# A FRAMEWORK OF UNIFORM MOTOR TERMINOLOGY FOR SOUTH AFRICAN OCCUPATIONAL THERAPISTS WORKING WITH DEVELOPMENTAL MOTOR DELAY

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# DECLARATION

I, Paula Monique Barnard, declare that this dissertation is my own work. It is being submitted for the degree of Master of Science in Occupational Therapy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.

Paula Monique Barnard

____________________ day of ________________ 2009

*To my parents, Beau and Gill, for always believing in me;*
*To my daughter, Morgan, for loving me unconditionally;*
*To my husband, Marc, for standing by me.*

# PUBLICATIONS AND PRESENTATIONS

## PUBLICATIONS

1. Barnard P, Franzsen D. **Motor terminology clarification survey**. South African Journal of Occupational Therapy. 2004;34(2):13-7. (APPENDIX A)
2. Barnard P, Franzsen D. **Towards A Uniform Taxonomy Of Motor Terminology: Stage 2.** South African Journal of Occupational Therapy. *Accepted for publication June 2008*

## PRESENTATIONS

South African Institute for Sensory Integration (SAISI) Congress Cape Town 2003 paper presentation: "**Motor Terminology Clarification Survey**".

# ABSTRACT

A uniform taxonomy within occupational therapy has become a recent focus of discussion and concern in the literature. This study investigated inconsistency in the literature and how South African occupational therapists use and understand terms related to motor performance in children with developmental motor delay. A three stage Delphi Technique was used to gain consensus on the association of characteristics of movement to six motor component terms. The results yielded both quantitative and qualitative data, which revealed that while there was strong consensus among the occupational therapists on some aspects of motor terminology, there is still ambiguity and overlap of understanding. This is reflected in a worrying inconsistency of the description of these terms in the literature and how occupational therapists use the terms in clinical practice. A Framework of Uniform Motor Terminology was developed based on the results of the Delphi Technique.

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# OPERATIONAL DEFINITIONS

**Delphi Technique**: A research method, which aims to gain consensus of opinion of professionals on a given topic where there is either too much information, too little or a contradiction within the literature. The process involves identifying experts in the field, sending the experts a survey form, receiving the replies, compiling a summary of the view points, redistributing the summary to the panel and repeating the process until consensus is achieved.

**Motor component**: The name of a cluster or group of characteristics of movement that are seen as being in common to each other. Motor components are representative of a type of movement (composite concept). It is an umbrella term. The terms investigated in the study, identified in stage 1 (chapter 4). Example: “Bilateral co-ordination” is a composite of all movements generated using both sides of the body.

**Characteristic of movement**: The motor/movement related phrase that is commonly used to refer to or describe an aspect of movement of developing children, as given in stage 2 (chapter 5). Example: “Crossing of midline” is movement across the saggital plane into the opposite hemispheric space that is considered movement that falls within “bilateral co-ordination”.

**Units of meaning**: the phrases that were drawn out of the therapist’s definitions on the motor components during stage 3 (chapter 6). Example: “Crossing of midline” is movement across the saggital plane into the opposite hemispheric space that is considered movement that falls within “bilateral co-ordination”. These are often the same as the characteristics of movement, but are labelled according to their source from the study.

**Semantic clusters** reflect the qualitative grouping of characteristics of movement and units of meaning according to common meaning (Chapter 6). Example: “Combining body parts” is a group label for units of meaning that relate to moving different parts simultaneously.

**Card sort clusters** are the groups / piles of cards that were sorted together based on the goodness of fit of the cards to each other (chapter 7).

**Learning disability**: A condition where a child's learning is influenced by difficulties in perceiving and processing information, understanding and using language and mathematical abilities in the absence of environmental limitations, primary sensory loss, physical disability or cognitive limitations.

**Developmental delay**: A hindrance of maturation evident by an infant, child or toddler performing significantly below (below the $5^{th}$ percentile) their peers in one or more of cognitive, motor, communication, socio-emotional or adaptive behaviours, but which is not due to insult, disorder or disease.

**Stage:** In the context of this study the word "stage" is used specifically to refer to one of the five research steps (stages) conducted in the completion of this study, as shown if in figure 1.1.

**Phase:** In the context of this study the word "phase" is used specifically to refer to one of the three steps (phases) conducted in the development of the FUMT in chapter 8 (stage 5) of the study.

