal: Hôpital Saint-Justine, Centre hospitalier
 Universitaire, Université de Montréal; 1993.
- 35. WHO. International Classification of Functioning, Disability and Health (ICF). Geneva: Wold Health Organization; 2001. 3-20 p.
- Dillman D. Mail and Telephone Surveys: The Total Design Method. New York: Wiley-Interscience; 1978.
- Bartlett DJ, Palisano RJ. A multivariate model of determinants of motor change for children with cerebral palsy. Physical Therapy. 2000; 80(6):598-614.
- Ottenbacher KJ, Biocca Z, DeCremer G, Gevelinger M, Jedlovec KB, Johnson MB.
 Quantitative analysis of the effectiveness of pediatric therapy. Emphasis on the neurodevelopmental treatment approach. Physical Therapy. 1986; 66(7):1095-101.

39. Brown GT, Burns SA. The efficacy of neurodevelopmental treatment in paediatrics: a systematic review. British Journal of Occupational Therapy 2001; 64(5):235-44.

.

- 40. Mazer B, Feldman D, Majnemer A, Gosselin J, Kehayia E. Rehabilitation services for children: therapists' perceptions. Pediatric Rehabilitation in press.
- Feldman DE, Champagne F, Korner-Bitensky N, Meshefedjian G. Waiting time for rehabilitation services for children with physical disabilities. Child: Care, Health & Development. 2002; 28(5):351-8.
- 42. Trahan J, Malouin F. Intermittent intensive physiotherapy in children with cerebral palsy: a pilot study. Developmental Medicine & Child Neurology 2002; 44(4):233-9.
- Humphris D, Littlejohns P, Victor C, O'Halloran P, Peacock J. Implementing evidence-based practice: Factors that influence the use of research evidence by occupational therapists.
 British Journal of Occupational Therapy 2000; 63(11):516-22.
- 44. Metcalfe C, Lewin R, Wisher S, Perry S, Bannigan K, Klaber Moffett J. Barriers to
 implementing the evidence base in four NHS therapies. Physiotherapy 2001; 87(8):43341.
- 45. Dysart AM, Tomlin GS. Factors related to evidence-based practice among U.S. occupational therapy clinicians. American Journal of Occupational Therapy 2002; 56(3):275-84.
- Tugwell PS, Qualman A, Judd MG. Workshop report: knowledge translation of musculoskeletal health research. Journal of Rheumatology. 2003; 30(3):575-8.
- Mottola CA. Research utilization and the continuing/staff development educator. Journal of Continuing Education in Nursing. 1996; 27(4):168-75.
- Davis D, Evans M, Jadad A, Perrier L, Rath D, Ryan D, Sibbald G, Straus S, Rappolt S, Wowk M. *et al.* The case for knowledge translation: shortening the journey from evidence to effect. British Medical Journal 2003; 327(7405):33-5.
- Beck SL. Strategies to translate research into practice. Seminars in Oncology Nursing.
 2002; 18(1):11-9.
- Jones TV, Gerrity MS, Earp J. Written case simulations: do they predict physicians' behavior? Journal of Clinical Epidemiology 1990; 43(8):805-15.
- Langley GR, Tritchler DL, Llewellyn-Thomas HA, Till JE. Use of written cases to study factors associated with regional variations in referral rates. Journal of Clinical Epidemiology 1991; 44(4-5):391-402.
- Royeen CB. Review of the DeGangi-Berk test of sensory integration. Physical and Occupational Therapy in Pediatrics 1988; 8(2/3):71-5.
- Mao H, Li W, Lo J. Construct validity of Beery's Developmental Test of Visual-Motor Integration for Taiwanese children. Occupational Therapy Journal of Research 1999; 19(4):241-57.
- Pollock N, Law M, Jones L. The reliability and validity of a revised version of the Erhardt Developmental Prehension Assessment. Canadian Journal of Occupational Therapy 1991; 58(2):77-84.
- 55. Snyder P, Lawson S, Thompson B, Stricklin S, et al. Evaluating the psychometric integrity of instruments used in early intervention research: The Battelle Developmental Inventory.
 Topics in Early Childhood Special Education 1993; 13(2):216-32.
- 56. Dodd KJ, Taylor NF, Graham HK. A randomized clinical trial of strength training in young people with cerebral palsy. Developmental Medicine & Child Neurology 2003; 45(10):652 7.
- 57. Dodd KJ, Taylor NF, Damiano DL. A systematic review of the effectiveness of strengthtraining programs for people with cerebral palsy. Archives of Physical Medicine and Rehabilitation 2002; 83(8):1157-64.

- 58. Darrah J, Fan JSW, Chen LC, Nunweiler J, Watkins B. Review of the effects of progressive resisted muscle strengthening in children with cerebral palsy: a clinical consensus exercise. Pediatric Physical Therapy 1997; 9(1):12-7.
- Hardy P, Collet JP, Goldberg J, Ducruet T, Vanasse M, Lambert J, Marois P, Amar M, Montgomery DL, Lecomte JM. *et al.* Neuropsychological effects of hyperbaric oxygen therapy in cerebral palsy. Developmental Medicine & Child Neurology 2002; 44(7):436-46.
- 60. Carlson WE, Vaughan CL, Damiano DL, Abel MF. Orthotic management of gait in spastic diplegia. American Journal of Physical Medicine & Rehabilitation. 1997; 76(3):219-25.
- Fowler EG, Ho TW, Nwigwe AI, Dorey FJ. The effect of quadriceps femoris muscle strengthening exercises on spasticity in children with cerebral palsy. Physical Therapy 2001; 81(6):1215-23.
- Taub E, Ramey SL, DeLuca S, Echols K. Efficacy of constraint-induced movement therapy for children with cerebral palsy with asymmetric motor impairment. Pediatrics 2004; 113(2):305-12.
- Benda W, McGibbon NH, Grant KL. Improvements in muscle symmetry in children with cerebral palsy after equine-assisted therapy (hippotherapy). Journal of Alternative & Complementary Medicine 2003; 9(6):817-25.
- Cherng R, Liao H, Leung HWC, Hwang A. The effectiveness of therapeutic horseback riding in children with spastic cerebral palsy. Adapted Physical Activity Quarterly 2004; 21(2):103-21.
- Ketelaar M, Vermeer A, Hart H, van Petegem-van Beek E, Helders PJ. Effects of a functional therapy program on motor abilities of children with cerebral palsy. Physical Therapy. 2001; 81(9):1534-45.

- Mossberg KA, Linton KA, Friske K. Ankle-foot orthoses: effect on energy expenditure of gait in spastic diplegic children. Archives of Physical Medicine & Rehabilitation 1990; 71(7):490-4.
- Park ES, Park CI, Lee HJ, Cho YS. The effect of electrical stimulation on the trunk control in young children with spastic diplegic cerebral palsy. Journal of Korean Medical Science. 2001; 16(3):347-50.
- Detrembleur C, Lejeune TM, Renders A, Van Den Bergh PY. Botulinum toxin and short-term electrical stimulation in the treatment of equinus in cerebral palsy. Movement Disorders 2002; 17(1):162-9.
- Dali C, Hansen FJ, Pedersen SA, Skov L, Hilden J, Bjornskov I, Strandberg C, Christensen J, Haugsted U, Herbst G. *et al.* Threshold electrical stimulation (TES) in ambulant children with CP: a randomized double-blind placebo-controlled clinical trial.
 Developmental Medicine & Child Neurology 2002; 44(6):364-9.
- Kerr C, McDowell B, McDonough S. Electrical stimulation in cerebral palsy: a review of effects on strength and motor function. Developmental Medicine & Child Neurology 2004; 46(3):205-13.
- Sommerfelt K, Markestad T, Berg K, Saetesdal I. Therapeutic electrical stimulation in cerebral palsy: a randomized, controlled, crossover trial. Developmental Medicine & Child Neurology 2001; 43(9):609-13.
- van der Linden ML, Hazlewood ME, Aitchison AM, Hillman SJ, Robb JE. Electrical stimulation of gluteus maximus in children with cerebral palsy: effects on gait characteristics and muscle strength. Developmental Medicine & Child Neurology 2003; 45(6):385-90.

- 73. Hainsworth F, Harrison MJ, Sheldon TA, Roussounis SH. A preliminary evaluation of ankle orthoses in the management of children with cerebral palsy. Developmental Medicine & Child Neurology 1997; 39(4):243-7.
- 74. Taylor CL, Harris SR. Effects of ankle-foot orthoses on functional motor performance in a child with spastic diplegia. American Journal of Occupational Therapy 1986; 40(7):492-4.
- 75. Dursun E, Dursun N, Alican D. Effects of biofeedback treatment on gait in children with cerebral palsy. Disability & Rehabilitation 2004; 26(2):116-20.
- Kramer JF, Ashton B, Brander R. Training of head control in the sitting and semi-prone positions. Child: Care, Health & Development 1992; 18(6):365-76.
- Malouin F, Gemmell M, Parrot A, Dutil R. Effects of auditory feedback on head position training in young children with cerebral palsy: a pilot study. Physiotherapy Canada 1985; 37(3):150-6.
- 78. Corry IS, Cosgrove AP, Duffy CM, McNeill S, Taylor TC, Graham HK. Botulinum toxin A compared with stretching casts in the treatment of spastic equinus: a randomised prospective trial. Journal of Pediatric Orthopedics. 1998; 18(3):304-11.
- 79. Flett PJ, Stern LM, Waddy H, Connell TM, Seeger JD, Gibson SK. Botulinum toxin A versus fixed cast stretching for dynamic calf tightness in cerebral palsy. Journal of Paediatrics & Child Health. 1999; 35(1):71-7.
- Bursun N, Dursun E, Alican D. The role of botulinum toxin A in the management of lower limb spasticity in patients with cerebral palsy. International Journal of Clinical Practice 2002; 56(8):564-7.
- 81. Boyd RN, Dobson F, Parrott J, Love S, Oates J, Larson A, Burchall G, Chondros P, Carlin J, Nattrass G. *et al.* The effect of botulinum toxin type A and a variable hip abduction orthosis on gross motor function: a randomized controlled trial. European Journal of Neurology. 2001; 8(Suppl 5):109-19.

- Jongerius PH, van den Hoogen FJ, van Limbeek J, Gabreels FJ, van Hulst K, Rotteveel JJ.
 Effect of botulinum toxin in the treatment of drooling: a controlled clinical trial. Pediatrics 2004; 114(3):620-7.
- Jongerius PH, Rotteveel JJ, van Limbeek J, Gabreels FJ, van Hulst K, van den Hoogen FJ.
 Botulinum toxin effect on salivary flow rate in children with cerebral palsy. Neurology 2004; 63(8):1371-5.
- 84. Boyd RN, Hays RM. Current evidence for the use of botulinum toxin type A in the management of children with cerebral palsy: a systematic review. European Journal of Neurology 2001; 5:1-20.
- 85. Ade-Hall RA, Moore AP. Botulinum toxin type A in the treatment of lower limb spasticity in cerebral palsy. Cochrane Database of Systematic Reviews 2000; 2.
- Catanese AA, Coleman GJ, King JA, Reddihough DS. Evaluation of an Early-Childhood Program Based on Principles of Conductive Education - the Yooralla Project. Journal of Paediatrics and Child Health 1995; 31(5):418-22.
- 87. Coleman GJ, King JA, Reddihough DS. A Pilot Evaluation of Conductive Education-Based Intervention for Children with Cerebral-Palsy - the Tongala Project. Journal of Paediatrics and Child Health 1995; 31(5):412-17.
- Reddihough DS, King J, Coleman G, Catanese T. Efficacy of programmes based on conductive education for young children with cerebral palsy. Developmental Medicine & Child Neurology 1998; 40(11):763-70.
- Stiller C, Marcoux BC, Olson RE. The effect of conductive education, intensive therapy, and special education services on motor skills in children with cerebral palsy. Physical & Occupational Therapy in Pediatrics 2003; 23(3):31-50.

- Chan NNC, Smith AW, Lo SK. Efficacy of neuromuscular electrical stimulation in improving ankle kinetics during walking in children with cerebral palsy. Hong Kong Physiotherapy Journal 2004; 6(29 ref).
- 91. Gisel EG, Applegate-Ferrante T, Benson JE, Bosma JF. Effect of oral sensorimotor treatment on measures of growth, eating efficiency and aspiration in the dysphagic child with cerebral palsy. Developmental Medicine & Child Neurology 1995; 37(6 June):528-43.
- 92. Sleigh G, Sullivan PB, Thomas AG. Gastrostomy feeding versus oral feeding alone for children with cerebral palsy. Cochrane Database of Systematic Reviews 2004; 2.
- 93. Bower E, McLellan DL, Arney J, Campbell MJ. A randomised controlled trial of different intensities of physiotherapy and different goal-setting procedures in 44 children with cerebral palsy. Developmental Medicine & Child Neurology. 1996; 38(3):226-37.
- 94. Bower E, Michell D, Burnett M, Campbell MJ, McLellan DL. Randomized controlled trial of physiotherapy in 56 children with cerebral palsy followed for 18 months. Developmental Medicine & Child Neurology 2001; 43(1):4-15.
- Reid DT, Sochaniwskyj A. Influences of a hand positioning device on upper-extremity control of children with cerebral palsy. International Journal of Rehabilitation Research 1992; 15(1):15-29.
- 96. Rosenbaum P, King S, Toal C, Puttaswamaiah S, Durrell K. Home or children's treatment centre: where should initial therapy assessments of children with disabilities be done? Developmental Medicine & Child Neurology 1990; 32(10):888-94.
- 97. MacKinnon JR, Noh S, Lariviere J, MacPhail A, Allan DE, Laliberte D. A study of therapeutic effects of horseback riding for children with cerebral palsy. Physical & Occupational Therapy in Pediatrics 1995; 15(1):17-34.

- Law M, Cadman D, Rosenbaum P, Walter S, Russell D, DeMatteo C. Neurodevelopmental therapy and upper-extremity inhibitive casting for children with cerebral palsy.
 Developmental Medicine & Child Neurology. 1991; 33(5):379-87.
- Law M, Russell D, Pollock N, Rosenbaum P, Walter S, King G. A comparison of intensive neurodevelopmental therapy plus casting and a regular occupational therapy program for children with cerebral palsy. Developmental Medicine & Child Neurology. 1997; 39(10):664-70.
- 100. Tsorlakis N, Evaggelinou C, Grouios G, Tsorbatzoudis C. Effect of intensive neurodevelopmental treatment in gross motor function of children with cerebral palsy.[erratum appears in Dev Med Child Neurol. 2005 Apr;47(4):287]. Developmental Medicine & Child Neurology 2004; 46(11):740-5.
- 101. Herndon WA, Troup P, Yngve DA, Sullivan JA. Effects of neurodevelopmental treatment on movement patterns of children with cerebral palsy. Journal of Pediatric Orthopedics. 1987; 7(4):395-400.
- 102. Fetters L, Kluzik J. The effects of neurodevelopmental treatment versus practice on the reaching of children with spastic cerebral palsy. Physical Therapy. 1996; 76(4):346-58.
- 103. DeGangi GA, Hurley L, Linscheid TR. Toward a methodology of the short-term effects of neurodevelopmental treatment. American Journal of Occupational Therapy. 1983; 37(7):479-84.
- 104. Butler C, Darrah J. Effects of neurodevelopmental treatment (NDT) for cerebral palsy: an
 AACPDM evidence report. Developmental Medicine & Child Neurology 2001; 43(11):778 90.
- 105. Van den Berg-Emons RJ, Van Baak MA, Speth L, Saris WH. Physical training of school children with spastic cerebral palsy: effects on daily activity, fat mass and fitness. International Journal of Rehabilitation Research 1998; 21(2):179-94.

- 106. Dodd KJ, Taylor NF, Graham HK. Strength training can have unexpected effects on the selfconcept of children with cerebral palsy. Pediatric Physical Therapy 2004; 16(2):99-105.
- 107. Tremblay F, Malouin F, Richards CL, Dumas F. Effects of prolonged muscle stretch on reflex and voluntary muscle activations in children with spastic cerebral palsy. Scandinavian Journal of Rehabilitation Medicine. 1990; 22(4):171-80.
- 108. Richards CL, Malouin F, Dumas F. Effects of a single session of prolonged planterflexor stretch on muscle activations during gait in spastic cerebral palsy. Scandinavian Journal of Rehabilitation Medicine 1991; 23(2):103-11.

	Total	User	Non-user	p-value ^b	
	N=85 *	n=57 *	n=28 °		
Clinician characteristics	· · · ·		, ···-		
Gender					
female	82	94.7%	100.0%	0.55	
Academic degree					
Bachelor	83	96.5%	100.0%	1.00	
Masters	2	3.5%	0.0%		
Workload status					
full-time	51	63.2%	53.6%	0.54	
part-time	34	36.8%	46.4%		
University teaching (<i>N</i> = 84)					
yes	9	12.5%	7.1%	0.71	
Specialty certificate					
yes	28	22.8%	53.6%	0.01	
Years since graduation: <i>M</i> (SD)	85	11.5(8.1)	13.2 (9.4)	0.41 °	
Clinical experience: M (SD)	85	8.2 (8.1)	9.1 (9.4)	0.66 °	
Monthly hours spent on continuing education: M (SD)	85	5.5 (5.1)	5.3 (4.5)	0.86°	
Work setting characteristics					
Funding (<i>N</i> = 84)	<u></u>				
private for profit	4	5.4%	3.6%	0.14	
private not for profit	2	0.0%	7.1%		
public	78	94.6%	89.3%		
Location					
urban	52	63.2%	57.1%	0.14	
suburban	15	12.3%	28.6%		
rural	18	24.6%	14.3%		
Multidisciplinary team					
yes	82	98.2%	92.9%	0.25	
Weekly case load of Cerebral Palsy					
1- 5	64	70.2%	85.7%	0.20	
>5	21	29.8%	14.3%		
Number of occupational therapists					
1	10	12.3%	10.7%	0.72 ^d	
2-4	35	36.8%	50.0%		
5-10	25	35.1%	17.9%		
> 10	15	15.8%	21.4%		
Cerebral Palsy research conducted in setting					
yes	28	40.4%	17.9%	0.07	
Access to new information on Cerebral Palsy					
yes	41	49.1%	46.4%	0.99	
Time allocated for learning on Cerebral Palsy ($N = 83$)					
yes	35	46.4%	33.3%	0.37	

Table 1: Characteristics of Occupational Therapists and Settings According to Clinician Being a User or Non-User of Standardized Assessments

~..

~

^a Unless otherwise indicated.

^b Unless otherwise indicated, *p*-values were the results of chi-square testing or Fisher's exact test when chi-squares were not valid. Italicized *p*-values indicate a significant association

° t-test

. سنر

.....

, سمندر

^d Kendall's tau-c test.

