The Impact of Neuro-Developmental Treatment on the Performance of Daily Living Tasks by Children with Cerebral Palsy - Pilot Studies in Measuring NDT Outcomes

By

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APPROVALS

This is to certify that the thesis entitled "The Impact of Neuro-Developmental Treatment on the Performance of Daily Living Tasks by Children with Cerebral Palsy - Pilot Studies in Measuring NDT Outcomes" submitted by Kathryn Bain in fulfillment of the requirements for the degree of Doctor of Health Sciences (HlthScD) is in a form ready for examination

Signed

14 June 2011
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ABSTRACT

The Neuro-Developmental Treatment (NDT) framework is commonly used around the world for children with Cerebral Palsy (CP), yet only a relatively small number of studies have investigated outcomes. Evidence of the benefit of NDT has not been established, although families and public funding bodies who are considering the inclusion of NDT in intervention programs request it. The research study described in this thesis was carried out in four phases, which comprised a literature review and three pilot studies. The aim of the research was twofold. The first aim was to develop a measurement model that could measure and quantify changes to posture and movement demonstrated by children with CP. The second aim was to use the measurement model to describe the changes in performance of relevant daily living tasks of a small group of children with CP who received an intensive course of NDT. Two pilot studies investigated and trialed methodology that was appropriate for use in the clinic to measure change in children's motor participation in daily tasks following NDT. The study aimed to reflect the current theoretical base and practice model of the Neuro-Developmental Treatment Association of North America (NDTA; Howle 2002).

Phase One of the research was a literature review that identified two potentially effective outcome measurement methods for use in later phases of the study: Goal Attainment Scaling (GAS; Kiresuk, Smith et al. 1994) and video recording. These methods showed the potential to identify functional change in children with 'diverse movement skills', such as those with CP.

GAS and video recording methods were trialed in the next two phases of the study in the form of two pilot studies. In Phase Two, the first pilot study employed critical case study methods. Using procedural and biomechanical task analytic methods, the researcher developed GAS scales that were tailored to two selected daily living tasks that were targeted by the children and their families for improvement. DVDs were made of the children performing the tasks before and after a short period of NDT. Ten expert NDTA Coordinator Instructors (CIs) were asked to rate one performance from randomly assigned DVDs with GAS scales, while blinded to pre- or post-test condition. This represented the first of two training periods for the CIs in using the GAS outcome measures.

Phase Three was the second pilot study in which a filming protocol was developed to further maximise 'onscreen' clarity, and increase the accuracy of GAS rating. Three regular video cameras included three views of functional skill performance, related to current therapy goals for each of six children. The three views were edited to allow simultaneous viewing on DVD format (Final Cut Pro, 2007). The filming procedure was designed to be child friendly and provide increased visual clarity (for reliability in rating). The protocol included a 'low tech', low cost and portable filming kit and child friendly measurement procedures. The focus for this study was to produce video footage, that was easily captured and analysed in the clinic, of a wide variety of daily functional tasks in a comfortable and playful setting for children. After generation of GAS scales for the six children, where performance was written in at -2 (the pre-test level) and using the task analytic methods employed in Phase Two of the research, the

DVDs were randomly assigned to the CIs, who were 'blinded' to the condition of intervention and who rated the GAS scales.

All outcome measures were utilized in the third pilot study, which was a quasi-experimental, pre- and post-test, outcome study with follow-up. The filming protocol, developed through the pilot studies, became central to the 'NDT Measurement Model' used. This pilot study aimed to quantitatively and qualitatively investigate the occupational performance outcomes of 12 children with CP aged between two and 15 years after an intensive course of NDT intervention. The intervention was administered by therapists under the guidance of instructors in an NDTA certification course.

Outcomes at the conclusion of the intervention, as measured by GAS scales, indicated significant positive change for the children between pre-test performance and post-test performance, as evaluated by both the researcher and the 'blinded' CI raters. No significant change was made from post-test performance to follow-up. These results indicate that use of an NDT intervention is successful in achieving relevant functional goals, and that there is maintenance of improved function in the children's chosen daily tasks after NDT intervention is withdrawn.

Other measures, including the Measures of Processes of Care (MPOC; King, Rosenbaum et al. 1995), generated highly supportive comments about the perception of NDT intervention by parents, children and therapists. Similarly, the narrative from both parents and therapists, relating to the children's goal outcomes

and their experiences with goal setting and the NDT process and outcomes, were positive.

Limitations of the NDT pilot studies included the small number of participants, and the quasi-experimental design that lacked a control group. Further research ideas for NDT research include the use of RCT methodology with a greater number of participants, and therapists learning to set their own GAS goals. Additional 'high tech' outcome measures for future research may add to visual aspects of the measurement model developed in this research. These may include the use of small, attachable, Bluetooth enabled devices for motion analysis (Australian Broadcasting Corporation, 2009). However, the 'low tech' outcome measures piloted in this research project, collectively called an 'NDT Measurement Model', demonstrated the ability to be used within a 'child friendly' clinic environment to capture the relationship between NDT intervention and daily task performance, and to successfully measure functional change in daily tasks.

DECLARATION

1, K**athryn Margaret Bain**, hereby declare that the work contained within this thesis is my own and has not been submitted to any other university or institution as a part of or a whole requirement for any other higher degree.

I, **Kathryn Margaret Bain**, hereby declare that I was the principal researcher of all work included in this thesis, including work published with multiple authors.

Name: Kathryn M. Bain

Signed:

Date : 3 June, 2011

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LIST OF PUBLICATIONS AND PRESENTATIONS

The following presentations were made during the course of the research and were based on the various phases of the research described in this thesis.

Published Papers:

Bain, K., (2009). *Seeking the Efficacy of Neuro-Developmental Treatment (Parts 1 - 3) - A Literature Review*, NDTA Network, March - April 2009, Volume 16, Issues 2 and 3.

Conference Presentations:

Bain, K., Chapparo C., Stagnitti K. (2007). *The Impact of Neuro-Developmental Treatment on the Performance of Daily Living Tasks in Children with Cerebral Palsy*. Faculty of Health Sciences, Postgraduate Research Student Conference, November, 2007, Sydney University.

Bain K., Chapparo, C., Stagnitti, K. (2009). *The impact of Neuro-Developmental Treatment on the Performance of Daily Living Tasks in Children with Cerebral Palsy*. Poster presentation 3rd International Cerebral Palsy Conference, February, 2009, Sydney, Australia.

Bain, K., Chapparo, C., Stagnitti, K. (2010). *The Impact of Neuro-Developmental Treatment on the Performance of Daily Living Tasks in Children with Cerebral Palsy*, Poster presentation, Australasian Academy of Cerebral Palsy and Developmental Medicine 5th Biennial Conference, 3-6 March, 2010, Christchurch, New Zealand.

Bain, K. (2010). *Measuring NDT Outcomes from Case Studies - Examples from an NDT Pilot Study*, Presentation at the 2010 NDTA Annual Conference "Clinical Problem Solving in the Context of NDT: Thinking, Treating and Documenting Like a Master Clinician", May, 2010, St. Louis, Missouri, USA.