# ABBREVIATIONS

| | |
|---|---|
| ADD | Attention Deficit Disorder |
| AMPS | Assessment of Motor and Process Skills |
| AOTA | American Occupational Therapy Association |
| BIS | Bilateral Integration and Sequencing |
| CNS | Central Nervous System |
| DAMP | Deficits in Attention, Motor control and Perception |
| DCD | Developmental Co-ordination Disorder |
| DD | Developmental Delay |
| DSM IV | Diagnostic and Statistical Manual of Mental Disorders: 4th Edition |
| FUMT | The Framework of Uniform Motor Terminology (developed in Chapter 8 of the study) |
| HPCSA | Health Professions Council of South Africa |
| ICD-10 | International Classification of Disease and Related Health Problems (tenth revision) |
| ICF | International Classification of Function, Disability and Health |
| LD | Learning Disability |
| M | mean (central tendency) |
| MOHO | Model of Human Occupation |
| Movement ABC | Movement Assessment Battery for Children |
| OTASA | Occupational Therapy Association of South Africa |
| SADC | Southern African Developing Community |
| SD | Standard Deviation |
| SIPT | Sensory Integration and Praxis Tests |
| SLD | Specific Learning Difficulty |
| The Framework | Occupational Therapy Practice Framework: Domain and Process |
| UT-III | The Uniform Terminology for Occupational Therapy – Third Edition |

# CHAPTER 1: INTRODUCTION

Almost a quarter of South African occupational therapists focus their practice domain on treating children with learning difficulties (LDs) and developmental delays (DDs) [3]. These therapists commonly work in a multi-disciplinary environment, liaising with parents, teachers, medical specialists, speech therapists, psychologists and physiotherapists regarding their assessment and treatment of common clients.

These occupational therapists use motor assessment tools to evaluate the motor skill performance of children in order to provide a targeted therapy regime that will enhance the child's functional performance. Children with DDs or LDs commonly experience motor performance delays which contribute to their difficulties in academic learning, daily self care activities and their play participation [4-7] . Fine motor ability forms the basis for academic skills such as writing and cutting [4,8], and for self care activities such as brushing teeth and dressing [4,8,9]. Gross motor ability forms the basis for posture [9] – for instance while sitting at a desk and performing sporting activities [8,9].

When writing reports to assess the client's strengths and weaknesses much of the terminology is derived from the psychometric assessments that the occupational therapists use to evaluate their clients performance. These include the Bruinninks-Oseretsky Test of Motor Proficiency [8,10], the Movement Assessment Battery for Children (Movement ABC) [8,11], or the Sensory Integration and Praxis Tests (SIPT) [12]. Although these tests were internationally developed, research has shown that many international standardised tests are valid at discriminating South African children with motor deficiencies from other typically developing South African children. Some allowance for rural based children scoring lower than urban children, but still within the international norms [13-15] is taken into account. As these tests are used in research, the terminology used in them is carried into journal articles and textbooks. Much of the terminology used in report writing and communicating the client's strengths and weaknesses is derived from these assessments, undergraduate training, current research and text books as opposed to published uniform terminology documents. This terminology is used in communication within the multidisciplinary team and is vital to the understanding of the client's areas of difficulty [16].

The dominant models of intervention, Model of Human Occupation (MOHO), and frames of reference, Sensory Integration (SI) and Motor Learning, for treatment of children with LD and DD also play a role in determining the words used by occupational therapists in clinical practice [17]. With such a variety of sources of inconsistent terminology, the confusion is inevitable.

This lack of uniform terminology was not restricted to South African occupational therapy. The American Occupational Therapy Association (AOTA) has been striving for the development of a uniform terminology document since the publication of the Uniform Terminology for Reporting Occupational Therapy Services (First Edition) in 1979 [18]. Two further editions [19] were published and have since been replaced by the 1995 publication of the Occupational Therapy Practice Framework: Domain and Process (The Framework) [2]. All the documents were developed by task forces or committees who convened with the express purpose of establishing uniform terminology. Unfortunately they seem to have fallen short of their intention as research by Borst and Nelson [20] in 1993 showed that American occupational therapists were not applying the Uniform Terminology for Occupational Therapy (Second Edition) effectively. They cited poor occupational therapist awareness of the document, poor clarity of the definitions in the document and overlap between the component categories as possible reasons for the lack of consistency of term usage in practice. Nelson also criticised The Framework in a study which considered the logic used in establishing this framework [21]. Improved acceptance and implementation of such a document would improve intra-disciplinary communication, add rigor to research as there would be confidence in the construct being measured, and provide easier understanding of curriculum content in training.

## 1.1 STATEMENT OF THE PROBLEM

Clinical experience and lecturing in the field of occupational therapy with children who have LD and DD revealed some lack of uniform terminology of motor function being used by local paediatric occupational therapists. Terminology currently used in this field is derived from assessment tools, training experiences, literature and uniform terminology documents. There is poor consistency across these media which seems to have created a myriad of variations of the context and meaning of basic motor function related terminology. This is evident in inconsistencies noted when comparing reports from different occupational therapists practicing within the field of LD and DD. Peer discussions are regularly fraught with debates as to what movement the other party is actually referring to. Inconsistency and ambiguity of motor function related term usage in occupational therapy related to LD and DD has permeated into research and literature within the field, exacerbating the problem into a degenerating cycle.