Tablez: Characteristics of the Thysical Therapists and County	Total $N = 62^{a}$
Clinician characteristics	n (%)
Gender	
female	57(91.9%)
Academic degree	
Bachelor	59(95.2%)
Masters	2(3.2%)
Other	1(1.6%)
Workload status	
full-time	43(69.4%)
part-time	19(30.6%)
University teaching ($N = 61$)	
yes	6(9.8%)
Specialty certificate	
yes	31(50%)
Clinical experience: M (SD)	12.4 (9.6)
Monthly hours spent on continuing education: M (SD)	3.7 (2.9)
Work setting characteristics	
Funding of setting	
private for profit	2(3.2%)
private not for profit	2(3.2%)
public	54(87.1%)
Other	4(6.5%)
Location	
urban	43(69.4%)
suburban	6(9.8%)
rural	13(21.0%)
Multidisciplinary team	
yes	60(96.8%)
Weekly case load of cerebral palsy	
1-5	32(38.7%)
> 5	30(48.4%)
Number of physical therapists	
1	10(16.1%)
2-4	18(29.0%)
5-10	18(29.0%)
> 10	16(25.8%)
Cerebral Palsy research conducted in the setting	
yes	29(46.8%)
Access to new information on cerebral palsy	
yes	38(61.2%
Time allocated for learning on cerebral palsy	
yes	35(56.5%)

Table2: Characteristics of the Physical Therapists and Settings

. سر

^a N unless otherwise indicated.



Figure 1A: Practices reported by occupational therapists for an 18-month old child with hemiplegia. ADL: activities of daily living; AD: assistive devices. N = 35



Figure 1B: Practices reported by occupational therapists for a 4-year old child with hemiplegia. ADL: activities of daily living; AD: assistive devices. N=38



Figure 2A: Practices reported by occupational therapists for an 18-month old child with quadriplegia. ADL: activities of daily living; AD: assistive devices. N=42





N=41



Use of Standardized Assessments by Occupational Therapists

`}

Figure 3: Occupational therapists' (OTs) use of standardized assessments for the four vignettes. OTs may have indicated more than one assessment per vignette. m = months, y = years.

Quest: Quality of Upper Extremities Skills Test [10]; TSI: Degangi-Berk Test of Sensory Integration [52]; VMI: Developmental Test of Visual-Motor Integration [53]; EDPA: Erhardt Developmental Prehension Assessment [54]; PDMS: Peabody Developmental Motor Scales [6]; BDI: Battelle Developmental Inventory [55]; PEDI: Pediatric Evaluation of Disability Inventory [7]; WeeFIM: Pediatric Functional Independence Measure (WeeFIM) [8].











.....









Use of Standardized Assessments by Physical Therapists

Figure 6: Physical therapists' use of standardized assessments for the four vignettes.

Clinicians may have indicated more than one assessment per vignette; m = months, y = years.

Muscle strength assessments include: manual muscle testing and hand-held dynamometer.

PDMS: Peabody Developmental Motor Scales, AIMS: Alberta Infant Motor Scale, GMFM: Gross Motor Function Measure.

<u>, , ,</u>	Child with hemiplegia at 18 months		Child with hemiplegia at 4 years		Child with quadriplegia at 18 months		Child with quadriplegia at 4 years	
	OT, <i>n</i> = 20	PT, <i>n</i> = 28	OT, <i>n</i> = 16	PT, n = 14	OT, n = 28	PT, <i>n</i> = 14	OT, <i>n</i> = 21	PT, <i>n</i> = 6
Occupational therapy	30.0%	92.9%	25.0%	100.0%	42.9%	100.0%	42.9%	100.0%
Physical therapy	95.0%	17.9%	93.7%	21.4%	93.0%	7.1%	100.0%	33.3%
SLP	40.0%	53.6%	87.5%	78.6%	64.3%	85.7%	100.0%	100.0%
Social work	65.0%	42.9%	37.5%	50.0%	78.6%	85.7%	66.6%	50.0%
Special education	40.0%	28.6%	56.3%	50.0%	21.4%	42.9%	38.1%	66.6%

Table 3: Common Typical Referrals for Other Services as Recommended by Clinicians per Vignette

Note. Clinicians may have more than one choice. OT: occupational therapists, PT: physical therapists, SLP: Speech -language pathology.



Figure 7: The most prevalent goals indicated by occupational therapists as their top three goals according to vignette.

UE: upper extremity, m = months, y = years.



Figure 8: The most prevalent goals indicated by physical therapists as their top three goals according to vignette. Hemi- 18m = an 18-month old child with hemiplegia; Hemi- 4y = a 4-year old child with hemiplegia; Quad-18m = an 18-month old child with quadriplegia; Quad-4y = a 4-year old child with quadriplegia; UE: upper extremity; ROM = range of motion; m = months; y = years.

	Occupational therapists		Physical therapists			
Hemi-18m		n = 20		n = 28		
	No desired interventions	10.0%	No desired interventions	28.6%		
	Increase treatment frequency and	45.0%	Hydrotherapy	32.1%		
	duration					
	Different treatment sessions in	15.0%	Increase treatment frequency and	21.4%		
	child's own environment		duration			
	More specialized education for the	10.0%	Horseback riding	7.1%		
	therapist					
	Assistive devices	5.0%	Treadmill	7.1%		
			Treadmill with partial weight support	7.1%		
Hemi -4y		<i>n</i> = 16		<i>n</i> = 14		
	No desired interventions	43.8%	No desired interventions	28.6%		
	Increase treatment frequency and	25.0%	Treadmill	21.4%		
	duration					
	Neurodevelopmental treatment	18.8%	Botox	14.3%		
	(NDT)					
	Hydrotherapy	6.3%	Increase treatment frequency and	14.3%		
			duration			
	More training on activities of daily	6.3%	Electrical stimulation	7.1%		
	living					
Quad-18m	- <u></u>	n = 28		<i>n</i> = 14		
	No desired interventions	7.1%	No desired interventions	0.0%		
	Increase treatment frequency and	28.6%	Hydrotherapy	42.9%		
	duration					
	More specialized education for the	14.3%	Intervention at home	14.3%		
	therapist					
	Intervention at home	14.3%	Increase treatment frequency and	7.1%		
			duration			
	Intervention at school	10.7%	Hippotherapy	7.1%		
Quad-4y		<i>n</i> = 21		<i>n</i> = 6		
	No desired interventions	0.0%	No desired interventions	1.67%		
	Increase treatment frequency and	38.1%	Increase treatment frequency and	1.67%		
	duration		duration			
	Intervention at school	23.8%	Horseback riding	1.67%		
	Home visit	14.3%	Hydrotherapy	1.67%		
	Intervention at home	14.3%	Hyperbaric oxygen therapy	1.67%		

Table 4: Desired Processes and Interventions clinicians would Use if Resources, Time and Tools were Unlimited

Note. Clinicians may have more than one choice; therefore percentages do not add up to 100%. Hemi- 18m = an 18month old child with hemiplegia; Hemi- 4y = a 4-year old child with hemiplegia; Quad-18m = an 18-month old child with quadriplegia; Quad-4y = a 4-year old child with quadriplegia.



Barriers to Desired Use

Figure 9: The top three barriers to desired use of interventions according to clinicians' rankings of top 3. Note: Of the 85 occupational therapists, 82 reported on barriers; of these, 5 reported only two barriers. Of the 62 physical therapists, only 59 reported on barriers; of these, six reported only one barrier; and 17 reported only two barriers.



Enablers of Evidence-Based Practice

Figure 10: The top three enablers of evidence based practice according to clinicians' rankings of top 3. CE: continuing education. OTs: occupational therapists, *N*= 84. PTs: physical therapists, *N*= 62.

CHAPTER 6: GENERAL DISCUSSION

Recent advances in neuromotor theories and models of disability have improved our understanding of CP. As a result, contemporary approaches to assessment and treatment of CP are emerging. Therefore, more research studies examining the effectiveness of traditional and newly emerging interventions are being conducted. This growing of knowledge faces clinicians with challenges to provide EBP within the context of their experience, the needs of the client, and health care demands (Perleth et al., 2001). However, little is known regarding actual OT and PT practices for young children with CP, and whether these practices would be different among clinicians for a specific child. This study described OT and PT practices for young children with CP in the province of Quebec, Canada.

In this section, a summary of the main findings of the study is presented, highlighting the primary original contribution of this research to scientific knowledge. In addition, clinical relevance and implication for future research is discussed. Finally, limitations of this study are presented.

This was the first population-based study to look at OT and PT practices for young children with CP using clinical vignettes. The use of vignettes has been found to be a valid method for comparing practices among health professionals and measuring the quality of clinical practice (Peabody et al., 2000; Peabody et al., 2004). Furthermore, vignettes were found to be valid for

measuring and predicting variation in preventive care (Dresselhaus et al., 2004). With the acknowledgement that CP is an umbrella term covering heterogeneous disabilities and disorders and that each child is unique, the use of four vignettes depicting two typical children with CP with two different classifications and functional levels and at two different age groups (covering the 1-5-year-old range) ensured that these vignettes would represent a wide range of children with CP. In addition, the use of the vignettes in this study helped to compare practices across clinicians for a specific child, and gave a 'snap-shot' of what these children were receiving in terms of OT and PT services.

This study was also the first to examine OTs' and PTs' reported actual practices within the context of the ICF, evidence from literature and experts' recommendation. Thus, it was the first to report gaps between actual and best practices for children with CP. The use of the framework of ICF in this study provided a common language for communication about OT and PT practices with different professionals in different disciplines (World Health Organization, 2001). ICF is now a widely acceptable international classification of health and health care. It has been found to be comparable with other OT conceptual frameworks such as the Canadian Model of Occupational Performance (CMOP) (Stamm, Cieza, Machold, Smolen, & Stucki, 2006).

The results of this survey have many implications for clinicians, health institutions, and families. Clinicians who participated in the survey showed

interest and enthusiasm towards the subject of the survey and towards EBP as can be seen from the high response rate and the agreement of clinicians about their need to learn more about research and EBP. Health institutions and administrative bodies are urged to create a culture in their settings that values research and encourages clinicians to be more involved in it. In addition, more collaboration between researchers and clinicians is needed to further explore effectiveness of practices used in clinical practice as well as to examine feasibility and clinical implications of innovative practices found to be effective in research. The present study has shown important gaps in knowledge that must be addressed by research. For example, almost all OTs in Quebec are using the Talbot Battery with children with developmental disabilities. As the battery is not a standardized assessment, researchers and clinicians are invited to work together to examine its psychometric properties. In addition, as practices were shown in this study to vary across clinicians of same profession for a specific child; factors affecting this variation need to be further explored. In particular, variation across different settings was not explored in the present study.

Differences between OTs and PTs use of best practice were evident in the present study. For example, while most OTs were using a non-standardized checklist (Talbot Battery), the majority of PTs used a standardized assessment (the GMFM). Factors affecting these choices were not studied here and need to be further explored. While the language could be a factor, in fact, the GMFM is an

English assessment tool which has not yet been translated into French. Therefore, it would be interesting to examine OTs' and PTs' strategies of knowledge dissemination.

Previous literature has shown that clinicians perceived time and unclear research results to be important barriers to EBP (Dysart & Tomlin, 2002; Metcalfe et al., 2001). These factors were also reported by our participants. Therefore, health institutions are also responsible for supporting the professional development of clinicians by providing more time and more funding for continuing education.

Despite the limited evidence of the effectiveness of rehabilitation treatment for children with CP, there is a growing evidence for many promising interventions as was shown by our systematic review such as strengthening exercises, task-specific training and CIT. In addition, many pediatric assessments that assess various domains of ICF have been validated for use with CP (Boulton et al., 1995; Kolobe, Palisano, & Stratford, 1998). Therefore, effective knowledge dissemination strategies are needed to ensure the translation of this EBP to our clientele with CP. Indeed, the slow uptake of EBP in daily clinical practice creates a gap between knowledge production and knowledge utilization (Buss, Halfens, Abu-Saad, & Kok, 1999; Davis et al., 2003; Mottola, 1996; Tugwell, Qualman, & Judd, 2003). Therefore, the use of appropriate knowledge translation strategies that involve various formats, including web-based support for learning, opinion

leaders and interactive in-services, may help bring the most current evidence to pediatric clinicians (Beck, 2002). Administrators are encouraged to work with clinicians and researchers to explore the most effective knowledge dissemination strategy in their own institute and to provide support to its implementation. For example, CP-Engine, a new clinician-friendly website constructed to provide evidence-based information on all rehabilitation interventions for CP in an easy to use, easy to understand web-based format. The goal of this web-based tool is to close the gap between research findings and clinical practice and to reduce the time required by clinicians and consumers in seeking new knowledge (Snider & Korner-Bitensky, 2005).

As was reported in the literature, the main focus of the clinicians' reported practices in present study was on impairments and activity limitation. Although there was some identification of practices related to participation such as play, and school and social integration; it was still limited, suggesting the need for more promotion of the broader perspectives of ICF (Battaglia et al., 2004; Valvano, 2004). Indeed, the use of the ICF model to guide assessment and treatment approaches to CP is expected to provide a more comprehensive management to these clients with the goal of promoting function, preventing secondary impairments as well as increasing the child's and family's social participation (Rosenbaum, 2003).

Family-centered service has been widely accepted as 'best-practice' for children with disabilities including CP (King, 2004). This model of service delivery recognizes that parents are the experts on their child's abilities and needs. Therefore, this approach of service delivery encourages clinicians to involve parents in the goal-setting process for their child. Parents need to be wellinformed about their child's strengths, needs and prognosis as well as health and community services available (King, 2004). Although some of participants in the present study showed attention to family issues and social participation, it was still limited. This highlights the need to further encourage and train clinicians on a family-centered approach to service delivery. Further, although the evidence of effectiveness of many OT and PT interventions is not yet clear, parents need to be aware of the different options available for their children. It is the responsibility of the clinician to remain up-to-date on the different treatment options for these children and to discuss them with parents.

Clinicians in our study wanted to increase treatment time and frequency for their clients. Previous literature (Ehrmann Feldman, Champagne, Korner-Bitensky, & Meshefedjian, 2002; Mazer, Feldman, Majnemer, Gosselin, & Kehayia, in press) has shown that waiting time for pediatric rehabilitation services is unacceptably long in Quebec. This gives families of young children with CP another burden to live with and raises the question on the need for early intervention services for these infants while they are waiting to get the
rehabilitation services they need. Early intervention has a growing evidence of effectiveness on global development of infants with or at risk of developmental delays (Blann et al., 2005; Chen et al., 2007; Majnemer, 1998; Noyes-Grosser et al., 2005). In addition, as early intervention services are mainly parent driven, the potential for empowerment of parents in encouraging them to play an active role in the evaluation of their child's needs is evident (Blann et al., 2005).

Study limitations

To decrease social desirability bias resulting from self-reporting of practice, clinicians were clearly instructed to report their actual practices and were unaware of the specific study questions prior to the interview. In addition, steps were taken to reduce potential contamination caused by respondents' interchanges by scheduling interviews for individuals working in the same setting or region simultaneously, or in rapid succession. Clinicians were also instructed to keep the interview confidential. Another possible concern is the use of vignettes. Using vignettes permitted evaluation of variations in practice patterns, while keeping the child profile constant. This is especially important in the investigation of individuals with CP, as this condition commonly results in an extremely heterogeneous group of clients. Indeed, the use of vignettes has been found to be a valid form of practice evaluation (Jones T. V. et al., 1990) especially if the goal is to study variations in practice (Langley G. R. et al., 1991). Finally, it should be noted that this is a Quebec-wide study and may not be applicable to

157

practice elsewhere in the world. Canada has a universal Medicare program that enables individuals to receive publicly funded rehabilitation services, albeit with serious concerns regarding waiting times and treatment intensity (Feldman D. E. et al., 2002).

Conclusion

Results derived from this survey offer valuable information about OT and PT practices for young children with CP. Based on these findings, several recommendations are made. First, general guidelines need to be established with regards to OT and PT management for young children with CP. The heterogeneous nature of CP justifies a comprehensive, but nonetheless individualized treatment plan for each child. Guidelines that emphasize functional activities, participation and family involvement, will ensure that each child receives, at the very least, management that is based on best-practice and which recognizes the needs of the child and family and the realities of clinical practice.

CP literature is still lacking strong evidence of effectiveness (or noneffectiveness) of most rehabilitation interventions. This emphasizes the need for more research to examine the effectiveness of these interventions. In addition, factors affecting the choice of a specific assessment or treatment need to be further explored. Furthermore, the evidence of low prevalence of use of bestpractice found in this study pinpoints the slow uptake of EBP. Innovative

158

strategies to enhance knowledge dissemination among rehabilitation therapists are warranted.

Many clinicians requested more training and education, including specific practices for CP and the interpretation and application of research findings for clinical practice. These findings highlight the need for increased support for clinicians through professional education and training. Our professional commitment for these young clients to provide them with the best practice available; demands that we, as OTs and PTs, are accountable for the quality of service that we provide.

References

- Adams R. C. & Snyder P. (1998). Treatments for cerebral palsy: making choices of intervention from an expanding menu of options. *Infants & Young Children, 10*(4), 1-22.
- Ade-Hall R. A. & Moore A. P. (2000). Botulinum toxin type A in the treatment of lower limb spasticity in cerebral palsy. *Cochrane Database of Systematic Reviews, 2*.
- Backstrom B. & Dahlgren L. (2000). Vojta self-training: Experiences of six neurologically impaired people: A qualitative study. *Physiotherapy*, *86*(11), 567-574.
- Barry M. J. (1996). Physical therapy interventions for patients with movement disorders due to cerebral palsy. *Journal of Child Neurology, 11*(Suppl 1), S51-60.
- Battaglia M., Russo E., Bolla A., Chiusso A., Bertelli S., Pellegri A., Borri G. & Martinuzzi A.
 (2004). International Classification of Functioning, Disability and Health in a cohort of children with cognitive, motor, and complex disabilities. *Developmental Medicine & Child Neurology*, 46(2), 98-106.
- Bauer H., Appaji G. & Mundt D. (1992). VOJTA neurophysiologic therapy. *Indian Journal of Pediatrics*, *59*(1), 37-51.
- Bax M., Goldstein M., Rosenbaum P., Leviton A., Paneth N., Dan B., Jacobsson B.& Damiano D. (2005). Proposed definition and classification of cerebral palsy, April 2005.
 Developmental Medicine & Child Neurology, 47(8), 571-576.
- Bax M. C. (1964). Terminology and classification of cerebral palsy. *Developmental Medicine & Child Neurology, 11*, 295-297.
- Beck S. L. (2002). Strategies to translate research into practice. *Seminars in Oncology Nursing*, *18*(1), 11-19.
- Beckung E. & Hagberg G. (2002). Neuroimpairments, activity limitations, and participation restrictions in children with cerebral palsy. *Developmental Medicine & Child Neurology*, 44(5), 309-316.
- Benda W., McGibbon N. H. & Grant K. L. (2003). Improvements in muscle symmetry in children with cerebral palsy after equine-assisted therapy (hippotherapy). *Journal of Alternative & Complementary Medicine, 9*(6), 817-825.
- Berry J. & Ryan S. (2002). Frames of reference: Their use in paediatric occupational therapy. *British Journal of Occupational Therapy, 65*(9), 420-427.
- Bjornson K. F., Graubert C. S., McLaughlin J. F., Kerfeld C. I. & Clark E. M. (1998). Test-retest reliability of the Gross Motor Function Measure in children with cerebral palsy. *Physical & Occupational Therapy in Pediatrics, 18*(2), 51-61.
- Blann L., Noyes-Grosser D., Holland J., Lyons D., Holland C., Romanczyk R. & Gillis J. (2005).
 Early intervention for children and families with special needs: Rationale and methodology for developing guidelines for early intervention services for young children

with developmental disabilities. *MCN, American Journal of Maternal Child Nursing, 30*(4), 263-267.

