



JHT READ FOR CREDIT ARTICLE #350.

Special Issue

Establishing expert consensus on the evaluation of pediatric upper extremity function



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ARTICLE INFO

Article history:

Received 16 June 2014

Received in revised form

27 August 2014

Accepted 5 September 2014

Available online 28 September 2014

Keywords:

Delphi methodology

Pediatrics

Upper extremity

Outcome assessment

ABSTRACT

Study design: Consensus statement.

Introduction: There is a lack of consensus in the literature on the measures of pediatric upper extremity (UE) function for musculoskeletal conditions.

Purpose: To establish expert consensus on utility, satisfaction and importance of functional outcome measures in children with UE musculoskeletal conditions, across International Classification of Functioning, Disability and Health (ICF) domains.

Methods: Using Delphi Consensus Methodology, expert panelists completed three rounds of questionnaires.

Results: Agreement on Body Functions and Structure, Activity, and Participation outcome measures was determined (α , ICC range = 0.86–0.96). Mean satisfaction of measures in the respective domains was between 6.93 and 7.94. The Activity domain had lowest satisfaction, however there was consensus it was the most important.

Discussion: Consensus on relative importance, but low satisfaction in the Activity domain suggests a need for better outcomes in this domain.

Conclusions: Findings report the status of outcome measure utility and use in pediatric UE function.

Level of evidence: 5

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Introduction

Upper extremity (UE) function is often impaired in children with congenital and traumatic musculoskeletal conditions.^{1–3} A comprehensive assessment of current levels of function is needed to determine an appropriate course of treatment for these children. To properly assess function, a clear definition of the term is required. The International Classification of Functioning, Disability and Health (ICF) Biopsychosocial Model of Disability (World Health Organization)⁴ is a comprehensive framework used to define function. The ICF classifies human functioning as Body Functions and Structure, Activity, and Participation.⁴ Evaluation of Body Functions and Structures of the hand are often used to evaluate

function.³ However, evaluation of Activity and Participation, defined as the execution of tasks or activities and involvement in life's situations, are also critical to understanding whether interventions improve these children's function.⁴

Literature on the utility, satisfaction and importance of existing pediatric UE measures is limited for children with UE musculoskeletal conditions. Ho and Clarke³ identified key components of a pediatric functional hand assessment for children with congenital hand differences, classified according to the ICF domains. Chien et al² built upon these identified components and proposed the Children's Hand Skills Framework, also consistent with the ICF model, to provide a comprehensive guide to pediatric UE assessment across diagnostic groups. While this framework serves as a conceptual guide to assessment, clinicians lack a standard method of evaluating pediatric UE function. Gilmore, Sakzewski, and Boyd⁵ assessed the psychometric properties of pediatric UE measures for children with hemiplegia for which 35% of items were coded as

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belonging to the Activity domain. The Melbourne Assessment of Unilateral Upper Limb Function (MUUL)⁶ and the Assisting Hand Assessment (AHA)⁷ were identified as having the strongest psychometric properties.⁵ The MUUL is an assessment of unilateral UE capacity in children with cerebral palsy (CP) or neurological impairments, which despite good psychometric properties, focuses solely on unilateral function. The AHA only assesses bimanual performance in children with unilateral disabilities.^{5,8}

The lack of consistency in assessment practices and the lack of consensus in this limited field of research demonstrate the need to access and consolidate expert opinion. The objective of this study is to establish consensus among expert clinicians on: 1) current assessments of pediatric UE function in children with congenital and traumatic UE musculoskeletal conditions, 2) satisfaction with the ability of current assessments to adequately assess ICF domains, 3) advantages and disadvantages of current assessments, 4) relative importance of ICF domains in contributing to the assessment of pediatric UE function, and 5) most important components of a comprehensive pediatric UE functional evaluation.