## 1.2 PURPOSE OF THE STUDY

This study investigated the motor terminology used by South African occupational therapists practicing in the field of LD and DD. It questioned whether there was common consensus of motor terminology used in practice, and if all therapists used the same motor terminology in the same contexts consistently. Consensual understanding was then synthesised to develop a Framework of Uniform Motor Terminology (FUMT) which would undergo validation, implementation and acceptance phases to ensure consistency of use within the field of occupational therapy with children who have LD and DD.

## 1.3 AIM OF THE STUDY

This study aimed to develop a FUMT for use by occupational therapists practicing in the field of LD and DD based on a synthesis of current term use within the field.

### 1.3.1 Study objectives

The objectives of this study are to:

- Investigate ambiguity and inconsistency of motor terminology use in literature and psychometric tests related to children with LD and DD.
- Investigate how occupational therapists use motor terminology pertaining to the therapeutic intervention with children who have LD or DD.

- Gain expert occupational therapist consensus on how motor terminology should be used related to occupational therapy intervention with children with LD and DD.
- Develop a FUMT for use by occupational therapists in communication, reporting, training and research related to the motor function of children with LD and DD that:
  - Is free of definitional precision and parsimony errors [21].
  - Contains terms frequently used and familiar to occupational therapists.
  - Is clear, concise and easily interpreted.

## 1.4 JUSTIFICATION

A consistent framework of motor performance related terminology in the context of occupational therapy treatment of children with LD and DD would make a significant contribution to occupational therapy practice in this field. A framework would provide a consistent terminology with which to communicate a child's motor abilities to parents, teachers and colleagues. It would alleviate ambiguity in training of undergraduate occupational therapists and form a basis for consistency within occupational therapy research related to motor performance in children with LD and DD.

Jennifer Creek (2006) stated:

> "*The recent flurry of activity around terminology suggests, perhaps, that we have reached a stage in our professional development when we are ready to examine the conceptual foundations of our work in more depth*"[22] (p6).

In partial response, this study aimed to develop a FUMT for use in research and clinical practice by defining conceptual structures in the area of paediatric occupational therapy related to LD and DD within the South African context.

## 1.5 OVERVIEW OF THE STUDY

The study was divided into Delphi [23,24] Technique stages to ensure that the framework was representative of the views and standard practice terms used by the occupational therapists, practicing in the field of LD and DD, who would ultimately use the FUMT. The Delphi stages used in this study are shown in figure 1.1, with each stage being dependant on the results of the prior stage, and contributing to the following stage.