- Bleck E. E. (1975). Locomotion prognosis in cerebral palsy. *Developmental Medicine & Child Neurology, 17*(1), 18-25.
- Bobath B. & Bobath K. (1975). *Motor development in the different types of cerebral palsy.* London: W. Heinemann Medical Books.
- Bobath K. (1980). *A neurophysiological basis for the treatment of cerebral palsy* (2nd ed.). London: William Heinemann Medical Books.
- Boulton J. E., Kirsch S. E., Chipman M., Etele E., White A. M. & Pape K. E. (1995). Reliability of the Peabody Developmental Gross Motor Scale in children with cerebral palsy. *Physical* & Occupational Therapy in Pediatrics, 15(1), 35-51.
- Bower E., McLellan D. L., Arney J. & Campbell M. J. (1996). A randomised controlled trial of different intensities of physiotherapy and different goal-setting procedures in 44 children with cerebral palsy. *Developmental Medicine & Child Neurology, 38*(3), 226-237.
- Bower E., Michell D., Burnett M., Campbell M. J. & McLellan D. L. (2001). Randomized controlled trial of physiotherapy in 56 children with cerebral palsy followed for 18 months. *Developmental Medicine & Child Neurology, 43*(1), 4-15.
- Boyce W. F., Gowland C., Rosenbaum P. L., Lane M., Plews N., Goldsmith C., Russell D. J., Wright V. & Zdrobov S. (1991). Measuring quality of movement in cerebral palsy: A review of instruments. *Physical Therapy*, *71*(11), 813-819.
- Boyd R. N., Dobson F., Parrott J., Love S., Oates J., Larson A., Burchall G., Chondros P., Carlin J., Nattrass G. & Graham H. K. (2001). The effect of botulinum toxin type A and a variable hip abduction orthosis on gross motor function: A randomized controlled trial. *European Journal of Neurology*, 8(Suppl 5), 109-119.
- Boyd R. N. & Hays R. M. (2001). Current evidence for the use of botulinum toxin type A in the management of children with cerebral palsy: A systematic review. *European Journal of Neurology, 8*(Suppl 5), 1-20.
- Brandt S., Lonstrup H. V., Marner T., Rump K. J., Selmar P., Schack L. K., d'Avignon M., Noren L. & Arman T. (1980). Prevention of cerebral palsy in motor risk infants by treatment ad modum Voita. A controlled study. *Acta Paediatrica Scandinavica, 69*(3), 283-286.
- Brown G. T. & Burns S. A. (2001). The efficacy of neurodevelopmental treatment in paediatrics: A systematic review. *British Journal of Occupational Therapy*, *64*(5), 235-244.
- Brown G. T. & Rodger S. (1999). Research utilization models: Frameworks for implementing evidence-based occupational therapy practice. *Occupational Therapy International*, 6(1), 1-23.
- Bullinger M., Alonso J., Apolone G., Leplege A., Sullivan M., Wood-Dauphinee S., Gandek B., Wagner A., Aaronson N., Bech P., Fukuhara S., Kaasa S. & Ware J. E., Jr. (1998).

Translating health status questionnaires and evaluating their quality: the IQOLA Project approach. International Quality of Life Assessment. *Journal of Clinical Epidemiology, 51*(11), 913-923.

Bumin G. & Kayihan H. (2001). Effectiveness of two different sensory-integration programmes for children with spastic diplegic cerebral palsy. *Disability & Rehabilitation, 23*(9), 394-399.

- Burtner P. A., McMain M. P. & Crowe T. K. (2002). Survey of occupational therapy practitioners in Southwestern schools: Assessments used and preparation of students for school-based practice. *Physical & Occupational Therapy in Pediatrics, 22*(1), 25-39.
- Burtner P. A., Wilhite C., Bordegaray J., Moedl D., Roe R. J. & Savage A. R. (1997). Critical review of visual perceptual tests frequently administered by pediatric therapists. *Physical and Occupational Therapy in Pediatrics*, *17*(3), 39-61.
- Buss I. C., Halfens R. J., Abu-Saad H. H. & Kok G. (1999). Evidence-based nursing practice: Both state of the art in general and specific to pressure sores. *Journal of Professional Nursing*, 15(2), 73-83.
- Butler C. & Darrah J. (2001). Effects of neurodevelopmental treatment (NDT) for cerebral palsy: An AACPDM evidence report. *Developmental Medicine & Child Neurology, 43*(11), 778-790.
- Campbell S. K., Vander Linden D. W. & Palisano R. J. (Eds.). (2006). *Physical therapy for children* (3 rd ed.). St. Louis: Saunders Elsevier.
- Carlson W. E., Vaughan C. L., Damiano D. L. & Abel M. F. (1997). Orthotic management of gait in spastic diplegia. *American Journal of Physical Medicine & Rehabilitation, 76*(3), 219-225.
- Carr J. & Shepherd R. (2000). Motor Learning Model for Rehabilitation. In Carr J. & Shepherd R. (Eds.), *Movement science: Foundations for physical therapy in rehabilitation* (2nd ed., pp. 33-110). Gaithersburg: Aspen Publishers.
- Case-Smith J. (1996). Analysis of current motor development theory and recently published infant motor assessments. *Infants & Young Children, 9*(1), 29-41.
- Case-Smith J. & Rogers S. (1999). Physical and occupational therapy. *Child & Adolescent Psychiatric Clinics of North America*, 8(2), 323-345.
- Catanese A. A., Coleman G. J., King J. A. & Reddihough D. S. (1995). Evaluation of an Early-Childhood Program Based on Principles of Conductive Education - the Yooralla Project. *Journal of Paediatrics and Child Health, 31*(5), 418-422.
- Chambers H. G. (2002). Advances in cerebral palsy. *Current Opinion in Orthopaedics, 13*(6), 424-431.
- Chan N. N. C., Smith A. W. & Lo S. K. (2004). Efficacy of neuromuscular electrical stimulation in improving ankle kinetics during walking in children with cerebral palsy. *Hong Kong Physiotherapy Journal, 22*, 50-56.

- Chandler L., Andrews M. S. & Swanson M. W. (1980). *The Movement Assessment of Infants*. Rolling Bay, Washington: Infant Movement Research.
- Chee F. K., Kreutzberg J. R. & Clark D. L. (1978). Semicircular canal stimulation in cerebral palsied children. *Physical Therapy*, *58*(9), 1071-1075.
- Chen D., Klein D., Haney M., Whinnery K., Whinnery S., Valvano J., Rapport M. J., DeVore S. & Bowers B. (2007). Promoting interactions with infants who have complex multiple disabilities: Development and field-testing of the PLAI curriculum. *Infants & Young Children, 20*(2), 149-162.
- Cherng R., Liao H., Leung H. W. C. & Hwang A. (2004). The effectiveness of therapeutic horseback riding in children with spastic cerebral palsy. *Adapted Physical Activity Quarterly*, *21*(2), 103-121.
- Chiarello L. A., O'Neil M., Dichter C. G., Westcott S. L., Orlin M., Marchese V. G., Tieman B. & Rose R. U. (2005). Exploring physical therapy clinical decision making for children with spastic diplegia: Survey of pediatric practice. *Pediatric Physical Therapy*, *17*(1), 46-54.
- Cohn E. S. (2001). Parent perspectives of occupational therapy using a sensory integration approach. *American Journal of Occupational Therapy*, *55*(3), 285-294.
- Coleman G. J., King J. A. & Reddihough D. S. (1995). A pilot evaluation of conductive educationbased intervention for children with cerebral palsy - the Tongala Project. *Journal of Paediatrics and Child Health, 31*(5), 412-417.
- Cook D. J., Sackett D. L. & Spitzer W. O. (1995). Methodologic guidelines for systematic reviews of randomized control trials in health care from the Potsdam Consultation on Meta-Analysis. *Journal of Clinical Epidemiology, 48*(1), 167-171.
- Corry I. S., Cosgrove A. P., Duffy C. M., McNeill S., Taylor T. C. & Graham H. K. (1998).
 Botulinum toxin A compared with stretching casts in the treatment of spastic equinus: A randomised prospective trial. *Journal of Pediatric Orthopedics*, *18*(3), 304-311.
- Craig M. (1999). Physiotherapy management of cerebral palsy: Current evidence and pilot analysis. *Physical Therapy Reviews*, *4*(4), 215-228.
- Crowe T. K. (1989). Pediatric assessments: A survey of their use by occupational therapists in Northwestern school systems. *Occupational Therapy Journal of Research, 9*(5), 273-286.
- Cummings S. R., Strull W., Nevitt M. C. & Hulley S. B. (1988). Planning the measurements: questionnaires. In Cummings S. R. (Ed.), *Designing Clinical research*. Baltimore: Williams and Wilkins.
- Curtin M. & Jaramazovic E. (2001). Occupational therapists' views and perceptions of evidencebased practice. *British Journal of Occupational Therapy, 64*(5), 214-222.
- Dabney K. W., Lipton G. E. & Miller F. (1997). Cerebral palsy. *Current Opinion in Pediatrics, 9*(1), 81-88.

- Dali C., Hansen F. J., Pedersen S. A., Skov L., Hilden J., Bjornskov I., Strandberg C., Christensen J., Haugsted U., Herbst G. & Lyskjaer U. (2002). Threshold electrical stimulation (TES) in ambulant children with CP: A randomized double-blind placebo-controlled clinical trial. *Developmental Medicine & Child Neurology, 44*(6), 364-369.
- Darrah J., Law, M. & Pollock, N. (2001). Innovations in practice. Family-centered functional therapy: A choice for children with motor dysfunction. *Infants and young children*, *13*(4), 79-87.
- Darrah J. & Bartlett D. (1995). Dynamic systems theory and management of children with cerebral palsy: Unresolved issues. *Infants & Young Children, 8*(1), 52-59.
- Darrah J., Fan J. S. W., Chen L. C., Nunweiler J. & Watkins B. (1997). Review of the effects of progressive resisted muscle strengthening in children with cerebral palsy: A clinical consensus exercise. *Pediatric Physical Therapy*, *9*(1), 12-17.
- Darrah J., Piper M. & Watt M. (1998). Assessment of gross motor skills of at-risk infants: Predictive validity of the Alberta Infant Motor Scale. *Developmental Medicine & Child Neurology*, 40(7), 485-491.
- d'Avignon M., Noren L. & Arman T. (1981). Early physiotherapy ad modum Vojta or Bobath in infants with suspected neuromotor disturbance. *Neuropediatrics*, *12*(3), 232-241.
- Davis D., Evans M., Jadad A., Perrier L., Rath D., Ryan D., Sibbald G., Straus S., Rappolt S.,
 Wowk M. & Zwarenstein M. (2003). The case for knowledge translation: Shortening the
 journey from evidence to effect. *British Medical Journal*, *327*(7405), 33-35.
- DeGangi G. A., Hurley L. & Linscheid T. R. (1983). Toward a methodology of the short-term effects of neurodevelopmental treatment. *American Journal of Occupational Therapy, 37*(7), 479-484.
- Detrembleur C., Lejeune T. M., Renders A. & Van Den Bergh P. Y. (2002). Botulinum toxin and short-term electrical stimulation in the treatment of equinus in cerebral palsy. *Movement Disorders*, *17*(1), 162-169.
- Dillman D. (1978). *Mail and telephone surveys: The Total Design Method.* New York: Wiley-Interscience.
- Dodd K. J., Taylor N. F. & Damiano D. L. (2002). A systematic review of the effectiveness of strength-training programs for people with cerebral palsy. *Archives of Physical Medicine and Rehabilitation*, *83*(8), 1157-1164.
- Dodd K. J., Taylor N. F. & Graham H. K. (2003). A randomized clinical trial of strength training in young people with cerebral palsy. *Developmental Medicine & Child Neurology*, 45(10), 652-657.
- Dresselhaus T. R., Peabody J. W., Luck J. & Bertenthal D. (2004). An evaluation of vignettes for predicting variation in the quality of preventive care. *Journal of General Internal Medicine*, *19*(10), 1013-1018.

- Dursun E., Dursun N. & Alican D. (2004). Effects of biofeedback treatment on gait in children with cerebral palsy. *Disability & Rehabilitation, 26*(2), 116-120.
- Dursun N., Dursun E. & Alican D. (2002). The role of botulinum toxin A in the management of lower limb spasticity in patients with cerebral palsy. *International Journal of Clinical Practice, 56*(8), 564-567.
- Dysart A. M. & Tomlin G. S. (2002). Factors related to evidence-based practice among U.S. occupational therapy clinicians. *American Journal of Occupational Therapy, 56*(3), 275-284.
- Dzienkowski R. C., Smith K. K., Dillow K. A. & Yucha C. B. (1996). Cerebral palsy: A comprehensive review. *Nurse Practitioner, 21*(2), 45-48.
- Feldman D. E., Champagne F., Korner-Bitensky N. & Meshefedjian G. (2002). Waiting time for rehabilitation services for children with physical disabilities. *Child: Care, Health & Development, 28*(5), 351-358.
- Eliasson A. C., Krumlinde-Sundholm L., Rosblad B., Beckung E., Arner M., Ohrvall A. M. & Rosenbaum P. (2006). The Manual Ability Classification System (MACS) for children with cerebral palsy: Scale development and evidence of validity and reliability. *Developmental Medicine & Child Neurology, 48*(7), 549-554.
- Fay T. (1954). The use of pathological and unlocking reflexes in the rehabilitation of spastics. *American Journal of Physical Medicine, 33*, 347.
- Fetters L. & Kluzik J. (1996). The effects of neurodevelopmental treatment versus practice on the reaching of children with spastic cerebral palsy. *Physical Therapy*, *76*(4), 346-358.
- Finnie N. R. (1974). *Handling the young cerebral palsied child at home* (2nd ed.). New York: Dutton.
- Flett P. J., Stern L. M., Waddy H., Connell T. M., Seeger J. D.& Gibson S. K. (1999). Botulinum toxin A versus fixed cast stretching for dynamic calf tightness in cerebral palsy. *Journal of Paediatrics & Child Health, 35*(1), 71-77.
- Foley N. C., Teasell R. W., Bhogal S. K. & Speechley M. R. (2003). Stroke rehabilitation evidence-based review: Methodology. *Topics in Stroke Rehabilitation*, *10*(1), 1-7.
- Fowler E. G., Ho T. W., Nwigwe A. I.& Dorey F. J. (2001). The effect of quadriceps femoris muscle strengthening exercises on spasticity in children with cerebral palsy. *Physical Therapy*, *81*(6), 1215-1223.
- Gebhard A. R., Ottenbacher K. J. & Lane S. J. (1994). Interrater reliability of the Peabody Developmental Motor Scales: Fine Motor scale. *American Journal of Occupational Therapy, 48*(11), 976-981.
- Gisel E. G., Applegate-Ferrante T., Benson J. E. & Bosma J. F. (1995). Effect of oral sensorimotor treatment on measures of growth, eating efficiency and aspiration in the

dysphagic child with cerebral palsy. *Developmental Medicine & Child Neurology, 37*(6), 528-543.

- Gordon J. (2000). Assumptions underlying physical therapy intervention: Theoretical and historical perspectives. In Carr J. & Shepherd R. (Eds.), *Movement science: Foundations for physical therapy in rehabilitation* (2nd ed., pp. 1-32). Gaithersburg: Aspen Publishers.
- Gormley ME. Jr. (2001). Treatment of neuromuscular and musculoskeletal problems in cerebral palsy. *Pediatric Rehabilitation, 4*(1), 5-16.
- Graves P. (1995). Therapy methods for cerebral palsy. *Journal of Paediatrics & Child Health, 31*(1), 24-28.
- Hainsworth F., Harrison M. J., Sheldon T. A. & Roussounis S. H. (1997). A preliminary evaluation of ankle orthoses in the management of children with cerebral palsy. *Developmental Medicine & Child Neurology*, 39(4), 243-247.
- Haley S. M., Coster W. J. & Ludlow L. H. (1992). *Pediatric Evaluation of Disability Inventory* (*PEDI*). Boston: New England Medical Center Hospitals.
- Hardy P., Collet J. P., Goldberg J., Ducruet T., Vanasse M., Lambert J., Marois P., Amar M., Montgomery D. L., Lecomte J. M., Johnston K. M. & Lassonde M. (2002).
 Neuropsychological effects of hyperbaric oxygen therapy in cerebral palsy. *Developmental Medicine & Child Neurology, 44*(7), 436-446.
- Harris S. R., Atwater S. W. & Crowe T. K. (1988). Accepted and controversial neuromotor therapies for infants at high risk for cerebral palsy. *Journal of Perinatology, 8*(1), 3-13.
- Helders P. J. M., Engelbert R. H. H., Gulmans V. A. M. & Van Der Net J. (2001). Paediatric rehabilitation. *Disability & Rehabilitation*, *23*(11), 497-500.
- Herndon W. A., Troup P., Yngve D. A. & Sullivan J. A. (1987). Effects of neurodevelopmental treatment on movement patterns of children with cerebral palsy. *Journal of Pediatric Orthopedics*, 7(4), 395-400.
- Himmelmann K., Beckung E., Hagberg G. & Uvebrant P. (2006). Gross and fine motor function and accompanying impairments in cerebral palsy. *Developmental Medicine & Child Neurology, 48*(6), 417-423.
- Humphris D., Littlejohns P., Victor C., O'Halloran P. & Peacock J. (2000). Implementing evidencebased practice: Factors that influence the use of research evidence by occupational therapists. *British Journal of Occupational Therapy, 63*(11), 516-522.

Jones R. B. (1975). The Vojta method of treating cerebral palsy. *Physiotherapy*, 61(4), 112-113.

Jongerius P. H., Rotteveel J. J., van Limbeek J., Gabreels F. J., van Hulst K. & van den Hoogen F. J. (2004). Botulinum toxin effect on salivary flow rate in children with cerebral palsy. *Neurology, 63*(8), 1371-1375.

- Jongerius P. H., van den Hoogen F. J., van Limbeek J., Gabreels F. J., van Hulst K. & Rotteveel J. J. (2004). Effect of botulinum toxin in the treatment of drooling: A controlled clinical trial. *Pediatrics, 114*(3), 620-627.
- Kaminker M. K., Chiarello L. A., O'Neill M. E. & Dichter C. G. (2004). Decision making for physical therapy service delivery in schools: A nationwide survey of pediatric physical therapists. *Physical Therapy, 84*(10), 919-933.
- Kerr C., McDowell B. & McDonough S. (2004). Electrical stimulation in cerebral palsy: A review of effects on strength and motor function. *Developmental Medicine & Child Neurology*, 46(3), 205-213.
- Ketelaar M., Vermeer A., Hart H., van Petegem-van Beek E. & Helders P. J. (2001). Effects of a functional therapy program on motor abilities of children with cerebral palsy. *Physical Therapy*, *81*(9), 1534-1545.
- Ketelaar M., Vermeer A. & Helders P. J. (1998). Functional motor abilities of children with cerebral palsy: A systematic literature review of assessment measures. *Clinical Rehabilitation*, 12(5), 369-380.
- King S., Teplicky R., King G. & Rosenbaum P. (2004). Family-centered service for children with cerebral palsy and their families: A review of the literature, *Seminars in pediatric neurology 11*(1), 78-86.
- Knott M. & Voss D. (1963). *Proprioceptive Neuromuscular Facilitation, patterns and techniques.* New York: Hoeber.
- Kolobe T. H., Palisano R. J. & Stratford P. W. (1998). Comparison of two outcome measures for infants with cerebral palsy and infants with motor delays. *Physical Therapy*, 78(10), 1062-1072.
- Korner-Bitensky N., Wood-Dauphinee S., Teasell R., Hanley J., Desrosiers J., Malouin F.,
 Thomas A., Harrison M., Kaizer F.& Kehayia E. (2004). *The Canadian National Survey on rehabilitation practices for stroke: Preliminary findings.* Paper presented at the 5th World Stroke Congress.
- Kramer J. F., Ashton B. & Brander R. (1992). Training of head control in the sitting and semiprone positions. *Child: Care, Health & Development, 18*(6), 365-376.
- Kulp M. T. & Sortor J. M. (2003). Clinical value of the Beery visual-motor integration supplemental tests of visual perception and motor coordination. *Optometry & Vision Science*, 80(4), 312-315.
- Law M., Darrah J., Pollock N., King G., Rosenbaum P., Russell D., Palisano R., Harris S., Armstrong R. & Watt J. (1998). Family-centred functional therapy for children with cerebral palsy: An emerging practice model. *Physical & occupational therapy in pediatrics*, *18*(1), 83-102.