Materials and methods

Ethics approval was obtained through two local Research Ethics Boards. The Delphi technique⁹ was used to develop consensus in this study. This methodology involves administering repeated rounds of questionnaires to an expert panel to gather their individual opinions on a topic. Participant anonymity encourages independent thought and expression without judgment or influence.^{10–12} Participants' responses are analyzed between successive rounds, to provide panelists with controlled feedback on the group's opinions, and to incorporate responses into the development of subsequent surveys to guide continued data collection.^{10–12} The provision of feedback to participants, with an indication of where their opinions fall, leads to convergence of opinions over repeated rounds.¹³

Participants were international expert clinicians in the field of pediatric UE conditions. Consistent with the Delphi technique, participants were selected based on their knowledge of the topic,¹⁴ and at the discretion of the senior investigators.¹¹ Potential panelists were occupational therapists, physical therapists, orthopedic surgeons, and plastic surgeons with at least five years of clinical experience whose current practice includes children with congenital and/or traumatic UE musculoskeletal conditions. Representativeness is based on the scope of participants' combined knowledge and not their number.^{10,15} However, a heterogeneous Delphi panel is said to benefit from greater than 15 members.¹¹ Forty-eight clinicians were contacted by email to participate in the study, based on mean physician and non-physician mail survey response rates (54% and 68% respectively).¹⁶ Data were distributed and obtained through an internet-based software program, SurveyMonkey™. Participants were given nine weeks from distribution to complete and submit each questionnaire, to maximize response rates and professional representation. Only participants who had completed a previous round of questionnaires were asked to complete the subsequent round.

Round 1

The initial questionnaire was relatively open ended,^{10,11} to capture an indication of current practices in this field. The following topics were included: panel demographics; standardized and non-standardized outcome measures that participants currently used to assess UE function; advantages and disadvantages of currently used assessments; and most important components of a pediatric UE functional evaluation.

The results of the first questionnaire were analyzed using conventional qualitative content analysis.¹⁷ To establish reliability, two raters coded data, performing three blinded iterations. Perspectives taken to examine the data included: meanings; strategies, practices and tactics, and conditions and constraints.¹⁸ The raters then jointly compared and grouped codes into themes. A senior investigator who was familiar with the dataset reviewed the codes and themes that were generated. These codes informed the development of items in the second questionnaire, and were presented to participants as a summary of responses from the previous round.^{10,19}

Round 2

In the second questionnaire, participants were asked to select and rank their most highly valued assessments from those identified in the first round within each of the ICF domains. Next, the participants were asked to rate their satisfaction with the outcome measures in the respective domains on a scale of zero to ten, where ten represented greatest satisfaction. In the Activity and Participation domains, participants rated their satisfaction, with the ability of their top ranked assessments to measure their respective ICF domains. As it was considered unlikely that any single Body Functions and Structure assessment, used in isolation, could encompass that domain comprehensively, participants were asked to rate their satisfaction with any combination of the Body Functions and Structure assessments identified. Participants also ranked the advantages and disadvantages of overall outcome measures identified in the first round, and ranked the most important components of a UE assessment from those generated in the first survey. Finally, participants ranked the three ICF domains according to their relative importance in contributing to the assessment of pediatric UE function. Participants were asked to rank items, as opposed to rating them on a Likert scale, as is commonly done in Delphi methodology.¹⁵ The spread of scores on ranked items examined true consensus and not a skewness toward agreement on a Likert scale, which could be misinterpreted as consensus. Further, forced selection of preferred items, rather than investigators inferring preference based on relative Likert ratings, likely contributed to a greater depth of meaning gained from rankings.

A weighted score was calculated to reflect both the frequency with which an item was selected for ranking, and the relative position of its ranking. The lowest ranked items were given a weight of 0.5, with an incremental increase of 0.5 for successively higher rankings. Those items that a participant did not select as one of their top ranked items were assigned a weighted score of zero. The ordinal rankings that were calculated were not interval in nature, although the assumption was made regarding equal value between ranks.

The level of agreement on rankings was found using Cronbach's α and the Intraclass correlation coefficient (ICC). There is considerable variability in Delphi methodology literature regarding the statistics used to determine levels of consensus.²⁰ Graham et al (2003)¹² suggested that a selected measure of consensus should be compared against another measure to ensure that the most useful statistic has been selected. The ICC was an appropriate measure of consensus for this study because rater performance was the area of interest.²¹ A one-way random measure model (1,k) assumes all variance is due to differences between raters and not the effects of variance due to time or subjects²¹; in this case, assessments. The ICC was compared to Cronbach's α . Similar to Graham et al's (2003)¹² methods, this study assumes that the level of consensus is a measure of internal consistency between the raters' rankings of items measuring a central characteristic; that is, the item's importance in the assessment of pediatric UE function.

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