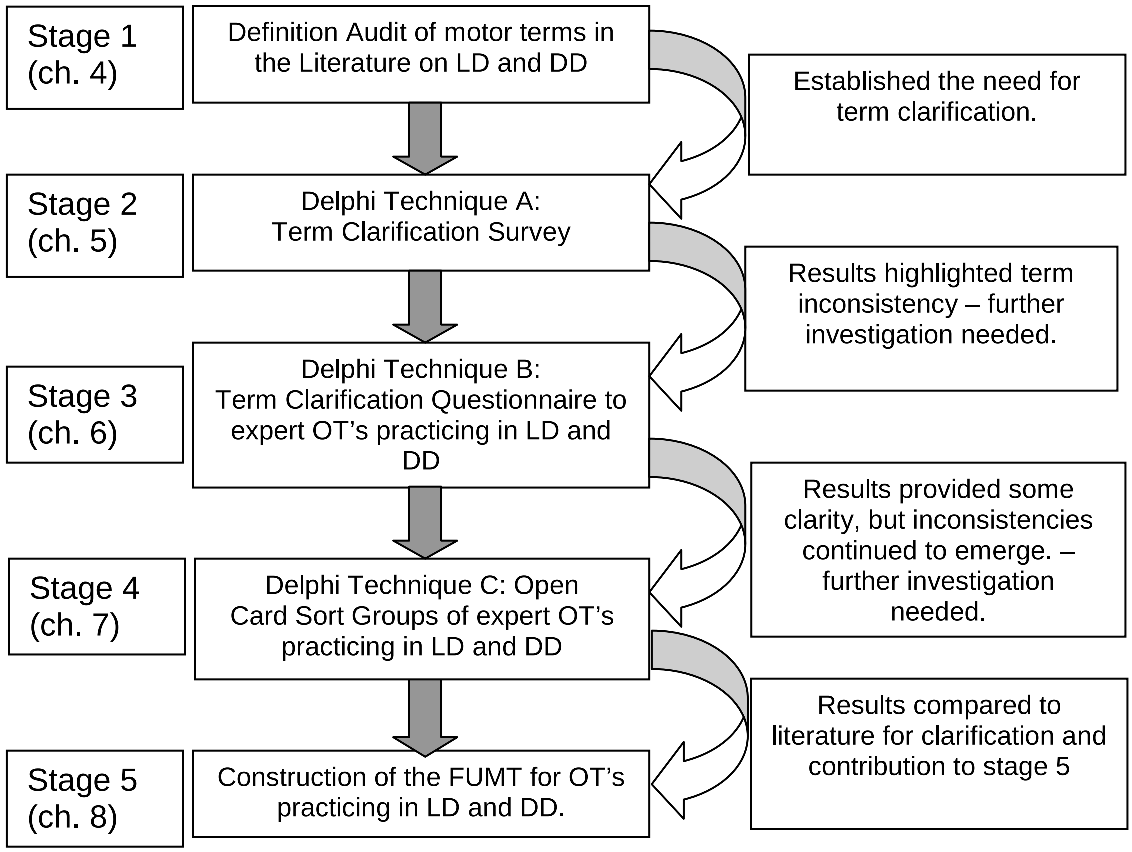



**Figure 1.1** Flow Chart of the Stages of the Study

## 1.6 DELIMITATIONS OF THE STUDY (SCOPE)

This study is limited to the occupational therapy assessment and intervention with children who have LDs and DDs. It specifically excludes the theory and practice of occupational therapy pertaining to children with syndromes, neurological impairments or diseases from the context of this study.

This study is confined to the context of the Southern African Developing Community (SADC).

# CHAPTER 2: REVIEW OF CURRENT LITERATURE

## 2.1 INTRODUCTION

The literature reveals that in South Africa approximately forty percent of primary school children are referred for special educational assistance, be it for a diagnosed disability or for more temporary assistance in terms of psychological, speech, occupational or remedial therapy [25]. The Free State Department of Education (2006) [26] identified 4087 learners as having specific learning difficulties (SLD) being educated in the 1919 main stream schools of the province. In the 20 special education schools they identified 133 such learners (with SLD) amongst children with syndromes, neurological impairments, sense organ loss, behavioural and physical disabilities [27]. These figures of children with SLD (although seemingly excessive) are made up of children with a variety of difficulties or impairments that are not associated with impairments to their bodies, but rather to their developmental delay (DD) or learning difficulties (LD). According to Martini and Polatajko [28], and Wilson et al. [29] six to nine percent of the general population is thought to be affected by Developmental Co-ordination Disorder (DCD) [28,29] . Deficits in Attention, Motor control and Perception (DAMP) is considered a combined disorder of Attention Deficit Disorder (ADD) and DCD, and affects 1.5% of the school aged population [30]. Martini and Polatajko [28] indicate that these disorders (SLD, DCD, DAMP) significantly affect a child's occupational performance in their scholastic, domestic and social environments [28,31], despite their normal intelligence [5,30]. A child presenting with these disorders often suffers with a form of motor performance delay, which impacts on the child's occupational performance [28,30,31]. Once referred to occupational therapy for treatment, analysing their movement is a vital part of a paediatric occupational therapists clinical work [32].

The body of knowledge that this literature review was drawn from primarily reflects occupational therapy frames of reference, focusing on Sensory Integration Theory developed by Dr A. Jean Ayres [33] and developmental theory [34,35]. Literature directly pertaining to Neurodevelopmental Therapy founded by the Bobaths [17] has specifically been excluded as this literature focuses on movement difficulty in the context of upper motor neurological lesions (cerebral palsy and traumatic brain injury) [17]. Motor learning theory [36,37] and motor control theory [36,38] from a psychological and educational perspective will be considered, as will medical work on the neurology, physiology and neuroanatomy of movement [38] from outside of the therapeutic sciences. The review explores from these perspectives the existing taxonomies, the importance of having a professional taxonomy, literature definitions of movement abilities and inconsistency of term usage in the literature.

## 2.2 MOTOR THEORIES

The frames of reference that underpin the therapeutic principles and techniques used by occupational therapists to treat LD and DD are founded primarily in motor control theories, motor learning theories and developmental theories [39]. Motor control theories focus on the central nervous system mechanisms that manage movement [40,41], motor learning theories seek to understand how a person acquires new motor skills [36,40,41] and developmental theories explore the transition and change of movement ability over time with growth and maturation[39,40,42]. These motor theories all contribute to the complex understanding required by an occupational therapist to achieve therapy outcomes [39].

### 2.2.1 Motor Control Theory

Early motor control theories such as the reflex hierarchy [5,35,38] and modular theories [38] were reductionist and simplifications of the mechanisms governing movement [5,41].

Reflex hierarchy theory proposes firstly that movement is a product of sensory input that forms a series of complex reflexive movement and secondly that a lower to higher level hierarchy of the CNS governs motor responses [38,41]. The first postulate contributes to the closed-loop system of motor control. The closed-loop system is the concept that a sensory input is processed at various levels of the CNS which stimulates motor output. This motor output action in turn generates new sensory input which provides information for error correction and modified motor output [36,38]. The theory of closed-loop systems has largely given way to the more current theory of open-loop systems in which feed-forward anticipation of movement requirements contributes to motor control based on stored motor programs or engrams[36,38].