- Law M., Cadman D., Rosenbaum P., Walter S., Russell D. & DeMatteo C. (1991). Neurodevelopmental therapy and upper-extremity inhibitive casting for children with cerebral palsy. *Developmental Medicine & Child Neurology*, *33*(5), 379-387.
- Law M., Russell D., Pollock N., Rosenbaum P., Walter S.& King G. (1997). A comparison of intensive neurodevelopmental therapy plus casting and a regular occupational therapy program for children with cerebral palsy. *Developmental Medicine & Child Neurology*, 39(10), 664-670.
- Lawlor M. C. & Henderson A. (1989). A descriptive study of the clinical practice patterns of occupational therapists working with infants and young children. *American Journal of Occupational Therapy*, *43*(11), 755-764.
- Levitt S. (1995). *Treatment of cerebral palsy and motor delay* (3rd ed.). Oxford: Blackwell Science Ltd.
- MacKinnon J. R., Noh S., Lariviere J., MacPhail A., Allan D. E. & Laliberte D. (1995). A study of therapeutic effects of horseback riding for children with cerebral palsy. *Physical & Occupational Therapy in Pediatrics, 15*(1), 17-34.
- Majnemer A. (1998). Benefits of early intervention for children with developmental disabilities. *Seminars in Pediatric Neurology, 5*(1), 62-69.
- Malouin F., Gemmell M., Parrot A. & Dutil R. (1985). Effects of auditory feedback on head position training in young children with cerebral palsy: A pilot study. *Physiotherapy Canada, 37*(3), 150-156.
- Mazer B., Feldman D., Majnemer A., Gosselin J. & Kehayia E. (in press). Rehabilitation services for children: therapists' perceptions. *Pediatric Rehabilitation*.
- McFadyen B. J., Malouin F. & Dumas F. (2001). Anticipatory locomotor control for obstacle avoidance in mid-childhood aged children. *Gait & Posture, 13*(1), 7-16.
- Metcalfe C., Lewin R., Wisher S., Perry S., Bannigan K. & Moffett J. (2001). Barriers to implementing the evidence base In four NHS therapies:D dietitians, occupational therapists, physiotherapists, speech and language therapists. *Physiotherapy*, *87*(8), 433-441.
- Mikhail C., Korner-Bitensky N., Rossignol M. & Dumas J. (2005). Physiotherapists' use of interventions with high evidence of effectiveness in the management of low back pain. *Physical Therapy, 85*, 1151-1167.
- Mongan D., Dunne K., O'Nuallain S. & Gaffney G. (2006). Prevalence of cerebral palsy in the West of Ireland 1990-1999. *Developmental Medicine & Child Neurology, 48*(11), 892-895.
- Moore D. S. & McCabe G. P. (1999). *Introduction to the practice of statistics* (3rd ed.). New York: W. H. Freeman and Company.

- Mossberg K. A., Linton K. A. & Friske K. (1990). Ankle-foot orthoses: Effect on energy expenditure of gait in spastic diplegic children. *Archives of Physical Medicine & Rehabilitation, 71*(7), 490-494.
- Mottola C. A. (1996). Research utilization and the continuing/staff development educator. *Journal* of Continuing Education in Nursing., 27(4), 168-175.
- Msall M. E., Rogers B. T., Ripstein H., Lyon N. & Wilczenski F. (1997). Measurements of functional outcomes in children with cerebral palsy. *Mental Retardation and Developmental Disabilities Research Reviews*, 3(2), 194-203.
- Mutch L., Alberman E., Hagberg B., Kodama K. & Perat M. V. (1992). Cerebral palsy epidemiology: Where are we now and where are we going? *Developmental Medicine & Child Neurology*, *34*(6), 547-551.
- Nordmark E., Hagglund G. & Jarnlo G. B. (1997). Reliability of the Gross Motor Function Measure in cerebral palsy. *Scandinavian Journal of Rehabilitation Medicine, 29*(1), 25-28.
- Noyes-Grosser D., Holland J., Lyons D., Holland C., Romanczyk R. & Gillis J. (2005). Rationale and methodology for developing guidelines for early intervention services for young children with developmental disabilities. *Infants & Young Children, 18*(2), 119-135.
- Oakland T. & Houchins S. (1985). A review of the Vineland Adaptive Behavior Scales, survey form. *Journal of Counseling & Development, 63*(9), 585-586.
- Olney S. J. & Wright M. J. (2000). Cerebral palsy. In Campbell S. K., Vander Linden D. W. & Palisano R. J. (Eds.), *Physical therapy for children* (2nd ed., pp. 533-570). Philadelphia: W.B. Saunders Company.
- Ottenbacher K., Dauck B. S., Gevelinger M., Grahn V. & Hassett C. (1985). Reliability of the Behavioral Assessment Scale of Oral Functions in Feeding. *American Journal of Occupational Therapy, 39*(7), 436-440.
- Ottenbacher K. J., Msall M. E., Lyon N., Duffy L. C., Ziviani J., Granger C. V., Braun S. & Feidler R. C. (2000). The WeeFIM instrument: It's utility in detecting change in children with developmental disabilities. *Archives of Physical Medicine & Rehabilitation, 81*(10), 1317-1326.
- Ottenbacher K. J., Msall M. E., Lyon N. R., Duffy L. C., Granger C. V. & Braun S. (1997).
 Interrater agreement and stability of the Functional Independence Measure for Children (WeeFIM): Use in children with developmental disabilities. *Archives of Physical Medicine* & *Rehabilitation, 78*(12), 1309-1315.
- Ottenbacher K. J., Taylor E. T., Msall M. E., Braun S., Lane S. J., Granger C. V., Lyons N. & Duffy L. C. (1996). The stability and equivalence reliability of the functional independence measure for children (WeeFIM). *Developmental Medicine & Child Neurology, 38*(10), 907-916.

Palisano R., Rosenbaum P., Walter S., Russell D., Wood E. & Galuppi B. (1997). Development and reliability of a system to classify gross motor function in children with cerebral palsy. *Developmental Medicine & Child Neurology, 39*(4), 214-223.

- Palisano R. J., Hanna S. E., Rosenbaum P. L., Russell D. J., Walter S. D., Wood E. P., Raina P. S. & Galuppi B. E. (2000). Validation of a model of gross motor function for children with cerebral palsy. *Physical Therapy*, *80*(10), 974-985.
- Palisano R. J., Kolobe T. H., Haley S. M., Lowes L. P. & Jones S. L. (1995). Validity of the Peabody Developmental Gross Motor Scale as an evaluative measure of infants receiving physical therapy. *Physical Therapy*, 75(11), 939-951.
- Paneth N., Hong T. & Korzeniewski S. (2006). The descriptive epidemiology of cerebral palsy. *Clinics in Perinatology, 33*(2), 251-267.
- Park E. S., Park C. I., Lee H. J. & Cho Y. S. (2001). The effect of electrical stimulation on the trunk control in young children with spastic diplegic cerebral palsy. *Journal of Korean Medical Science, 16*(3), 347-350.
- Patrick J. H., Roberts A. P. & Cole G. F. (2001). Therapeutic choices in the locomotor management of the child with cerebral palsy: More luck than judgement? *Archives of Disease in Childhood*, 85(4), 275-279.
- Peabody J. W., Luck J., Glassman P., Dresselhaus T. R. & Lee M. (2000). Comparison of vignettes, standardized patients, and chart abstraction: A prospective validation study of 3 methods for measuring quality. *JAMA*, *283*(13), 1715-1722.
- Peabody J. W., Luck J., Glassman P., Jain S., Hansen J., Spell M. & Lee M. (2004). Measuring the quality of physician practice by using clinical vignettes: A prospective validation study. *Annals of Internal Medicine, 141*(10), 771-780.
- Perleth M., Jakubowski E. & Busse R. (2001). What is 'best practice' in health care? State of the art and perspectives in improving the effectiveness and efficiency of the European health care systems. *Health Policy*, *56*(3), 235-250.
- *Physiotherapy Evidence Database* (2005, 6 November). [Internet]. Centre for Evidence-Based Physiotherapy PEDro. Retrieved June, 2005, from the World Wide Web: http://www.pedro.fhs.usyd.edu.au/index.html
- Piper M. C., Pinnell L. E., Darrah J., Maguire T. & Byrne P. J. (1992). Construction and validation of the Alberta Infant Motor Scale (AIMS). *Canadian Journal of Public Health. Revue Canadienne de Sante Publique, 83*(2), 95-101.
- Reddihough D. S., King J., Coleman G. & Catanese T. (1998). Efficacy of programmes based on conductive education for young children with cerebral palsy. *Developmental Medicine & Child Neurology, 40*(11), 763-770.
- Reid D. (1987). Occupational therapists' assessment practices with handicapped children in Ontario. *Canadian Journal of Occupational Therapy, 54*(4), 181-188.

- Reid D. T. & Sochaniwskyj A. (1992). Influences of a hand positioning device on upper-extremity control of children with cerebral palsy. *International Journal of Rehabilitation Research*, 15(1), 15-29.
- Richards C. L., Malouin F., Dumas F., Marcoux S., Lepage C. & Menier C. (1997). Early and intensive treadmill locomotor training for young children with cerebral palsy: a feasibility study. *Pediatric Physical Therapy*, *9*(4), 158-165.
- Rodger S. (1994). A survey of assessments used by paediatric occupational therapists. *Australian Occupational Therapy Journal, 41*(3), 137-142.
- Rood M. (1956). Neurophysiological mechanisms utilized in the treatment of neuromuscular dysfunction. *American Journal of Occupational Therapy, 10*, 4.
- Rosenbaum P. (2003). Cerebral palsy: What parents and doctors want to know. *BMJ, 326*(7396), 970-974.
- Rosenbaum P., King S., Law M., King G. & Evans J. (1998). Family-centred service: A conceptual framework and research review. *Physical & Occupational Therapy in Pediatrics, 18*(1), 1-20.
- Rosenbaum P., King S., Toal C., Puttaswamaiah S. & Durrell K. (1990). Home or children's treatment centre: Where should initial therapy assessments of children with disabilities be done? *Developmental Medicine & Child Neurology, 32*(10), 888-894.
- Rosenbaum P. L., Russell D. J., Cadman D. T., Gowland C., Jarvis S. & Hardy S. (1990). Issues in measuring change in motor function in children with cerebral palsy: A special communication. *Physical Therapy*, *70*(2), 125-131.
- Rosenbaum P. L., Walter S. D., Hanna S. E., Palisano R. J., Russell D. J., Raina P., Wood E.,
 Bartlett D. J. & Galuppi B. E. (2002). Prognosis for gross motor function in cerebral palsy:
 Creation of motor development curves. *JAMA*, *288*(11), 1357-1363.
- Russell D. J., Avery L. M., Rosenbaum P. L., Raina P. S., Walter S. D. & Palisano R. J. (2000).
 Improved scaling of the Gross Motor Function Measure for children with cerebral palsy:
 Evidence of reliability and validity. *Physical Therapy*, *80*(9), 873-885.
- Russell D. J., Rosenbaum P. L., Lane M., Gowland C., Goldsmith C. H., Boyce W. F. & Plews N. (1994). Training users in the Gross Motor Function Measure: Methodological and practical issues. *Physical Therapy*, *74*(7), 630-636.
- Sackett D. L. (1989). Rules of evidence and clinical recommendations on the use of antithrombotic agents. *Chest, 95*, 2S- 4S.
- Sackett D. L., Rosenberg W. M., Gray J. A., Haynes R. B. & Richardson W. S. (1996). Evidence based medicine: What it is and what it isn't. *BMJ*, *312*(7023), 71-72.
- Sackett D. L., Straus S. E., Richardson W. S., Rosenberg W. & Haynes R. B. (2000). *Evidence-based Medicine. How to practice and teach EBM* (2nd ed.). London: Churchill Livingstone.

- Scherzer A. & Tscharnuter I. (1982). *Early diagnosis and therapy in cerebral palsy: A primer on infant developmental problems.* New York and Basel: Marcel Dekker.
- Shelton T. L. & Stepanek J. S. (1994). *Family-centered care for children needing specialized health and developmental services* (3rd ed.). Bethesda, Maryland: Association for the Care of Children's Health.
- Sherrington C., Herbert R. D., Maher C. G. & Moseley A. M. (2000). PEDro. A database of randomized trials and systematic reviews in physiotherapy. *Manual Therapy*, 5(4), 223-226.
- Shevell M. I. & Bodensteiner J. B. (2004). Cerebral palsy: Defining the problem. *Seminars in Pediatric Neurology, 11*(1), 2-4.
- Siebes R., Wijnroks L.& Vermeer A. (2002). Qualitative analysis of therapeutic motor intervention programs for children with cerebral palsy. *Developmental Medicine & Child Neurology*, 44(9), 593-603.
- Silagy C. & Weller D. (1998). Evidence based practice in primary care: An introduction. In Silagy C. & Haines A. (Eds.), *Evidence based practice in primary care* (pp. 1-10). London: BMJ.
- Sleigh G., Sullivan P. B. & Thomas A. G. (2004). Gastrostomy feeding versus oral feeding alone for children with cerebral palsy. *Cochrane Database of Systematic Reviews, 2.*
- Snider L. & Korner-Bitensky N. (2005). *CPEngine*. McGill University. Retrieved December 22, 2006, from the World Wide Web: <u>http://www.medicine.mcgill.ca/spot/cpengine/index.htm</u>
- Sommerfelt K., Markestad T., Berg K. & Saetesdal I. (2001). Therapeutic electrical stimulation in cerebral palsy: A randomized, controlled, crossover trial. *Developmental Medicine & Child Neurology*, 43(9), 609-613.
- Sortor J. M. & Kulp M. T. (2003). Are the results of the Beery-Buktenica Developmental Test of Visual-Motor Integration and its subtests related to achievement test scores? *Optometry* & Vision Science, 80(11), 758-763.
- Sperle P. A., Ottenbacher K. J., Braun S. L., Lane S. J. & Nochajski S. (1997). Equivalence reliability of the functional independence measure for children (WeeFIM) administration methods. *American Journal of Occupational Therapy*, *51*(1), 35-41.
- Stamm T. A., Cieza A., Machold K., Smolen J. S. & Stucki G. (2006). Exploration of the link between conceptual occupational therapy models and the International Classification of Functioning, Disability and Health. *Australian Occupational Therapy Journal*, *53*(1), 9-17.
- Stanley F., Blair E. & Alberman E. (2000). *Cerebral palsies: Epidemiology and causal pathways.* London: Mac Keith Press.
- Steultjens E. M. J., Dekker J., Bouter L. M., van de Nes J. C. M., Lambregts B. L. M. & van den Ende C. H. M. (2004). Occupational therapy for children with cerebral palsy: A systematic review. *Clinical Rehabilitation*, *18*(1), 1-14.

Stewart S. & Neyerlin-Beale J. (1999). Enhancing independence in children with cerebral palsy. Symposium on cerebral palsy. *British Journal of Therapy & Rehabilitation, 6*(12), 574.

- Stiller C., Marcoux B. C. & Olson R. E. (2003). The effect of conductive education, intensive therapy, and special education services on motor skills in children with cerebral palsy. *Physical & Occupational Therapy in Pediatrics, 23*(3), 31-50.
- Surveillance of Cerebral Palsy in Europe. (2000). Surveillance of cerebral palsy in Europe (SCPE): A collaboration of cerebral palsy surveys and registers. *Developmental Medicine* & Child Neurology, 42(12), 816-824.
- Sutherland H. J., Beaton M., Mazer R., Kriukov V. & Boyd N. F. (1996). A randomized trial of the total design method for the postal follow-up of women in a cancer prevention trial. *European Journal of Cancer Prevention, 5*(3), 165-168.
- Taub E., Ramey S. L., DeLuca S. & Echols K. (2004). Efficacy of constraint-induced movement therapy for children with cerebral palsy with asymmetric motor impairment. *Pediatrics*, *113*(2), 305-312.
- Taylor C. L. & Harris S. R. (1986). Effects of ankle-foot orthoses on functional motor performance in a child with spastic diplegia. *American Journal of Occupational Therapy, 40*(7), 492-494.
- Taylor M. C. (2000). *Evidence-Based Practice for occupational therapists*. Oxford: Blackwell Science Ltd.
- Thelen E. (1989). The (re)discovery of motor development: Learning new things from an old field. *Developmental Psychology, 25*(6), 946-949.
- Thelen E. (1995). Motor development. A new synthesis. American Psychologist, 50(2), 79-95.
- Thelen E. & Spencer J. P. (1998). Postural control during reaching in young infants: A dynamic systems approach. *Neuroscience & Biobehavioral Reviews, 22*(4), 507-514.
- Thorpe D. E. & Valvano J. (2002). The effects of knowledge of performance and cognitive strategies on motor skill learning in children with cerebral palsy. *Pediatric Physical Therapy*, *14*(1), 2-15.
- Trahan J. & Malouin F. (1999). Changes in the Gross Motor Function Measure in children with different types of cerebral palsy: An eight-month follow-up study. *Pediatric Physical Therapy*, *11*(1), 12-17.
- Tsorlakis N., Evaggelinou C., Grouios G. & Tsorbatzoudis C. (2004). Effect of intensive neurodevelopmental treatment in gross motor function of children with cerebral palsy. *Developmental Medicine & Child Neurology, 46*(11), 740-745.
- Tugwell P. S., Qualman A. & Judd M. G. (2003). Workshop report: Knowledge translation of musculoskeletal health research. *Journal of Rheumatology, 30*(3), 575-578.
- Valvano J. (2004). Activity-focused motor interventions for children with neurological conditions. *Physical and Occupational Therapy in Pediatrics, 24*(1/2), 79-107.