A hierarchy of motor control implies that lower level (spinal and brainstem) reflexes control movement in the absence, damage or immaturity of higher (midbrain and cortical) CNS centres [40]. It is currently more accepted that the concept of a hierarchy of control is limiting and does not account for the complexity of voluntary movement [5,35,40,41]. Many factors such as weight gain [40], milestone attainment, and lower CNS level control of complex movement [35] have contributed to rejecting a hierarchical model. The existence of reflexes and motor reactions that are processed at various levels of the CNS is undisputed [35,38,40], but the role that these mechanisms play in motor control has been widely debated [5,38,41] and thus their value in therapy also questioned [38,40].

Dynamic systems theory, based on systems theory, represents the complex interaction of the body systems (musculo-skeletal, neuro-muscular reactions, sensory processing, cognition) and environmental systems (objects, surfaces, physics, gravity) with the task being performed [35,38]. This theory is accounts for the need for systems to be adaptable, functioning in changing environments and tasks[41]. No one system is in control, but rather each system is of equal importance and may in different contexts play a more prominent role in an action [40,41]. Dynamic systems theory has emerged as the more comprehensive and accepted motor control theory in recent research [35,36,38,41].

### 2.2.2 Motor Learning Theory

Motor learning theory explores the mechanisms by which practice of actions or action series results in recurrent ability to perform the action and retain the skill being focused on [36,38,42]. Many texts consider motor learning theory as a component of motor control theory [40,41], possibly due to open-loop theory and dynamic systems theory of motor control providing a strong base for motor learning theory [35,36,38].

The prominent factors explored in motor learning theory are:

- the effect of practice [38,42],
- the nature of feedback gained while practicing [38,43],

- manual guidance of movement [38,40],
- breaking skills up into movement units (fragmentation and segmentation) [38,43],
- formation of motor programs to enhance automatic movement [40,41], and
- the effect of the environment, motivation, genetics and opportunity [43].

These factors influence ability to progress from being inefficient and clumsy at a motor task to an ability to perform the task in an automatic, efficient, accurate manner [41,43]. Sullivan et al. [43] investigated skill acquisition in children as compared to young adults, with either 100% feedback or reduced feedback on performance. This study found that while young adults with reduced feedback on performance performed better reacquisition of skill than adults with 100% feedback, this was not true for children. The children aged eight to fourteen years performed better in 100% feedback conditions, showing that motor learning and the frequency of feedback required for skill attainment is different in adults and children. Sullivan et al. found that children may require longer periods of practice with more consistent performance feedback than adults [43]. This study highlights the need for caution when adopting a theory as being equally applicable to adults and children, which is of clinical importance to occupational therapists interpreting the literature.

### 2.2.3 Motor Development Theory

Motor development is demarcated by the attainment of motor milestones, but it is a far more complex maturational process [40,42]. Early motor development theory was also based in a hierarchy of motor ability acquisition, but dynamic systems theory has aided in rejecting this staged approach to understanding motor development [35].

Developmental theorists such as Freud and Piaget have contributed much of the psychosocial foundation to motor development theory[39]. Biological science and medicine have contributed to the nature process side of the nature-nurture debate [40]. It is currently accepted practice that biological process (nature) and environmental influence (nurture) contribute to motor development [39]. Children all follow a similar but not exact pattern of developing motor ability, providing a scale for measurement of motor milestones[40,42]. A child's performance in motor tasks compared to peers provides occupational therapists with a guide as to the efficiency of a child's development and whether intervention is required [34,35].

Knowledge of motor development further plays a role in the occupational therapists goal setting and planning of intervention for children who have delayed motor development [34,39].

Motor development, motor control and motor learning are discrete concepts, but all have had influence on the theory of the others. Motor learning theory contributes to motor development but fails to include the maturational factors such as building muscle strength, pathway maturation and cognitive maturity (increased concentration span, problem solving and planning ability as examples). A seven year old child cannot learn to drive a car through peak hour traffic. With the right practice motor learning theory says it can be achieved, motor control theory proposes that the child will achieve improved accuracy and timing, but motor development theory negates it as achievable based on the child's inability to simultaneously process all the information it would require, legs that don't yet reach peddles, and the lack of complex experience to topographically orientate and navigate safely to the destination.

### 2.2.4 Occupational Therapy Frames of Reference

Occupational therapists treating children with LD and DD derive intervention strategies from frames of reference such as Sensory Integration, Motor Skills Acquisition and Biomechanics.

Sensory Integration is a prominent frame of reference used by occupational therapists to treat children with LD and DD [17]. Dr A.J. Ayres founded much of the theory of Sensory Integration on the motor control and motor learning theory's prevalent in the 1960's and 1970's [5]. At this time, hierarchical models were still popular. Ayres' investigations into dyspraxia in children lead to her questioning the simplicity of such models and she was an early pioneer in contributing to systems theory by integrating the role of the sensory systems in motor control to the cognitive processes needed for praxis [5,33]. Sensory Integration today follows more of the dynamic systems theory with heavy reliance on play for motivation, and the spiral process of self actualisation through the just right challenge [5,6].