- Valvano J. & Newell K. M. (1998). Practice of a precision isometric grip-force task by children with spastic cerebral palsy. *Developmental Medicine & Child Neurology, 40*(7), 464-473.
- van der Linden M. L., Hazlewood M. E., Aitchison A. M., Hillman S. J. & Robb J. E. (2003).
 Electrical stimulation of gluteus maximus in children with cerebral palsy: Effects on gait characteristics and muscle strength. *Developmental Medicine & Child Neurology*, 45(6), 385-390.
- Van der Weel F. R., Van der Meer A. L. & Lee D. N. (1991). Effect of task on movement control in cerebral palsy: Implications for assessment and therapy. *Developmental Medicine & Child Neurology*, *33*(5), 419-426.
- Vincer M. J., Allen A. C., Joseph K. S., Stinson D. A., Scott H. & Wood E. (2006). Increasing prevalence of cerebral palsy among very preterm infants: A population-based study. *Pediatrics*, 118(6), e1621-e1626.
- Volman M. J., Wijnroks A. & Vermeer A. (2002). Effect of task context on reaching performance in children with spastic hemiparesis. *Clinical Rehabilitation, 16*(6), 684-692.
- Wanamaker C. E. & Glenwick D. S. (1998). Stress, coping, and perceptions of child behavior in parents of preschoolers with cerebral palsy. *Rehabilitation Psychology, 43*(4), 297-312.
- Wann J. P. & Turnbull J. D. (1993). Motor skill learning in cerebral palsy: Movement, action and computer-enhanced therapy. *Baillieres Clinical Neurology*, *2*(1), 15-28.
- Wiart L. & Darrah J. (2002). Changing philosophical perspectives on the management of children with physical disabilities: Their effect on the use of powered mobility. *Disability & Rehabilitation*, 24(9), 492-498.
- World Health Organization. (2001). International Classification of Functioning, Disability and Health (ICF). *Geneva: World Health Organization*, 3-20.
- Wright F. V. & Boschen K. A. (1993). The Pediatric Evaluation of Disability Inventory (PEDI):
 Validation of a new functional assessment outcome instrument. *Canadian Journal of Rehabilitation*, 7(1), 41-42.
- Wu Y. W., Croen L. A., Shah S. J., Newman T. B. & Najjar D. V. (2006). Cerebral palsy in a term population: risk factors and neuroimaging findings. *Pediatrics*, *118*(2), 690-697.
- Ziviani J., Ottenbacher K. J., Shephard K., Foreman S., Astbury W. & Ireland P. (2001).
 Concurrent validity of the Functional Independence Measure for Children (WeeFIM) and the Pediatric Evaluation of Disabilities Inventory in children with developmental disabilities and acquired brain injuries. *Physical & Occupational Therapy in Pediatrics, 21*(2-3), 91-101.

Appendix A

~.

Gross Motor Function Classification System for Cerebral Palsy (GMFCS) levels for ages from birth to 4 years old (Palisano et al., 1997)

Level	Description			
Before 2nd Birthday				
Level I	Infants move in and out of sitting and floor sit with both hands free to manipulate			
	objects. Infants crawl on hands and knees, pull to stand and take steps holding on			
	to furniture. Infants walk between 18 months and 2 years of age without the need			
	for any assistive mobility device.			
Level II	Infants maintain floor sitting but may need to use their hands for support to			
	maintain balance. Infants creep on their stomach or crawl on hands and knees.			
	Infants may pull to stand and take steps holding on to furniture.			
Level III	Infants maintain floor sitting when the low back is supported. Infants roll and creep			
	forward on their stomachs.			
Level IV	Infants have head control but trunk support is required for floor sitting. Infants can			
	roll to supine and may roll to prone.			
Level V	Physical impairments limit voluntary control of movement. Infants are unable to			
	maintain antigravity head and trunk postures in prone and sitting. Infants require			
	adult assistance to roll.			
Between 2nd and 4th Birthday				
Level I	Children floor sit with both hands free to manipulate objects. Movements in and out			
	of floor sitting and standing are performed without adult assistance. Children walk as			
	the preferred method of mobility without the need for any assistive mobility device.			
Level	Children floor sit but may have difficulty with balance when both hands are free to			
11	manipulate objects. Movements in and out of sitting are performed without adult			
	assistance. Children pull to stand on a stable surface. Children crawl on hands and			
	knees with a reciprocal pattern, cruise holding onto furniture and walk using an			
	assistive mobility device as preferred methods of mobility.			
Level	Children maintain floor sitting often by "W-sitting" (sitting between flexed and			
111	internally rotated hips and knees) and may require adult assistance to assume			
	sitting. Children creep on their stomach or crawl on hands and knees (often without			
	reciprocal leg movements) as their primary methods of self-mobility. Children may			
	pull to stand on a stable surface and cruise short distances. Children may walk short			
	distances indoors using an assistive mobility device and adult assistance for			
	steering and turning.			
Level	Children sit on a chair but need adaptive seating for trunk control and to maximize			
IV	hand function. Children move in and out of chair sitting with assistance from an adult			
	or a stable surface to push or pull up on with their arms. Children may at best walk			
	short distances with a walker and adult supervision but have difficulty turning and			

	maintaining balance on uneven surfaces. Children are transported in the community.
	Children may achieve self-mobility using a power wheelchair.
Level	Physical impairments restrict voluntary control of movement and the ability to
v	maintain antigravity head and trunk postures. All areas of motor function are limited.
	Functional limitations in sitting and standing are not fully compensated for through
	the use of adaptive equipment and assistive technology. At Level V, children have
	no means of independent mobility and are transported. Some children achieve self-
	mobility using a power wheelchair with extensive adaptations.

.

Appendix B

Ì

Most common pediatric assessments in the CP literature

Measure		AIMS ¹	GMFM ²	PDMS ³	PEDI ⁴
Purpose		Screening	Evaluative	Discriminative	Discriminative
				Evaluative	Evaluative
ICF classification		Functional	Functional	Functional	Activity, participation, environment
Target population	Diagnoses	Infants at risk for	Children with CP	Delayed motor	Children with disabilities
		developmental delays		development	
	Age	Birth to independent walking	No age limits	1 month-7years	6 months- 7years
Scaling		Dichotomous scale;	4-point Likert scale;	3-point ordinal scale;	6-point ordinal scale for
		norm-referenced	criterion-referenced	norm-referenced.	caregiver assistance
				Independent gross motor	and modification items
				scale and fine motor scale	dichotomous scaling of
					motor, self-care, and
					social domains
Dimensions/domains		Postural control in prone,	1)lying and rolling,	Reflexes, stationary,	1) skills in mobility, self-
		supine, sitting, and	2)crawling and kneeling,	locomotion, object	care, and social
		standing	3)sitting, 4)standing, and	manipulation, grasping	function, 2) caregiver
			5)walking, running and	and visual motor	assistance, and 3)
			jumping	integration	environment/equipment
					modification

Standardization		Normative data on 2202		Normative data on sample of 617 children	Normative data on 412 infants and children
		months			
Psychometric	Reliability	Excellent test-retest and	Excellent test-retest, inter-	Excellent test-retest, intra-	Excellent test-retest,
properties		inter-rater reliabilities	rater and intra-rater	rater and inter-rater	inter-rater, and intra-
			reliabilities	reliabilities for gross motor	rater reliabilities
				scale and inter-rater	
				reliability for fine motor	
				scale	
	Validity	Content validity. Good	Construct validity	Good discriminative	Content validity by
		concurrent validity with		(construct) validity and	expert group, construct
		BSID-GM and PDMS-		good concurrent validity	(discriminative) validity,
		GM		with the BSID-GM	and concurrent with
					PDMS and BDI
	Responsiveness	Not done	Validated as sensitive to	Limited for gross motor	Established evaluative
			change over 6 months of	scale for infants with	validity
			PT in children with CP	developmental delays or	
				CP over 6-months period	

Measure		WeeFIM ⁵	VMI ⁶	VABS ⁷
Purpose		Discriminative	Discriminative, predictive	Discriminative measure
ICF classification		Functional	Impairment	Functional limitation and participation
Target population	Diagnoses	Developmental disabilities		Children with/without disability
	Age	All ages of children with developmental disabilities and mental ages less than 7 years	3-18 years	Birth-18 years
Scaling		7- point ordinal scale; criterion- referenced	24 geometric forms to be copied in developmental sequence of complexity and are scored on 0-4 point scale for age- equivalent score	Semi-structured interview of typical performance. Tri-chotomous ordinal scale.
Dimensions/domains		Self-care, sphincter control, mobility, locomotion, communication, and social cognition	Measures visual motor perceptual skills.	1) communication, 2) daily living skills, 3) socialization, 4) motor skills

Standardization		Normative sample of	Normative data on 5,824	3,000 children (0-18 years) stratified
		over 500 children without	children	by age, geographic regions (in USA),
		disabilities and 705 with		parental education, race, and
		disabilities		community size
Psychometric properties	Reliability	High test-retest and	Moderately high inter-	High levels of internal consistency
		inter-rater reliability	rater and test-retest	and test-retest reliability for the
			reliabilities.	composite and domains. Moderate
				inter-rater reliability
	Validity	Content validity	Construct: age	Construct: age differentiation and
		established by group of	differentiation.	factor analysis. Concurrent: good
		experts. Construct	Discriminative: group	correlation with other adaptive
		validity with children with	differentiation.	behavior scales
		neurosensory,	Concurrent with Bender	
		communicative and	Gestalt and DTVP.	
		developmental delays.	Predictive validity: limited	
		Concurrent validity with		
		the VABS and AAQ,		
		PEDI and BDI		
	Responsiveness	With GMFM, measures	Not done	Not done
		change in children with		
		CP in early intervention.		
		Showed ability to detect		
		changes in the functional		
		status of children with		
		disability over a 1-year		
		period		

)

j.

¹ AIMS= Alberta Infant Motor Scale (Darrah et al., 1998; Piper, Pinnell, Darrah, Maguire, & Byrne, 1992); ² GMFM= Gross Motor Function Measure (Bjornson et al., 1998; Russell et al., 2000; Russell et al., 1994; Trahan & Malouin, 1999); ³ PDMS= Peabody Developmental Motor Scale (Boulton et al., 1995; Gebhard, Ottenbacher, & Lane, 1994; Kolobe et al., 1998; Palisano et al., 1995); ⁴ PEDI=Pediatric Evaluation of Disability Inventory (Haley, Coster, & Ludlow, 1992; Wright & Boschen, 1993); BSID= Bayley Scales of Infant Development; PDMS-GM= Peabody Developmental Gross Motor Scale; BDI= Battelle Development Inventory; ⁵ WeeFIM= pediatric Functional Independence Measure (Ottenbacher et al., 2000; Ottenbacher et al., 1997; Ottenbacher et al., 1996; Sperle, Ottenbacher, Braun, Lane, & Nochajski, 1997; Ziviani et al., 2001); ⁶ VMI= Test of Visual-Motor Integration (Burtner et al., 1997; Kulp & Sortor, 2003; Sortor & Kulp, 2003); ⁷ VABS= the Vineland Adaptive Behavior Scale (Msall et al., 1997; Oakland & Houchins, 1985); AAQ= Amount of Assistance Questionnaire; DTVP= Developmental Test of Visual Perception; PT= Physical Therapy; CP= Cerebral Palsy .

Appendix C

`}

An overview of ICF (World Health Organization, 2001).

	Part 1: Fonc	tioning and Disability	Part 2: C	ontextual Factors
Components	Body Functions Activities and and Structures Participation		Environmenta) Factors	Personal Factors
Domains	Body functions Body structures Life areas (tasks. actions)		External influences on functioning and disability	Internal influences on functioning and disability
Constructs	Change in body functions (physiological) Change in body structures (anatomical)	Capacity Executing tasks in a standard environment Performance Executing tasks in the current environment	Facilitating or hindering impact of features of the physical, social, and attitudinal world	Impact of attributes of the person
Positive aspect	Functional and Activities structural integrity Participation Functioning		Facilitators	not applicable
Negative aspect	Impairment Dis	Activity limitation Participation restriction ability	Barriers / hindrances	not applicable

Appendix D

. - معمر

. ، مستعر

 \sim

PEDro Scale (last modified March, 1999) (*Physiotherapy Evidence Database*, 2005)

1. Eligibility criteria were specified.	no/yes
2. Subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received).	no/yes
3. Allocation was concealed.	no/yes
 The groups were similar at baseline regarding the most important prognostic indicators. 	no/yes
5. There was blinding of all subjects.	no/yes
6. There was blinding of all therapists who administered the therapy.	no/yes
7. There was blinding of all assessors who measured at least one key outcome.	no/yes
8. Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups.	no/yes
9 . All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by "intention to treat".	no/yes
10. The results of between-group statistical comparisons are reported for at least one key outcome.	no/yes
11. The study provides both point measures and measures of variability for at least one key outcome.	no/yes

Appendix E

Levels of Evidence

Evidence Level	Quality of Research Done to Date	Examples of rehabilitation-based physical therapy interventions for children with CP
1a (Strong)	Well designed meta-analysis, or 2 or more "high"	
	quality RCTs (PEDro scores ≥6) that show similar	
	findings of effectiveness (or ineffectiveness) of an	
	intervention	
1b (Moderate)	One RCT of "high" quality (PEDro score ≥6)	Strength training seemed to increase muscle strength (Darrah, Fan, Chen, Nunweiler,
	showing effectiveness (or ineffectiveness) of an	& Watkins, 1997; Dodd, Taylor, & Damiano, 2002; Dodd, Taylor, & Graham, 2003).
	intervention	<i>Hyperbaric oxygen therapy</i> . evidence of ineffectiveness on cognitive function (Hardy et al. 2002)
2a (Limited)	At least one "fair" quality RCT (PEDro =4-5)	Ankle-foot orthosis (AFO) seems to have positive effects on ankle movements and
za (cinited)		gait kinematics and kinetics (Carlson Vaughan Damiano & Abel 1997)
		Strength training did not increase specticity in children with CP (Darrah et al. 1997).
		Fowler Ho Nwigwe & Dorey 2001)
		Constraint induced therapy produced significant suctained improvements in hand
		function and promoted upo of offected orm (Touth Removi Dol upo & Echolo 2004)
		Interior and promoted use of anected ann (Taub, Ramey, DeLuca, & Echois, 2004).
		Horseback holing may improve symmetry in muscle activity and gross motor function
		for some children with spastic CP (Benda, McGlobon, & Grant, 2003; Cherng, Liao,
		Leung, & Hwang, 2004).
		Functional activities were shown to produce significant changes on the PEDI
		(Ketelaar et al., 2001) .
2b (Limited)	At least one well-designed non-experimental study:	AFO may reduce ambulation energy expenditure and improve motor performance in
	non-randomized controlled trial; quasi-experimental	children with spastic diplegia. (Mossberg, Linton, & Friske, 1990)
	studies; cohort studies with multiple baselines;	
	single subject series with multiple baselines etc	

3 (Consensus)	Agreement by an expert panel, a group of	Adaptive sports, swimming (as recommended by our expert group).
	professionals in the held of a number of pre-post	
	design studies with similar results	
4 (Conflicting)	Conflicting evidence of two or more equally	Electrical stimulation: a systematic review showed non-conclusive results regarding
	designed studies	effectiveness of different types of electrical stimulation on muscle function. In addition,
		there was lack of consensus on optimal treatment parameters (Dali et al., 2002;
		Detrembleur, Lejeune, Renders, & Van Den Bergh, 2002; Kerr, McDowell, &
		McDonough, 2004; Park, Park, Lee, & Cho, 2001; Sommerfelt, Markestad, Berg, &
		Saetesdal, 2001; van der Linden, Hazlewood, Aitchison, Hillman, & Robb, 2003).
5 (No	No well-designed studies: "Poor" quality RCTs with	
Evidence)	PEDro scores ≤ 3; case studies; cohort studies;	
	single subject series with only pre-post designs	

CP: cerebral palsy, RCTs: randomized controlled trials, PEDro: Physiotherapy Evidence Database, PEDI: Pediatric Evaluation of Disability Inventory.

Appendix F

Clinical vignettes Hemi-18m-English

A young mother brings her 18-month-old child, S to you for an initial assessment. S is sitting in an umbrella stroller, and is leaning to one side. This is mom's first child. Dad works as a technician and mom works as a secretary but has been off work since the baby was born. She is looking into day care as she hopes to return to work soon. Mom mentions that they have one car. Currently, she spends most days at home. The family outings include going to the neighbourhood park where S enjoys watching the other children play. One set of grandparents lives nearby and comes to babysit at times.

When you ask the mother to undress the child, you note that S's growth seems average for an 18 months old child, although, the right upper and lower limbs seem slightly smaller than the left. Mom reports that S has a good appetite. On the mat, S sits independently with weight shifted to the left side. You note a slight increase in upper and lower limb tone on the right side. S scoots on her bottom, pulling with her left arm and leg to get to toys placed on the floor. When seated at the side of the toy box, she grabs a Pop-up clown with her left hand and pushes the button with her whole right hand to make the clown pop up. S. seems familiar with the toy. S scoots from toy to toy, leaving the mat frequently to try to explore the rest of the room. When you place a toy up on the bench she pulls up on the bench and stands to reach for it. You observe S's weight is primarily on the left leg, with the right leg slightly bent and internally rotated. The right heel does not touch the floor. S reaches for a cube on the bench with the left hand using the thumb, index and middle fingers. Mother reports that S has a hard time picking up Cheerios. Mother also reports that at home S cruises along the length of the couch but cannot climb up onto it. However, S is able to climb down from the couch. To get from standing to sitting she drops down onto her bottom.

S cries when you try to move her right arm, and you note very limited spontaneous use of the right hand. However, you observe that S stabilizes a book with her right forearm while turning several pages at a time with the left hand. Mom says that S enjoys books, responds to name, waves byebye, and has ten words in her vocabulary. Mom also reports that S babbles spontaneously and moves very quickly from toy to toy.

Mom says that she first became concerned when the baby wasn't sitting at 10 months and seemed slower than a cousin of the same age whom they met at a family party. When she mentioned her concern at the 12-month check-up with the family doctor, a referral was made.

Hemi-18m-French

Une jeune mère vous amène son enfant S de 18 mois pour une première consultation. S est assis dans une poussette parapluie avec le corps incliné d'un côté. La mère dit qu'il s'agit de leur premier enfant. Le père travaille comme technicien et la mère est secrétaire. Elle n'a pas travaillé depuis la naissance du bébé. Elle recherche les garderies car elle aimerait retourner au travail bientôt. Les grands-parents habitent à proximité et à l'occasion viennent à la maison pour garder S. La mère mentionne qu'ils n'ont qu'une seule auto. Présentement, elle est à la maison la plupart de son temps. Les sorties familiales consistent en des visites au parc du voisinage où S s'amuse en regardant les autres enfants jouer.

Lorsque la mère déshabille S, vous notez que sa taille est normale pour un enfant de 18 mois, mais que la jambe et le bras du côté droit sont un peu plus petits comparé au côté gauche. La mère dit que S a un bon appétit. Sur le matelas, S s'assoit sans aide mais en mettant plus de poids du côté gauche. Vous notez une augmentation du tonus musculaire des membres du côté droit. Pour s'approcher des jouets, S se traine sur les fesses en se tirant avec son bras et sa jambe gauche. Une fois arrivé à la boîte de jouets, S saisit un jouet, le clown éjectable, avec la main gauche et utilise toute sa main droite pour pousser sur le bouton afin de faire surgir le clown. S semble connaître ce jouet. S va rapidement d'un jouet à l'autre et s'éloigne souvent du matelas pour explorer le reste de la salle. Lorsque vous placez un jouet sur un banc, S se tire debout pour le saisir. Vous observez que S se sert surtout de sa jambe gauche et garde sa jambe droite légèrement fléchie et en rotation interne. Le talon du pied droit ne touche pas le plancher. S va chercher un cube sur le banc avec sa main gauche en se servant du pouce, de l'index et du majeur. La mère dit que S a de la difficulté à ramasser des Cheerios. Elle mentionne aussi qu'à la maison S marche en se tenant au fauteuil, mais ne réussit pas à y monter. Cependant, S est capable de descendre du fauteuil. Pour s'asseoir d'une position debout, l'enfant se laisse tomber sur les fesses.

S pleure lorsqu'on tente de mobiliser son bras droit. Vous notez peu de mouvement spontané à la main droite. Par contre, vous remarquez que S se sert de son avant-bras droit pour stabiliser un livre et qu'il le feuillette de sa main gauche en tournant plusieurs pages à la fois. La mère souligne que S aime les livres, répond à son nom, salue de la main gauche et peut dire dix mots. Elle mentionne aussi que S babille spontanément et s'intéresse peu longtemps à chaque jouet.

Le mère avoue qu'elle a commencé à s'inquiéter, quand à l'âge de 10 mois S ne s'assoyait pas encore et qu'il paraissait moins développé qu'un cousin du même âge. Quand elle en a parlé au médecin lors de la visite annuelle (12 mois), il l'a référé.

Hemi-4y-English

S is a four-year-old year old child who you are seeing in your department today for the first time. The parents have recently moved to your region, away from a supportive family. They live in an urban setting, in a one level bungalow that has a few stairs. They have another child, a 3-month-old baby. Mom would like S to attend a half day preschool starting in September, a few months away. Mom is presently not working.

You observe that S walks independently with a hinged ankle-foot orthosis (AFO) on her right foot. She uses no other walking aids. Mom says that S's gait deteriorates when not using the AFO at home. Mother reports that S can now go up and down stairs alone in a reciprocal pattern using a railing on the left side. Mother also mentions that S likes going shopping with mom, who brings a stroller for use when they cover longer distances. You observe that when S tries to run, she has difficulty clearing the right foot off the ground. In addition, you observe an asymmetrical gait pattern with an increase in right arm tone as S increases her walking speed.

Mom reports that S becomes frustrated when trying to keep up with the neighbourhood children. S does not seem to understand the concepts of "taking turns" or the rules of simple games they play at home. She tantrums easily. The parents find this especially stressful now that the new baby has arrived. Mom indicates that dad is supportive and helps in the evening with supper and baths.

You observe that S scribbles with a crayon using her left hand and likes using scissors to try to snip paper. Mom reports that S tries to pull up her pants, but requires some help with dressing. S eats independently but is messy, and uses a spoon and fork, but not a knife. You note a spontaneous, but difficult, use of her right hand when it is really needed. Mom mentions that she often needs to remind S to use her right hand. S speaks in short sentences.

Mom reports that S was previously followed in a rehabilitation center and was given a home program of stretching exercises and activities for her upper and lower limbs. Mom says that she was happy with her child's therapist and hopes to have the same level of service. When you ask mom about her main concerns, she says that it is on how to integrate S into nursery school.

Hemi-4y-French

S est un enfant de 4 ans qui se présente à votre département pour la première fois. Ses parents ont récemment déménagé dans votre région, s'éloignant ainsi de leur famille immédiate. Ils habitent dans un bungalow avec quelques marches situé dans une petite ville. Ils ont également un autre enfant, un bébé de 3 mois. La mère souhaiterait que S aille à la pré-maternelle à demi-temps en septembre, ce qui veut dire dans quelques mois. La mère ne travaille pas à l'extérieur.

Vous notez que S marche indépendamment avec le port d'une orthèse tibiale articulée à la droite. Elle n'utilise aucune autre auxiliaire de marche. La mère mentionne que l'enfant marche moins bien sans l'orthèse. S peut monter et descendre les escaliers sans aide, de façon alternée, en tenant la rampe gauche. La mère mentionne aussi que S aime l'accompagner lorsqu'elle va magasiner et, que pour les longues distances, elle l'assoit dans la poussette.

Lors qu'elle essaie de courir, vous notez que S accroche parfois le bout de son pied droit. Son patron de marche est asymétrique et, lorsque S marche plus vite, son coude droit plie et son bras a tendance à lever de côté.

La mère rapporte que son enfant a tendance à se fâcher lorsqu'elle ne peut suivre les enfants du quartier. La mère dit que S ne peut attendre son tour et ne saisit pas les règles des jeux faciles joués à la maison. Elle avoue que son enfant s'emporte facilement. Les parents trouvent cela d'autant plus difficile depuis l'arrivée du bébé. Le père fait sa part le soir, s'occupant du souper et du bain.

S gribouille de sa main gauche et aime bien essayer de couper du papier avec des ciseaux. La mère mentionne que son enfant essaie de mettre ses pantalons, mais qu'elle requiert de l'aide avec l'habillage. S mange sans aide en faisant beaucoup de dégâts. Sauf pour les couteaux, S se sert d'ustensiles. Lorsque c'est très nécessaire, vous notez que S peut utiliser spontanément mais difficilement sa main droite. Toutefois, la mère souligne qu'elle doit souvent rappeler à S d'utiliser sa main droite. S s'exprime avec de courtes phrases.

La mère indique que son enfant a déjà été suivi dans un centre de réadaptation où on lui a donné un programme à domicile incluant des exercices et activités pour les membres supérieurs et inférieurs. La mère avoue qu'elle a bien apprécié la thérapeute de son enfant et espère recevoir le même niveau de service. Quand vous demandez à la mère ce qui la préoccupe le plus, elle avoue que c'est l'intégration de son enfant à la pré-maternelle.

Quad-18m-English

A young mother brings her 18-month old child, V, for an initial assessment. The family recently moved into the area. V is sitting in a standard stroller. Mom says that V is the youngest of her three children. The father works at a small company; mom is a secretary. Both are currently working full-time and mom mentions that they have two cars. They live in a rural area in a bungalow where they have set up a playroom in the basement. The grandparents live nearby and come to baby-sit at night and on the weekends, when necessary. They have had a hard time finding other baby-sitters. Family vacations are rare. In the summer the children use the family pool. But right now (January) the mother emphasizes that she would like to get V outside more, but she can't find an adequate sled.

You note that in the stroller V is leaning to the right, is slipping out of the seat and his legs are stiff. V is holding a toy in his left hand and his right hand is fisted. He smiles when spoken to. You note a slight "strabismus". You ask the mother to bring the child into the evaluation room, to remove all his clothing, except for his undershirt and diaper, and to place him on the mat on the floor.

The mom indicates that V has been turning from his stomach to his back since the age of 12 months. He can turn back onto his stomach when he really wants something but prefers to remain on his back. You observe that once on his back, he moves little and when he wants to reach for a toy with his left hand, his right arm tightens. If a toy is placed close by, V can turn onto his stomach with a little bit of help. In this position, if you place him supported by his forearms, he lifts his head and maintains the position for a few seconds with his fists closed. V soon tries to return to his back and does so by pushing his head into extension.

V enjoys sitting but needs to be supported. Sitting, V plays with toys and makes little sounds. V is able to grab a toy with his left hand and to let it go. V also loves to scribble with a crayon but his right hand remains closed. In sitting, when he is unable to do a certain activity he gets angry and pushes into extension. The mom says that when he is sitting in his adapted highchair he can bring a cookie to his mouth with his left hand and often brushes objects off his tray with a broad motion of the right arm. He is still eating soft foods because he has difficulty with solid food. V drinks generally from his bottle. Recently V has started to drink from a sip-cup but he chokes from time to time.

During the day, V goes to the same daycare as his brother. The parents don't go out often especially because V has a hard time going to sleep. To get him to sleep or to calm down, they use music and read him books.

Quad-18m -French

Une jeune mère amène son enfant de 18 mois, V, en évaluation initiale suite à leur déménagement dans la région. V est assis dans une poussette régulière. La mère dit que c'est le plus jeune de ses trois enfants. Le père travaille dans une petite industrie et la mère est secrétaire. Tous les deux travaillent actuellement à temps plein et la mère mentionne qu'ils ont deux voitures. Ils habitent en milieu rural un bungalow où ils ont aménagé une salle de jeux au sous-sol. Les grands parents habitent tout près et gardent les enfants le soir et la fin de semaine lorsque nécessaire. Ils ont de la difficulté à trouver d'autres gardiens. Les vacances familiales sont peu nombreuses. L'été les enfants profitent de la piscine familiale. Par contre, présentement (janvier) la mère souligne qu'elle aimerait sortir l'enfant davantage, mais elle ne trouve pas de traîneau adéquat.

Dans la poussette, V est penché vers la droite, elle glisse du siège et ses jambes sont raides. V tient un bonhomme dans la main gauche et sa main droite reste fermée. L'enfant sourit lorsqu'on lui parle; on note un léger strabisme. On demande à la mère d'amener l'enfant à la salle d'évaluation, de le dévêtir, à l'exception de sa couche et sa camisole et de le déposer au sol sur le matelas.

La mère indique que V se tourne du ventre au dos depuis l'âge de un an. L'enfant peut se retourner sur le ventre lorsqu'il veut vraiment obtenir quelque chose, mais préfère rester sur le dos. Dans cette position, l'enfant bouge peu et, lorsqu'il tente d'atteindre un jouet avec sa main gauche, son bras droit fléchit davantage. Si un jouet est placé tout près, V arrive à se tourner sur le ventre avec un peu d'aide. Dans cette position, si on place l'enfant en appui sur les avant-bras, il relève la tête et la tient quelques secondes, poings fermés. V cherche aussitôt à se retourner sur le dos en poussant sa tête en extension.

V aime être assis mais a besoin d'être tenu. Assis, V s'amuse avec des jouets et émet des petits sons. V est capable de saisir un jouet avec sa main gauche et de le relâcher. V aime aussi gribouiller, mais la main droite reste fermée. Lorsqu'il ne réussit pas une activité, il se fâche et se pousse en extension. La mère mentionne que, lorsque assis dans sa chaise haute adaptée, l'enfant peut porter un biscuit à sa bouche avec sa main gauche et fait souvent tomber les objets placés sur la tablette d'un geste brusque du bras droit. On lui donne encore de la nourriture molle, car V a de la difficulté avec une nourriture plus solide. V boit généralement au biberon. Toutefois V a commencé à boire avec un gobelet, mais s'étouffe de temps en temps.

Durant la journée, V fréquente la même garderie que son frère. Les parents sortent peu, d'autant plus que V a un sommeil difficile. Pour l'endormir ou le consoler, ils utilisent la musique et la lecture de petits livres.

Quad-4y-English

V is 3 years, 10 months when he arrives at your department for a re-evaluation after the summer vacation. V was followed in therapy regularly until this time. V lives with his two parents, his two brothers and his sister. The father and mother both work full-time. They live in a single family bungalow that has a playroom in the basement.

V will soon attend preschool and the mother has some concerns. She is not sure what kind of school he could go to and she is worried about how well V will function. She is particularly worried that V is not yet walking and that he still wets himself often, even though she tries to toilet train him. As you proceed to the evaluation room you note that V is seated in a specially adapted posture-seat stroller. When taken out of the stroller, V helps by bearing weight on his legs. When undressing him you notice that he helps by lifting up his left arm when you remove his shirt. When you talk to him, V responds with short sentences but this requires a lot of effort for him. The mom says that strangers have a hard time understanding him because he speaks very slowly and he sometimes refrains from talking.

You observe that, while sitting, V is able to support himself with his right arm and to reach for toys with his left hand. As soon as he has a toy in his hand he plays with it between his legs. V is very interested in the toys in the room and 'bunny hops' to get to them. The mom mentions that this is how he moves around at home. For example, V likes to go into the living room where he pulls up to stand using his arms to retrieve objects off the table. She adds that it is when he is in his adapted walker that he is most comfortable playing ball with his brother. V is able to move around in his walker for short distances but needs help to steer. On his adapted tricycle, V can peddle by himself, but as with the walker, he also needs help steering.

V is still in daycare and enjoys playing with his friends. He is interested in the same games they enjoy but he is easily distracted. V loves to draw and when asked, is able to make some simple lines. With help, V completes a four-piece puzzle. During meals V uses an adapted spoon and eats small bite-size pieces. V drinks from a straw to minimize spills. His mother mentions that V is a messier eater than her other children especially with liquids. Therefore when they go to a restaurant the parents order mostly solid foods for him.

On weekends the family rarely goes out because the grandparents who used to look after V can no longer do so because he has become too heavy. The mom says that it is difficult to find him other babysitters. Because his brothers and sister are often out playing with friends, V occupies himself mostly with his computer games. V uses an adapted mouse in the form of a joystick. He also loves to watch television and listen to music.
Quad-4y-French

V est âgé de 3 ans 10 mois et se présente à votre département pour réévaluation après la période de vacances d'été. V a été suivi en thérapie de façon régulière avant cette période. V demeure avec ses deux parents et ses deux frère et sœur. Le père et la mère travaillent à temps plein. Ils habitent une maison unifamiliale de type bungalow dotée d'une salle de jeux au sous-sol.

V fréquentera bientôt la pré-maternelle ce qui préoccupe la mère. Elle se questionne sur le type d'école que V pourra fréquenter et sur le fonctionnement de son enfant. Elle est particulièrement inquiète du fait que V ne marche pas encore et aussi du fait que V se mouille encore souvent bien qu'elle l'entraîne à la propreté.

Pour se rendre à la salle d'évaluation, V est assis dans une poussette adaptée avec un siège de posture. Lorsque sorti de la poussette, V participe en prenant du poids sur ses jambes. Lors du déshabillage, vous observez que V s'aide en levant le bras gauche pour enlever son chandail. Lorsque vous lui parlez, V tente de répondre par de courtes phrases, mais cela lui demande beaucoup d'efforts. La mère mentionne que les étrangers le comprennent difficilement car son langage est lent et, que parfois, V s'empêche même de parler.

Vous observez que V se tient assis au sol en s'appuyant sur sa main droite et s'allonge pour prendre les jouets avec sa main gauche. Aussitôt assis avec un jouet, il joue avec entre ses jambes. V est très intéressé aux jouets qui sont dans la salle et se déplace en sauts de lapin pour aller les chercher. La mère mentionne que c'est sa façon de se déplacer à la maison. Par exemple, V aime aller au salon où il peut atteindre les objets sur la table en se tirant debout avec ses bras. Elle ajoute que c'est toutefois dans sa marchette entourée que V est le plus à l'aise pour jouer au ballon avec son frère. V arrive à se déplacer avec celle-ci sur de courtes distances, mais a besoin d'aide pour la diriger. Sur son tricycle adapté, V peut pédaler seul mais a également besoin d'aide pour se diriger.

V va encore à la garderie et aime beaucoup jouer avec ses amis. V s'intéresse aux mêmes jeux qu'eux, mais est facilement distrait. V aime dessiner et sur demande réussit à faire des traits simples. Avec aide, V complète un casse-tête de 4 morceaux. Pour les repas, V utilise une cuillère adaptée et mange sa nourriture en petits morceaux. V boit à la paille pour diminuer les dégâts. La mère mentionne que V mange moins proprement que ses autres enfants surtout avec les liquides. Donc, lorsqu'ils vont au restaurant, les parents lui commandent surtout de la nourriture solide.

Les fins de semaine, la famille sort peu car les grands-parents qui gardaient l'enfant ne peuvent plus s'en occuper, V étant devenu trop lourd. La mère mentionne qu'il lui est difficile de trouver d'autres gardiens. Comme ses frère et sœur vont souvent jouer avec leurs amis, V s'occupe surtout à des jeux à l'ordinateur. V utilise une souris adaptée de type Joystick. V aime aussi regarder la télévision et écouter de la musique.

Appendix G

Survey of Physical and Occupational Therapy Services for Young Children with Cerebral Palsy (CP) English version

We are interested in learning about the assessments and interventions physical and occupational therapists use for young children with CP. By completing this questionnaire you will contribute to the knowledge about our professional practices. NOTE: Use of the term "young children" below refers to children between 1-5 years of age.

Section 1: Socio-demographics

We will begin by asking some questions about you and your clinical

experience in health care.

- **S1.** Please indicate the profession in which you practice: [] Occupational Therapy [] Physical Therapy
- S2. Gender: [] Female [] Male
- **S3.** Specify your highest academic degree achieved in (OT/PT):

Year of Graduation of latest (OT/PT) degree:

S4. Are you currently working full-time or part-time as a (PT/OT.)?

[] Part Time (*less than 35 hours/week*)

[] Full Time (equal or greater than 35 hours/week)

S5. How many years of clinical experience do you have with young children with CP or at high risk for CP? ______ (years)

S6. In a typical week, approximately how many young children with or <u>at high risk for CP</u> do you see?

[] < 2 [] 2-5 [] 6-10 [] > 10

- **S7.** In a typical week, what percentage of your time do you spend assessing or reassessing young children with or at high risk for CP? ______%
- **S8.** In a typical week, what percentage of your time do you spend **treating** young children with or at high risk for CP? ______%

Section 2: Work Environment

For the following questions, indicate the response that best represents

your work environment during the past four months where you primarily

assess or treat young children with/ at high risk for CP.

W1. Which setting best describes where you primarily **assess** or **treat** young children with/ at high risk for \underline{CP} ?

[] Acute care Hospital In-patient patient	[] Acute care Hospital Out-
[] Community Organization (e.g. CLSC)] Private Clinic
[] Rehabilitation In-patient	[] Rehabilitation Out-patient
[] Long-term Care Facility	[] School
[] Other SPECIFY	
W2. Is this setting in an urban, suburban or r	rural region?(<i>suburban<u>></u> 30</i>

 W2. Is this setting in an urban, suburban or rural region? (suburban≥ 30 kilometres & <50 kilometres from major city, rural ≥ 50 kilometres)</td>

 [] urban
 [] suburban

 [] urban
 [] rural

 W3. What is the source of funding for your setting?

 [] Private for profit
 [] Private not for profit

 [] Public

[] Other If other, please specify

 W4.
 Is rehabilitation research focusing on CP conducted in your setting?

 [] Yes
 [] No
 [] Don't know

W5. Is your setting an environment where students (*specify their discipline- either OT/PT*) come for fieldwork placements?

[] Yes 0 No If yes, about how many do you personally supervise per year? [] 0 [] 3-5 [] 1-2 [] >5 W6. How many therapist(s) (specify their discipline- either OT/PT) including yourself work in your setting? [] 2-4 ∏ 5-10 [] >10 [] 1 W7. Do you work in a multidisciplinary team including professionals from other disciplines?

[] Yes [] No If the answer is yes, continue to next question. If the answer is **no**, skip to **Section 3**.

W8. What professional discipline(s) are represented on your team? Physical Therapist [] Occupational Therapist [] Speech Therapist [] Family physician [] Psychologist []Dietician Neuro-psychologist [] Neurologist [] Case Manager Physiatrist Social Worker [] Nurse Teacher [] Neontologist [] Special educator [] Other: (please specify) [] Audiologist

Section 3: Case Study #1

Indicate which one: _____

For the next series of questions we ask you to refer to the case study that we sent you describing the child with... (-interviewer specifies according to randomization scheme assigned to the therapist). Please note that there are no right or wrong answers.

Section 3a: Problem Identification

First we are interested in the problems that you have identified in this client. Please state each problem you identified based on the information in the case study.

1	11
2	12
3	13
4	14
5	15
6	16
7	17
8	18
9	19
10	20

Section 3b: Assessments

Now we would like you to indicate the assessments you would <u>typically</u> use again related to the case.

Assessments are defined as any scale, measure, tool, equipment or

procedure that you use where the results are then recorded in written

format. These can be standardized or non-standardized.

INDICATE THE NAME OF EACH ASSESSMENT YOU WOULD USE. PLEASE ANSWER BASED ON YOUR ACTUAL DAILY CLINICAL PRACTICE.