The motor acquisition frame of reference relies heavily on motor learning theory [44] where skills are learnt through practice and repetition with the occupational therapist providing enhanced feedback with is gradually withdrawn as skill improves. This frame of reference also proposes fragmentation and segmentation of skills into bits that are practiced individually then gradually combined to provide an entire motor skill [42,44]. The biomechanical frame of reference is based more in the physics of movement, relying on the distribution of weight around the stabilising and movement levers to generate or sustain movement. It is frequently used through provision of assistive devices that enhance movement efficiency through reducing the forces influencing a movement [35,44].

Occupational therapists draw on the knowledge of motor control, motor learning, motor development and the frames of reference in order to tailor each therapeutic intervention specifically to the needs of the child with LD and DD[39].

## 2.3 EXISTING TAXONOMIES

### 2.3.1 Medical Taxonomies

The medical and health professions have released three prominent taxonomies that have been internationally accepted and applied to clinical practice across the specialities. These are the Diagnostic and Statistical Manual of Mental Disorders: 4th Edition (DSM IV) [45], the International Classification of Function, Disability and Health (ICF) [46] and the International Classification of Diseases and Related Health Problems (tenth revision) (ICD-10) [47]. All three taxonomies relate to providing a globally recognised system for labelling and identifying the various conditions that afflict humans. The DSM IV and the ICD-10 provide descriptions and diagnostic criteria for medical conditions. The ICF is unlike the other two taxonomies in that it doesn’t focus on medical diseases and disorders, but rather on the nature of healthy functioning and the state of health of humans [48], and has been recognised as the system that is most affiliated to the practice of occupational therapy [48,49]. While the ICF is comprehensive and detailed in breaking down movements into small, measurable activity descriptions, and lists body functions, it does not have a classification for the nature and quality of movement as needed by occupational therapists to analyse movement difficulties.

Haglund and Henriksson [48] concluded that,

> *"The ICF classification can serve as a useful tool for occupational therapists and support communication between professions, but it is not sufficient as a professional language for occupational therapists. The results of this study indicate that, in addition to the ICF, occupational therapists also need their own terminology to describe the client's capacity in a way that guides intervention."* [48] (p267-268)

All three of these taxonomies are widely used in the practice of occupational therapy, but are not profession specific. While they assist in interdisciplinary communication, they are not specific enough to occupational therapy intervention [48] to prove useful in other contexts of the profession, such as reporting on client performance and research into practice efficacy.

### **2.3.2 Occupational Therapy Taxonomies**

The AOTA has been striving since the late seventies [18] to develop a document that provides uniform terminology for the occupational therapy profession. They have released four such documents since then through the formation of terminology task forces, with presentation to and acceptance of the documents by the Representative Assembly of the association [2,19]. Each document published then rescinds and replaces its predecessor [2,19]. The objective of these documents was to provide a generic outline of the occupational therapy scope of practice [2,19], create a base of terminology that is common and can be applied across all the occupational therapy theories, models and frames of reference, and provide a succinct and understandable communication tool for reporting [19].

The Uniform Terminology for Occupational Therapy – Third Edition (UT-III) [19] (published in 1994, replacing the 1989 second edition) warrants detailed discussion as it has been a reference document in the education of occupational therapists, and research within the profession, and is possibly the source of some of the literature inconsistencies. The UT-III was similar to the second edition, but was expanded to include occupational contexts. The motor related terms of the second edition were consistent with that of the third [19]. Borst and Nelson [20] investigated the adoption of the second edition terminology into occupational therapist practice, and found poor agreement between the document categorization and definitions and the way in which the 113 sampled occupational therapists used them. They cited possible reasons for the poor consistency of use, even in light of having such a document, as being due to the inadequate definitions provided by the second edition, an overlapping of categories and terms, and poor awareness of the document's existence [20]. The first two factors relate to the quality of the document, indicating that the terms were possibly inefficiently formulated, defined and categorised in a way that is meaningful to the occupational therapists that use them. The third factor implies that the document was not widely distributed and not recognised by occupational therapists as being important. It is therefore imperative to not only produce a succinct and definitive taxonomy document, which involves input from the occupational therapists who would use it, but also to plan an implementation and evaluation process ensuring that it is adopted by the practicing occupational therapists [22].

According to Nelson [21] in order for a professional taxonomy document to be effective and unambiguous, it should conform to basic definitional and classification rules. The definitions of terms should be clearly stated, including all aspects that discriminate this term from other similar terms (Definitional Precision). Definitions should reduce and refine the qualities of a term so that variables would be attributed solely to that term and not to any others (Definitional Parsimony). He further identified that in classification of terms it is imperative that a term has a clear rank at a particular hierarchical level, and could not be assigned a different hierarchical place (Classification Exclusivity). The hierarchical structure should also have a suitable place for all members or examples related to the topic of the taxonomy (Classification Exhaustiveness). The users should not fall into a situation in which they are unable to place a term within the taxonomy's hierarchy [21].

When analysing specifically the motor related terminology presented in UT-III the source of confusion and inconsistency becomes more distinct. The word "controlled" is used in defining terms that include "coordination" in the term name (such as “gross coordination” p1053), and the word “coordinating” is then used in defining terms that have either “control” (such as “oral-motor control” p1053) or “integration” (such as “bilateral integration” p1053) in the term name [19]. This definitional parsimony [21] error implies that the words “control”, “integration” and “coordination” can be used interchangeably in describing movement quality. Thus the distinguishing element between these terms seems not to be in the nature of the movement, but rather in the body parts being moved.

Further to this, the definition for “visual-motor integration” is “coordinating the interaction of information from the eyes with the body movements during activity” [19] (p1053), which is very broad as this includes any voluntary movement where the eyes are not closed. Exner defines “visual motor integration” as “refer[ring] to the interaction of visual skills, visual perceptual skills and motor skills” [50] (p289), which incorporates the more specific components of visual perception and skilled movement into the definition. This is similar to the earlier definition by Beery who defined it as “the degree to which visual perception and finger-hand movements are well coordinated” [51] (p19), but which specifically excludes movement of the rest of the body. This lack of definitional precision [21] is strongly evident throughout UT-III.

The UT-III [19] also fails on classification exhaustiveness as the only mention of balance is in defining “postural control” and yet static and dynamic balance are motor components that are incorporated as measurable constructs in most paediatric motor assessments [10-12]. It is possibly for these reasons that AOTA decided to implement a completely new structure and taxonomy with the 2002 Occupational Therapy Practice Framework: Domain and Process, also referred to as The Framework in many texts [2].

The Framework [2] is not simply a taxonomy document, as it covers the terminology as well as an outline of the occupational therapy process of evaluation and intervention applied to occupational performance. This document is far more detailed than its predecessor, and presents a more hierarchical structure for classification of abilities and skills. However, it too has come under scrutiny by Nelson [21], who analysed the domain component of The Framework in terms of the definitional rules of precision and parsimony and the classification rules of exclusivity and exhaustiveness. Nelson [21] demonstrated in his analysis that the Framework repeatedly violates all four of these rules.

Surprisingly the motor domain terms cited in The Framework are all drawn from one taxonomy provided by Fisher in Kielhofner's Model of Human Occupation (MOHO) [1], and in many instances the paraphrasing used in The Framework has altered Fisher's intended meaning. For example The Framework defines "walks" as "*Ambulates on level surfaces and changes direction while walking without shuffling the feet, lurching, instability or using external supports or assistive devises (e.g. cane, walker, wheelchair) during the task performance*" [2] (p621). Fisher on the other hand states that the definition for "walks" is, "*Ambulating on level surfaces. It includes the ability to turn around and to change direction while walking. Unsteadiness or shuffling, lurching, and ataxia are examples of difficulty in walking. Using a wheelchair or ambulating with an assistive device represent modified methods*" [1] (p117). In condensing the definition by using "without" as a conjunction, The Framework has effectively proposed that walking on an uneven surface, or with a stroller no longer constitutes walking. Exposure to the motor terms from The Framework is poor in South Africa. There has only been one Assessment of Motor and Process Skills (AMPS) [52] course in South Africa, which is the only test using this taxonomy. Although MOHO is used in South African occupational therapy training centres, the skills as defined by the model are seldom taught. Thus the use of the terms such as "transports" for moving an object from one place to another [1] is unfamiliar to most South African occupational therapists. "Transports" as a motor term has been avoided in local training as for second language English speakers the use of the term would lead to confusion with the conventional sense of vehicular transport.

### 2.3.3 Motor Development Related Taxonomies

There is a paucity of taxonomies addressing the motor domain in children with LD or DD. The only taxonomy found was the 1972 "A Taxonomy of the Psychomotor Domain" by Anita J Harrow [53]. This outdated text divided movement into five categories:

- Reflexive Movements (Segmental, Intersegmental and Suprasegmental Reflexes)
- Basic-Fundamental Movements (Locomotor, Non-locomotor and Manipulative Movements)
- Physical Abilities (Endurance, Strength, Flexibility and Agility)
- Skilled Movements (Simple Adaptive, Compound Adaptive and Complex Adaptive Skills) and
- Non-Discursive Communication (Expressive and Interpretive Movement)

The taxonomy further includes a category for Perceptual Abilities. This work was intended to compliment other taxonomies related to the cognitive-affective domains, in the preparation of primary level educational programs. Harrow hoped that the taxonomy would "*serve to increase educators' understanding of and appreciation of meaningful movement for the total development of the child*" [53] (p 10). Analysis of this taxonomy revealed that the constructs outlined in it are relevant to the motor development of children in a manner common to occupational therapy and educational literature. Its limitation is the unfamiliar, outdated terms used. Although this taxonomy may be recognised in education literature, the terms used are not contextual to the practice of occupational therapy.