(Once the clinician has identified a list of assessments then ask :)

Please indicate when you would typically use each assessment, for example:

- initial assessment
- during the course of treatment
- around discharge from treatment
- Follow-up after treatment is terminated

Assessments: Actual Use

Name of Assessment

Typical Use

Initial	Interim	Discharge	Follow-up

Section 3c: Therapeutic Interventions

Now, we are interested in identifying the interventions you would <u>typically</u> use for the client described in the case study given that the assessments you performed revealed impairments, disabilities, or limitations in participation.

Interventions are defined as any specific modalities, treatments and approaches common to your rehabilitation discipline. These practices can include educational, physical, psycho-social, functional interventions, approaches, techniques or modalities used with the goal of reducing impairments, disabilities or handicaps associated with CP.

Please indicate the name of each intervention you would typically use with the client described in the vignette.

PLEASE ANSWER BASED ON YOUR ACTUAL CLINICAL PRACTICE.

Section 3c-I: Therapeutic Interventions: Actual Use

ONCE THE CLINICIAN HAS IDENTIFIED A LIST OF INTERVENTIONS THEN ASK THEM the following questions related to a typical treatment session for this child

1. About how long (minutes) would a typical treatment session last for this client?

2. About how many times in a month would you typically treat this client?

3. About how long in total would you typically treat this client?

Section 3c-ll Therapeutic Interventions: Desired Use

In a perfect world (one in which resources, time and tools were available), what additional interventions, if any, would you use with this client? Would you eliminate any interventions used in your actual practice?

ONCE THE CLINICIAN HAS IDENTIFIED A LIST OF DESIRED INTERVENTIONS THEN ASK THEM the following questions related to the desired treatment session for this child.

Again referring to the perfect world:

- 1- About how long (minutes) would the treatment session last for this client?
- 2- About how many times in a month would you treat this client?
- 3- About how long in total would you treat this client?

<u>3c-IIITherapeutic Interventions: Barriers to Desired Use:</u> **This is their page 1**

For desired interventions that you would like to use for this client, please choose the top three reasons why you do not use them, even though you would like to. Rank them from 1 to 3 with 1 being the top reason.

Barriers	Ranking (Top 3)
Requires special training	
I do not feel competent enough	
I do not have the necessary time	
Lack of skill to appraise the literature in this area	
Lack of funding for continuing education	
Financial constraints	
Equipment not available	
Conflicts with the philosophy of the work setting	
Potential problems in child/parent compliance	
Other - please specify	

3c-VI Referrals:

Again referring to the child in the case study, what are the typical referrals you would recommend:

[] Physical Therapist	[] Occupational Therapist	[] Speech Therapist
] Psychologist] Dietician	[] Neurologist
[] Physiatrist	Social Worker	[] Special Educator
[] Other: (please specify)		
For each discipline indi	cated, please specify the reason f	or referral:
Discipline	Reason(s)	
. <u></u>		
		201

3-d Goals:

From your perspective as a clinician, what are the top three goals for the child described in the case study?

1	
2	
3.	

Section 4 Case Study #2

Section 4a: Problem Identification

First we are interested in the problems that you have identified in this client. Please state each problem you identified based on the information in the vignette.

1.	 11
2.	 12
3.	 13
4.	 14
5.	 15

6	16
7	17
8	18
9	19
10	20

Section 4b: Assessments

Now we would like you to indicate the assessments you would <u>typically</u> use for the child with CP described in this vignette (case study)

<u>Just a reminder that</u> assessments are defined as any scale, measure, tool, equipment or procedure that you use to assess the client and/or family where the results are then recorded in written format, and can be standardized or non-standardized.

INDICATE THE NAME OF EACH ASSESSMENT YOU WOULD USE. PLEASE ANSWER BASED ON YOUR ACTUAL DAILY CLINICAL PRACTICE.

(ONCE THE CLINICIAN HAS IDENTIFIED A LIST OF ASSESSMENTS THEN ASK ...) Please indicate when you would typically use each assessment.

- initial assessment
- during the course of treatment
- around discharge from treatment
- Follow-up after treatment is terminated

4b-I: Assessments: Actual Use

Name of Assessment

Typical Use

Initial	Interim	Discharge	Follow-up

Section 4c: Therapeutic Interventions

Now, we are interested in identifying the interventions you would <u>typically</u> use for the client described in the vignette (case study) given that the assessments you performed revealed impairments, disabilities, or limitations in participation.

Just a reminder that Interventions are defined as any specific modalities, treatments and approaches common to your rehabilitation discipline. These practices can include educational, physical, psycho-social, functional interventions, approaches, techniques or modalities used with the goal of reducing impairments, disabilities or handicaps associated with CP.

Please indicate the name of each intervention you would typically use with the client described in the vignette.

PLEASE ANSWER BASED ON YOUR ACTUAL CLINICAL PRACTICE.

ONCE THE	CLINICIAN HAS IDENTIFIED A LIST OF INTERVENTIONS THEN ASK THEM
DNCE THE	CLINICIAN HAS IDENTIFIED A LIST OF INTERVENTIONS THEN ASK THEM
DNCE THE he follow child.	CLINICIAN HAS IDENTIFIED A LIST OF INTERVENTIONS THEN ASK THEM
ONCE THE he follow	CLINICIAN HAS IDENTIFIED A LIST OF INTERVENTIONS THEN ASK THEM ing questions related to a typical treatment session for this a.About how long (minutes) would a typical treatment session last for thi client?
DNCE THE he follow	CLINICIAN HAS IDENTIFIED A LIST OF INTERVENTIONS THEN ASK THEM ing questions related to a typical treatment session for this a.About how long (minutes) would a typical treatment session last for thi client? b.About how many times in a month would you typically treat this client?
ONCE THE the follow child.	CLINICIAN HAS IDENTIFIED A LIST OF INTERVENTIONS THEN ASK THEM ing questions related to a typical treatment session for this a.About how long (minutes) would a typical treatment session last for thi client? b.About how many times in a month would you typically treat this client? c. About how long in total would you typically treat this client?

We are now reaching the final series of questions. Section 5: Education at work:

Now I am going to ask you some questions related to your work

environment in regards to on-going learning about CP. In your opinion ...

NL1. Is your work environment supportive of on-going professional learning?

[] Yes [] No

- NL2. In your work environment, is access to new information on <u>CP</u> easily available? [] Yes [] No
- NL3. In your work environment, is time allocated for learning new information about <u>CP</u>?

NL4. Does your worksite provide funds for you to attend continuing education activities such as conferences and specialty courses?

Section 6: Continuing Education:

Now I am going to ask you some questions related to your continuing

education activities:

NL5. On average, how many hours per month <u>in total</u> do you spend on continuing education activities specific to learning in your professional domain (for example, reading, in-services, journal clubs, workshops, conferences) ______hours.

NL6. Do you have specialty certification? [] Yes [] No

Please specify level of certificate and area of specialty

NL7. Are you active in teaching at the university level?
I Yes
No

Please specify?

Section 7: Enablers of Evidence-based Practice:

This is their page 2

From the list of helpful factors provided to you, please choose the top three factors that you think might be most helpful for a clinician in making use of research findings in clinical practice and rate them from 1 to 3.

Enablers	Ranking (Top 3)
Time dedicated in the working week for research activities	
Access to necessary resources	
Frequent educational sessions on the use of research findings in clinical settings	
Funding for continuing education	
Self motivation of the therapist and his/her willingness to work in	
their own time.	
Learning to critique research and develop statistical skills.	
Involvement in research projects	
Work environment/management support	
Research presented in easily understandable ways showing its	
clinical	
Other - please specify	

The formal part of the interview is now over. Do you have any comments or questions you would like to ask or have answered?

I will now take a moment to review your completed questionnaire to make sure I didn't miss anything. (PAUSE) Yes, all is complete...

Thank you for taking the time to complete this questionnaire

Your contribution is greatly appreciated

Enquête des Services d'Ergothérapie et de Physiothérapie pour les Enfants Atteints par la Paralysie Cérébrale <u>French version</u>

Nous souhaitions connaître les évaluations et interventions utilisées par les spécialistes en réadaptation des jeunes enfants atteints par la paralysie cérébrale. En répondant à ce questionnaire, vous contribuez aux connaissances des pratiques professionnelles quotidiennes. À NOTER: L'utilisation du terme « jeunes enfants » s'adresse aux enfants de 1

à 5 ans. Section 1: Données sociodémographiques

Nous débutons par une série de questions à propos de vous et de vos

expériences cliniques dans le domaine de la santé

- **S1.** S'il vous plait indiquez la spécialité dans laquelle vous pratiquez: [] Ergothérapie [] Physiothérapie
- S2. Sexe : [] Femme [] Homme
- S3. Spécifiez le dernier diplôme obtenu en (ergo/physio):

Année de graduation pour le dernier diplôme professionnelle obtenu en (ergo/physio) : ______

S4. Travaillez-vous présentement à temps plein ou à temps partiel comme (ergo/physio)?

[] Temps partiel (moins de 35 heures/semaine)

[] Temps complet (35 heures/semaine ou plus))

S5. Combien d'année (s) d'expérience clinique avez-vous auprès de la clientèle atteinte par la paralysie cérébrale ou à risque élevé d'être atteint par la paralysie cérébrale?

_____ (années)

S6. Lors d'une semaine typique, combien de jeunes enfants atteints ou à risque élevé d'être atteint par la paralysie cérébrale voyez-vous?

[] < 2 [] 2-5 [] 6-10 [] > 10

S7. Lors d'une semaine typique, quel pourcentage de votre temps accordez-vous à **l'évaluation et la réévaluation** des jeunes enfants atteints ou à risque élevé d'être atteint par la paralysie cérébrale? _____%

S8. Lors d'une semaine typique, quel pourcentage de votre temps accordez-vous **au traitement** des jeunes enfants atteints ou à risque élevé d'être atteint par la paralysie cérébrale? ______%

Section 2: Environnement de travail

Pour les questions qui suivent, veuillez indiquer la réponse qui représente le mieux l'environnement de travail où vous avez évalué et traité les jeunes enfants atteints ou à risque élevé d'être atteint par la paralysie cérébrale lors des derniers 4 mois.

W1. Quel type d'établissement décrit le mieux le lieu où vous évaluez et traitez les jeunes enfants atteints ou à risque élevé d'être atteint par la paralysie cérébrale?

[] Hôpital soins aigus – patients hospitalisés	[] Hôpital soins aigus –patients en clinique externe		
[] Organisme communautaire (e.g. CLSC)	[] Clinique privée		
[] Centre de réadaptation – patients en clinique externe	[] Centre de réadaptation – patients		
[] Établissement de soins à longue durée hospitalisés	[] École		
[] Autre (À SPÉCIFIER)			

W2. Est-ce que cet établissement est situé dans une région urbaine, une banlieue, ou une région rurale? (Une banlieue est définie comme une région située à ≥ 30 kilomêtres et <50 kilomètres d'une ville majeure. Une région rurale est définie comme une région située à

≥ 50 kilomètres d'une ville majeure.)

[] urbaine [] banlieue [] rurale

- W3. Quelle est la source de financement de votre établissement? [] Privée à but lucrative [] Privée à but non-lucrative [] Publique [] Autre Si autre, veuillez spécifier :
- W4. Y a-t-il, dans votre établissement, de la recherche qui porte sur la réadaptation des jeunes enfants atteints ou à risque élevé d'être atteint par la paralysie cérébrale?

W5. Votre établissement offre-t-il des stages cliniques pour les étudiants en (ergo/physio)?

🛛 Oui 🔹 🖓 Non

Si oui, environ combien d'étudiant supervisez-vous personnellement par année? [] 0 [] 1-2 [] 3-5 [] >5 Combien de (physio/ergo), incluant vous, travaille(nt) dans votre W6. établissement? [] 1 [] 2-4 ∏ 5-10 ∏ >10 W7. Travaillez-vous dans une équipe qui comprend des professionnels d'autres disciplines? [] Oui [] Non Si vous avez répondu oui, passer à la question suivante. Si vous avez répondu non, aller directement à la Section 3. **W8.** Quels types de professionnels travaillent dans votre équipe? [] Physiothérapeute [] Ergothérapeute [] Omnipraticien [] Psychologue [] Diététicienne [] Neurologue [] Pédiatre [] Neuropsychologue [] Gestionnaire de cas [] Travailleur(se) social(e) [] Physiatre [] Enseignante [] Infirmière [] Éducateur spécialisé(e) [] Néotologiste [] Audiologiste [] Autre: (veuillez spécifier)

<u>Section 3:</u> Histoire de Cas #1 Indiquez lequel :

Pour les prochaines sections nous vous demandons de vous référer à la vignette de l'enfant atteint... (l'enquêteur(euse) spécifie le cas d'après le schéma qui a été choisi au hasard pour le/la thérapeutre). À noter qu'il n'y a pas de bonne ou de mauvaise réponse.

Section 3a: Identification des problèmes

En premier lieu, nous souhaitons connaître les problèmes que vous avez identifiés chez ce client. S'il vous plaît nommer chaque problème que vous avez identifié en tenant compte des renseignements présents dans la vignette.

 1.
 6.

 2.
 7.

 3.
 8.

4.	 9
5.	 10

Section 3b: Évaluations

Maintenant, nous vous demandons d'identifiez les évaluations que vous utiliseriez

typiquement pour la personne dans l'histoire de cas.

Une évaluation est définie comme étant toute forme d'échelle, de mesure, d'outil, de test, d'équipement ou de procédure utilisée pour évaluer le client et dont les résultats sont rapportés par écrit. Ses évaluations peuvent être standardisées ou non standardisées.

Indiquez le nom de chaque évaluation que vous utiliseriez. Nous vous demandons de répondre en vous référant à votre pratique clinique quotidienne.

(Une fois que le clinicien a identifié la liste des évaluations, veuillez lui demander :) Indiquez à quel moment vous utiliseriez typiquement ces évaluations

- Évaluation initiale
- Durant le traitement
- Près du congé du traitement
- Suivi après la fin du traitement

Utilisation habituelle

Nom de l'évaluation

Usage habituel

Initiale	Intérim	Congé	Suivi
		-	

Section 3c: Interventions thérapeutiques

Nous souhaitons maintenant connaître les interventions que vous utiliseriez typiquement avec le client décrit dans la vignette (histoire de cas) en supposant que les évaluations ont révélé des déficiences, des incapacités ou une réduction de la participation.

Une intervention est définie comme toute forme de modalité spécifique, traitement, et approche propre à votre discipline. Ces pratiques peuvent inclure les interventions, approches, techniques ou modalités éducationnelles, physiques, psychosociales ou fonctionnelles utilisées dans le but de réduire les déficiences, incapacités et situations de handicap associées à la paralysie cérébrale.

Nous vous demandons d'indiquer le nom de chaque intervention que vous utiliseriez normalement avec le client décrit dans la vignette.

VEUILLEZ RÉPONDRE EN VOUS BASANT SUR VOTRE PRATIQUE HABITUELLE EN CLINIQUE.

Section 3c-I : Interventions : Usage habituel

UNE FOIS QUE LE THERAPEUTRE A IDENTIFIE LA LISTE D'INTERVENTIONS, DEMANDEZ-LEUR CES QUESTIONS EN SE RÉFÉRANT À UNE SESSION DE TRAITEMENT **TYPIQUE** POUR L'ENFANT DANS L'HISTOIRE DE CAS.

- 1. La durée typique d'une séance de traitement pour ce client?
- 2. Combien de séances par mois est-ce qu'il y aurait lieu typiquement?
- 3. La durée totale typique des traitements chez ce client?

Section 3c-II : Utilisation souhaitée

Dans un monde parfait (dans lequel les ressources, le temps et les outils seraient

disponibles), quelles interventions additionnelles, s'il y a lieu, utiliseriez-vous avec ce

client? Est-ce que vous élimineriez des interventions utilisées actuellement?

Éliminer :

Une fois que le clinicien(ne) a identifié la liste d'intervention souhaitée, demandez-leur ces questions reliées au traitement désiré pour cet enfant.

Encore, dans un monde parfait:

- 1. Quelle serait la durée typique approximative (minute) de chaque séance de traitement pour ce client?
- 2. À peu près combien de traitements, typiquement par mois?

3- La durée totale de ces traitements chez ce client?

<u>3c-III Interventions thérapeutiques: Facteurs qui entravent l'utilisation</u> <u>désirée:</u>

** Ceci apparaît sur leur page 1**

Pensez aux interventions que vous désireriez utiliser avec ce client. De la liste fournie, identifiez les 3 facteurs pour lequel vous n'utiliseriez pas ces interventions, et classez-les de 1 à 3 en ordre de priorité.

Facteurs qui entravent l'utilisation désirée	Classement (1 à 3)
Nécessite la formation spécialisée	
Je ne me sens pas assez compétent	
Je n'ai pas le temps requis	
Manque d'expertise pour évaluer la littérature dans ce domaine	
Manque de financement pour participer à des activités de formation continue	
Contrainte financière	
L'équipement nécessaire n'est pas disponible	
Il y a un conflit avec la philosophie du milieu de travail	
Potentiel de problème de conformité chez l'enfant/parent	
Autre - Veuillez SPÉCIFIER :	

[] Physiothérapeutre	[] Ergothérapeutre	[] Orthophoniste
[] Psychologue	[] Diéticienne	[] Neurologue
] Physiatre	[] Travailleur(euse) social	[] Éducateur spécialis
[] Autre: (À spécifier)		
Pour chaque disciplir pour la référence :	ne indiquée, s'il vous plait indiquer l	a/les raison(s)
Discipline	Raison(s)	
Discipline 3-d Objectifs: Selon vous, comme cli	Raison(s)	s les plus
Discipline 3-d Objectifs: Selon vous, comme clii importants pour ce clie 1.	Raison(s)	s les plus
Discipline 3-d Objectifs: Selon vous, comme clinimportants pour ce clie 1. 2.	Raison(s)	s les plus
Discipline 3-d Objectifs: Selon vous, comme clia importants pour ce clie 1. 2. 3.	Raison(s)	s les plus
Discipline 3-d Objectifs: Selon vous, comme clia importants pour ce clie 1. 2. 3. Section 4 : Histoire	Raison(s)	s les plus

par contre elles seront moins nombreuses. L'histoire de cas se rapporte... (l'enquêteur(euse) spécifie le cas d'après les détails tels que l'âge de l'enfant).

Section 4a : Identification des problèmes

En premier lieu, nous souhaitons connaître les problèmes que vous avez identifiés chez ce client. S'il vous plaît nommer chaque problème que vous avez identifié en tenant compte des renseignements présents dans la vignette

1	11
2	12
3	13
4	14
5	15
6	16
7	17
8	18
9	19
10	20

Section 4b: Évaluations

Maintenant, nous souhaitons que vous identifiiez les évaluations que vous

utiliseriez typiquement pour la personne dans l'histoire de cas.

<u>On vous rappelle qu'une évaluation est définie comme étant toute forme</u> d'échelle, de mesure, d'outils, de tests, d'équipements ou de procédures utilisés pour évaluer le client et dont les résultats sont rapportés par écrit. Ses évaluations peuvent être standardisées ou non standardizées.

Indiquez le nom de chaque évaluation que vous utiliseriez. Nous vous demandons de répondre en vous référant à votre pratique clinique quotidienne.

(Une fois que le clinicien a identifié la liste des évaluations, veuillez lui demander :)

Indiquez à quel moment vous utiliseriez typiquement ces évaluations

- Évaluation initiale
- Durant le traitement
- Près du congé du traitement
- Suivi après la fin du traitement

4b-1: Utilisation habituelle

Nom de l'évaluation		Usage h	abituel	
	Initial	Intérim	Congé	Suivi

Section 4c: Interventions thérapeutiques

Nous souhaitons maintenant connaître les interventions que vous utiliseriez typiquement avec le client décrit dans la vignette (histoire de cas) en supposant que les évaluations ont révélé des déficiences, des incapacités ou une réduction de la participation.

<u>Nous vous rappelons</u> q'une intervention est définie comme toute forme de modalité spécifique, de traitement, et d'approche propre à votre discipline. Ces pratiques peuvent inclure les interventions, approches, techniques ou modalités éducationnelles, physiques, psychosociales ou fonctionnelles utilisées dans le but

217

de réduire les déficiences, incapacités et situations de handicap associées à la paralysie cérébrale.

Nous vous demandons d'indiquer le nom de chaque intervention que vous utiliseriez normalement avec le client décrit dans la vignette.

VEUILLEZ RÉPONDRE EN VOUS BASANT SUR VOTRE PRATIQUE HABITUELLE.

Section 4c-I: Interventions thérapeutiques: Usage habituelle

Une fois que le clinicien(ne) a identifié la liste d'intervention, **demandez**leur ces questions reliées au traitement typique pour cet enfant.

- 1- Quelle serait la durée typique approximative (minute) de chaque traitement pour ce client?
- 2- À peu près combien de traitements, typiquement par mois?

3- La durée totale typique des traitements chez ce client?

On approche la dernière série de questions. <u>Section 5: Enseignement au travail</u>:

Maintenant, je vais vous poser quelques questions reliées à votre environnement de travail en rapport avec la formation continue sur la paralysie cérébrale. D'après vous ...

NL1. Est-ce que votre environnement de travail encourage la formation professionnelle continue ?

[] Oui [] Non

NL2. Dans votre environnement de travail, est-ce que les nouvelles informations sur la paralysie cérébrale sont facilement accessibles ?

NL3. Dans votre environnement de travail, avez-vous du temps alloué pour l'apprentissage de nouvelles informations à propos de la paralysie cérébrale?

[] Oui [] Non

NL4. Est-ce que votre lieu de travail vous finance pour participer à des activités de formation continue comme des conférences ou des cours de spécialisation ?
[] Oui
[] Non

Section 6: Formation continue

Maintenant, je vais vous poser quelques questions à propos de vos activités de formation continue

- NL5. En moyenne, combien d'heures par mois <u>au total</u> allouez-vous aux activités de formation continue propre à votre domaine professionnel (par exemple, lecture, formation continue dans votre département, clubs de lecture, ateliers, conférences) ? ______ heures
- NL6. Possédez-vous un certificat de spécialisation ?
- [] Oui [] Non

Veuillez spécifier

NL7. Etes-vous impliqué(e) dans l'enseignement universitaire ? [] Oui [] Non

Veuillez spécifier

Section 7: Facilitateur de la pratique fondée sur les preuves scientifiques pour les enfants atteints de la paralysie cérébrale: ** Ceci apparaît sur leur page 3**

D'après la liste qu'on vous a envoyée, choisissez les trois facteurs qui seraient les plus utiles pour les cliniciens, en termes d'utilisations pratiques des nouvelles informations disponibles dans l'évaluation et le traitement des enfants atteints par la paralysie cérébrale, et les classez-les de 1 à 3.

Facilitateurs	Classement (1 à 3)
Temps alloué durant la semaine pour des activités de	
recherche.	
Accès aux ressources nécessaires.	
Des sessions éducationnelles fréquentes, au sujet de	
l'utilisation de nouvelles informations dans le milieu	
thérapeutique.	
Le financement pour les activités de formation continue.	
La motivation personnel du thérapeute et la volonté de	
travailler durant son temps personnel.	
Apprendre à critiquer la recherche et de développer les	
habiletés statistiques.	
La participation aux projets de recherche.	
L'appuie de l'administration / l'environnement de travail.	
La présentation de nouvelles informations de façon simple à	
comprendre, démontrant les implications cliniques.	
Autre – Veuillez SPÉCIFIER :	

La partie officielle de l'entrevue est maintenant terminée. Avez-vous des commentaires ou des questions auxquelles vous voudriez que je réponde ?

Je vais maintenant prendre un moment pour réviser le questionnaire complété afin de m'assurer que je n'ai pas oublié de questions. (PAUSE) Oui, tout est complet…

Merci d'avoir pris le temps de compléter ce questionnaire

Votre participation est grandement appréciée

Appendix H

Evidence of Effectiveness of Rehabilitation Interventions for Cerebral Palsy (CP)

Intervention	Outcomes-	Diagnosis	Summary of conclusions	Level of evidence of
	ICF			effectiveness
Ankle-foot orthoses (AFO)	Impairment	Spastic CP-	AFO seems to have positive effects on ankle movements, and gait	2a (limited) for
(Carlson et al., 1997;	& functional	mainly	kinematics and kinetics. AFO may reduce ambulation energy expenditure	effectiveness of AFO on
Hainsworth, Harrison,	activity	hemiplegia and	and improve motor performance in children with spastic diplegia.	ankle and gait. 2b (limited)
Sheldon, & Roussounis,		diplegia (3-11		for effectiveness in
1997; Mossberg et al., 1990;		years old)		reducing energy
Taylor & Harris, 1986)				expenditure. 5 (no
				evidence) for
				effectiveness on motor
				performance.
Biofeedback (Dursun,	Impairment	CP (2.5-10	EMG biofeedback with conventional exercise significantly improved ankle	1b (moderate) for EMG
Dursun, & Alican, 2004;		years old)	ROM and muscle tone in children with dynamic equinus deformity more than	biofeedback on ankle
Kramer, Ashton, & Brander,			conventional exercise only, both groups improved in gait function. Auditory	movements. 2a (limited)
1992; Malouin, Gemmell,			feedback appears to have positive effects on head position control, with	for auditory feedback on
Parrot, & Dutil, 1985)			problems of carry-over limiting its effectiveness. Head position trainer (with	head control. 2b (limited)
			visual and auditory feedback) was shown to be effective in improving head	for head position trainer.
			control in different positions, improvements lasting 16 weeks after training.	
Botulinum toxin type A (BT-	Impairment	Spastic CP (1-	A systematic review found no strong evidence to support or refute effect of	1a (strong) showing BT-A
A) (Ade-Hall & Moore, 2000;	& functional	16 years old)	BT-A on leg spasticity or function. Another one found some evidence on its	not to be superior to other
Boyd et al., 2001; Boyd &	activity		effectiveness in the management of gait and pain, but evidence of	conventional therapies in
Hays, 2001; Corry et al.,			effectiveness on function was equivocal. BT-A with hip abduction orthosis	managing impairment and
1998; Dursun, Dursun, &			was not superior to conventional therapy on the GMFM. BT-A was similar to	functional limitation. 2b
Alican, 2002; Flett et al.,			scopolamine (anticholinergic drug) in decreasing salivary flow rate, but	(limited) on effectiveness
1999; Jongerius, Rotteveel			showed less side effects.	of BT-A in decreasing
et al., 2004; Jongerius, van				drooling.
den Hoogen et al., 2004)				

1

Conductive education (CE)	Impairment	CP (1- 7 years	No difference between CE and conventional therapy on the GMFM, fine	2a (limited) evidence
(Catanese, Coleman, King,	& functional	old)	motor skills, PSI, cognitive function and feeding.	showing CE not different
& Reddihough, 1995;	activity			from conventional therapy.
Coleman, King, &				
Reddihough, 1995;				
Reddihough, King, Coleman,				
& Catanese, 1998; Stiller,				
Marcoux, & Olson, 2003)				
Constraint-induced therapy	Impairment	Hemiplegia (7-	CIT produced significant sustained improvements in hand function and	2a (limited) evidence of
(CIT) (Taub et al., 2004)	& functional activity	96 months old)	promoted use of affected arm.	effectiveness.
Electrical stimulation (ES)	Impairment	CP mainly	A systematic review of ES showed non conclusive results. However, there	4 (Conflicting) evidence
(Chan, Smith, & Lo, 2004;	and	hemiplegia and	was more evidence to support the use of neuromuscular electrical	on effectiveness of
Dali et al., 2002;	functional	diplegia (6	stimulation than therapeutic/threshold electrical stimulation in improving	different types of electrical
Detrembleur et al., 2002;	activity	months- 18	strength and motor function. However, there was lack of consensus on	stimulation on muscle
Kerr et al., 2004; Park et al.,		years)	optimal treatment parameters.	function.
2001; Sommerfelt et al.,				
2001; van der Linden et al.,				
2003)				
Feeding (Gisel, Applegate-	Impairment	CP with	The differences between gastrostomy feeding versus oral feeding could not	2a (limited) for
Ferrante, Benson, & Bosma,		feeding	be established. Oral sensorimotor treatment did not have effects on eating	ineffectiveness of oral
1995; Sleigh, Sullivan, &		problems	efficiency.	sensorimotor treatment on
Thomas, 2004)		(mean age 5.1		eating efficiency
		years)		
Goal-specific/ functional	Functional	Spastic CP (3-	Conflicting evidence on effectiveness of use of specific measurable goals on	2a (limited) evidence of
therapy (Bower, McLeilan,	activity	12years old)	the GMFM. However, functional activities were shown to produce significant	effectiveness of functional
Arney, & Campbell, 1996;			changes on the PEDI.	therapy. 4 (conflicting) for
Bower, Michell, Burnett,				effectiveness of
Campbell, & McLellan, 2001;				collaborative goal-setting
Ketelaar et al., 2001)				therapy.

Hand positioning device	Impairment	CP	Individual subject data showed a trend for improvements in upper extremity	5 (no evidence) of
(Reid & Sochaniwskyj, 1992)			control and visual-motor performance when the device was on.	effectiveness.
Home or clinical initial	Environmen	Preschool	No obvious advantage of home assessment over clinic assessment.	2a (limited) evidence of no
therapy assessment	tal factors	children with	However, added cost of home assessments was marginal and justifies	difference.
(Rosenbaum, King, Toal,		СР	seeing the child for first assessment at home.	
Puttaswamaiah, & Durrell, 1990)				
Horseback riding (Benda et	Impairment	Spastic CP (3-	Horseback riding may improve symmetry in muscle activity and gross motor	2a (limited) evidence of
al., 2003; Cherng et al.,	&	12 years old)	function for some children with spastic CP.	effectiveness.
2004; MacKinnon et al.,	functional			
1995)	activity			
Hyperbaric oxygen therapy	Impairment	CP (4-12 years	There was no significant difference between HBO2 and sham groups in	1b (moderate) evidence of
(HBO2) (Hardy et al., 2002)	& functional	old)	cognitive function.	ineffectiveness.
	activity			
Neurodevelopmental	Impairment	CP (18	The majority of results did not provide any advantage to NDT over the	1a (strong) evidence of
treatment (NDT) (Brown &	&	months-15	alternatives to which it was compared. There was no consistent evidence	ineffectiveness.
Burns, 2001; Butler &	functional	years)	that NDT changed abnormal motor reflexes, slowed or prevented	
Darrah, 2001; DeGangi,	activity		contractures, or that it facilitated more normal motor development or	
Hurley, & Linscheid, 1983;			functional motor activities.	
Fetters & Kluzik, 1996;				
Herndon, Troup, Yngve, &				
Sullivan, 1987; Law et al.,				
1991; Law et al., 1997;				
Tsorlakis, Evaggelinou,				
Grouios, & Tsorbatzoudis,				
2004)				

ICF domains	The specific terms used by experts to describe the problem			
	Child with hemiplegia at 18	Child with hemiplegia at	Child with quadriplegia at	Child with quadriplegia at 4
	months	4 years	18 months	years
Body functions & structures:				
Attention	Decreased attention span			Attention/concentration
Behavior & emotion	N/A	Immature behavior,	Easily frustrated/gets	
		tantrums easily, easily	angry	
		frustrated		
Language	Decreased vocabulary	Language problems	Language problems	
Mobility of joint	Stiffness of right upper &	N/A		
	lower limbs, tight heel cord			
Motor reflexes & reactions	N/A	N/A	Associated reactions	
Motor control & planning	Asymmetrical postural	N/A	Decreased postural	Poor eye hand
	control		control in sitting	coordination bilaterally
Pain & other health issues	Pain with passive	N/A	Sleeping difficulty,	Weight gain
	mobilization of the right		strabismus	
	upper limb			
Activities & participation:				
Maintain & change basic	Asymmetrical weight		Not standing yet, difficulty	
body positions	bearing (sitting, standing),		moving prone to supine &	
	transitional skills		vice versa, abnormal	
			pattern in rolling	

Appendix I

Experts' Best Practice Problem Identification List for Each Vignette

Walk & move around	Mobility, atypical floor	Lack of endurance to		Poor endurance with the
	mobility	walk in the community,		walker, difficulty steering a
		poor gait pattern when		walker, difficulty steering
		not wearing ankle foot		adapted tricycle, No
		orthoses (AFO), going		independent transfers
		up & down stairs using		
		a railing on the left side,		
		difficulty running		
Upper extremity use & fine	Decreased use of right	Difficulty using tools:	Asymmetrical use of upper	Asymmetrical use of upper
motor skills	upper extremity, poor fine	pencil, scissors & knife	extremities, delayed fine	extremities
	motor skills development		motor function	
Activities of daily living	N/A	Dressing: difficulty	Dysphagia, still on soft	Not toilet trained, difficulty
(ADL)		pulling up pants.	food, difficulty with liquids,	dressing & undressing.
		Difficulty with feeding:	chokes easily, & not	Messy eater, difficulty with
		messy eater	drinking from a cup.	liquids
School	N/A	Difficulty integrating into	N/A	Concerns about preschool
		nursery		integration
Learning & applying	N/A	Poor development of	N/A	Poor paper & pencil skills
knowledge		school pre-requisites,		
-		poor handwriting &		
		drawing.		
Play, socialization & leisure	Little contact with peers,	Difficulty taking turns &	Delayed play abilities	Not participating in
-	decreased ability to play	following instructions		community leisure
	with peers			activities
Communication	N/A	Immature	N/A	Effortful to communicate,
		communication		difficult to comprehend,
				reluctant to speak

Environment				
Family	N/A	Concern of the mother as for integration at the pre-school, burden of care	Parents cannot go out much	Grandparents can no longer take care of the child, difficulty finding babysitter, parents cannot go out much
Services	Long waiting list for rehabilitation, mother is looking for daycare	Not yet linked to rehabilitation center	Hard time finding a babysitter, respite services not available	Finding suitable school
Equipment	Equipment not adapted: umbrella stroller, playground	N/A	Non-adapted equipment: appropriate sled, high chair & stroller	
Physical environment				Playroom in basement

ICF: International Classification of Functioning, Disability and Health

N/A: not applicable

)

)

Appendix J

)

Experts' Best Practice Treatment Interventions List for Each Child

ICF domains	The specific terms used by experts to describe the intervention				
** <u></u>	Child with hemiplegia at	Child with hemiplegia at 4	Child with quadriplegia at 18	Child with quadriplegia at 4	
	18 months	years	months	years	
Body functions & str	uctures:				
Attention, cognition	Structured activities to	Positive reinforcement	Perceptive-cognitive	Exercises to improve	
& behavior	improve attention span		evaluation	attention & cognition	
Mobility of joint	Maintain or improve joint	Maintain or improve joint	Stretching, passive	N/A	
	range of motion, stretching	range of motion	mobilization		
Muscle function,	Hydrotherapy,	Electrical stimulation of lower	Weight bearing activities,	Weight bearing activities,	
power & tone	strengthening, weight	limb, assess the need for	hydrotherapy	hydrotherapy	
	bearing exercises	Botox			
Motor control &	N/A	Stimulation to improve eye-	Oral motor activities	N/A	
planning		hand coordination			
Other health	N/A	N/A	Evaluate sleeping: posture,	Referral to dietician	
issues: sleeping,			medication, habits, routine.		
vision, nutrition			Evaluate vision		
Activities & participa	tion:				
Motor	Stimulation of postural	N/A	Developmental stimulation to	Foster acquisition of	
development:	reactions (task-specific),		foster acquisition of	milestones, standing	
maintain & change	stimulate gross motor		milestones, task-specific	position .: exercises to	
basic body	development		exercises	improve postural control	
positions					

N

Walk & move	Treadmill, task-specific	Exercises to improve balance	Treadmill with partial weight
around		& endurance. Task specific exercises for gait	support
Upper extremity	Stimulate by task-specific,	Constraint induced therapy,	Standardized assessment of
use	goal-oriented training	task-specific treatment & play	fine motor skills. Task-

				increase endurance with walker. Task-specific: treadmill with partial weight support
Upper extremity	Stimulate by task-specific,	Constraint induced therapy,	Standardized assessment of	Task-specific training,
use	goal-oriented training	task-specific treatment & play	fine motor skills. Task-	restrict compensatory
		to encourage use of both	specific exercises.	movements
		arms		
Learning &	N/A	School pre-requisites	N/A	Training pre-writing skills on
applying				computer, school pre-
knowledge				requisites
Activities of daily	N/A	Task specific, dressing (best	Evaluate swallowing, video	Evaluate ADL at home.
living (ADL)		clothing to facilitate	fluoroscopy, developmental	Toilet training, transfers,
		independence), feeding	stimulation	dressing, eating
Play	Guide parents on age-		Increase access to toys at	Adapt play ground & other
	appropriate toys		home & school	play spaces
Socialization	Promote socialization with	group activities/therapy	N/A	Increase social contacts
	peers			with peers, inform teachers
				about socialization
Recreation &	Adaptive recreational	Sports, swimming, skiing,	Refer to community	Adaptive sports, community
leisure	activities (e.g. Swimming)	community programs	resources	programs
Communication	N/A	Provide appropriate modeling	Appropriate modeling	Appropriate modeling

}

Independent mobility:

wheelchair. Improve

steering of tricycle & walker,
Environment				
Family	Parent education on	Parent education on CP,	Parent education on CP	Teach parents &
	cerebral palsy (CP)	inform parents on available		grandparents transfers &
	· · ·	educational resources,		recommend technical
		educate on importance of		assistances, inform parents
		wearing AFO during walking		on schooling & respite
				services
Services	Referral to social work,	Refer to rehabilitation center,	Positioning clinic,	Refer to social work, nurse
	speech language	social work, SLP,	psychology, SLP, social work	(toilet training), SLP,
	pathology (SLP)	psychologist & special	(respite, babysitting,	dietician , & for car
		educator. Consult with	community resources)	adaptation
		orthotics. Multidisciplinary		
		evaluation for Botox		
Adaptive	Evaluate the need for	Adaptive scissors, improve	Evaluate the need for	As needed to facilitate ADL,
equipment &	adaptive equipment or	AFO, aids for dressing,	adaptive equipment e.g.	communication table,
assistive devices	orthoses for upper limb,	adaptive utensils to facilitate	postural aids, adaptation to	computer, wheelchair
	adaptation to stroller & play	independent feeding	sled & stroller, provide	
	ground. Advice to use		inhibitory orthoses as	
	ankle foot orthoses (AFO)		needed, assistive technology	
	at night.			
Physical		Assess home environment		Car adaptation, home
environment		for architecture barriers, visit		assessment & adaptation,
		daycare & meet teacher		meet teachers

ì

ICF: International Classification of Functioning, Disability and Health. N/A: not applicable

Ì

Appendix K

···.

Ethical Certificates