## 2.4 CONFUSION IN THE PROMINENT TEXTS

Occupational therapy literature is plagued with confusing new terms and looseness of motor terminology. Of greatest concern is that the problem has infiltrated texts used as prescribed reading during occupational therapy training. It is highlighted by Exner [50], who demonstrates the reason for the confusion that still reigns in the occupational therapy profession. She noted that the term "hand skills" is used interchangeably with "fine motor co-ordination", "fine motor skills" and "dexterity" in her introduction to a chapter on the development of hand skills in a prominent paediatric occupational therapy text book. She opted to use the term "hand skills" as she felt that it is more specific to "*skills of the hands that are needed to attain and manipulate objects*" (p304). While highlighting the problem, she has neither given a precise definition for hand skills, nor discriminated "hand skills" from its proposed synonyms, thus failing to rectify the situation.

Many texts provide glossaries at the end of chapters [54], or in concluding the book [5]. These glossaries are very useful in understanding the context of the work. Their possible limitation is that they lack comprehensive cover of terms, often only citing terms deemed confusing by the author. The assumption may be that commonly used terms are clear and precise to the reader and not in need of defining. This is evident in the glossary concluding Sensory Integration Theory and Practice 2nd Edition [5] which omits “praxis”, “co-ordination” and “motor skills”. Unfortunately this perpetuates the confusion, as each reader is left to use their own understanding of each term in interpretation of the text. This may lead to different interpretations of the information and different readers drawing different conclusions.

Some psychometric tests clearly define all the motor terms that form subtest names and the motor components being assessed. The SIPT [12] defines each praxis sub-test name (p7), with detailed subtest descriptions, as well as the motor component “praxis” (p9). Other psychometric tests fail to be so vigilant. While the Movement ABC [11] has detailed descriptions of the sub-tests and of movement difficulties in children, it fails to state definitions of motor related terminology.

Performing a literature search for definitions proved difficult as most texts talk about and generally describe terms, rather then defining them at the onset. This may have implication for occupational therapy training as it is unfair to discredit a student’s performance based on lack of clarity of the literature.

## 2.5 THE NEED FOR UNIFORM TERMINOLOGY

Anne Cusick, in the 2001 Sylvia Docker Lecture, dedicated a significant portion of her presentation to words to communicate within the profession of occupational therapy [55]. This Australian occupational therapist felt,

> *“When I look around and see the number of practical and theoretical approaches to occupational therapy increasing, I feel a sense of wonder that I ever managed to muddle through occupational therapy with so few conceptual tools. I feel proud to know that we have an*

> *evolving professional language which aims to present the concepts of our profession with greater refinement"* [55] (p105).

More recently English occupational therapist, Jennifer Creek has also been outspoken about the significance of professional terminology [22], demonstrating the world-wide realisation that term consistency is important.

These two prominent occupational therapists concur that there is a need for consensus regarding the terminology used within the profession, that this needs to be effectively accepted into practice and clearly interpreted by those we communicate with [22,55]. Creek also suggests that the use of the Delphi Technique is an appropriate method of establishing such a taxonomy [22]. Cusick however warns that there are risks to becoming too specialist in our terms, increasing the need for separate glossaries and dictionaries for each frame of reference or professional theory [55].

The realisation of the terminology dilemma is not restricted to the profession of occupational therapy. Physiotherapist Cynthia Coffin-Zadai in June 2007 cited language and labelling issues as a contributing factor in confusion regarding diagnosis [56]. She reasoned that it would be beneficial to use a physiologic system, such as the "movement system" as a framework for organising the description of diagnoses and that a consistent terminology bank would thus be available for communication. She further supported Creek and Cusick's lobbying for more specific descriptions of terms, in this case specifically of those that are motor related [56]. Evident throughout these commentaries is the realisation stated by Borst and Nelson that "*one by-product of this knowledge explosion is a larger and sometimes inconsistent professional language"* [20] (p 611).

Within the field of LD and DD there are countless cross-profession articles that argue the difference between DCD, clumsy child syndrome, DAMP and developmental dyspraxia [5,8,57-59]. This is possibly the source of some of the confusion in defining praxis and co-ordination. Sheila Henderson has led the debate, feeling strongly that DCD is distinct from developmental dyspraxia as she views dyspraxia purely as the higher level difficulty in producing a movement plan, and is not a difficulty in co-ordination [57]. She also feels that dyspraxia is an inappropriate term due to it's close association to adult onset apraxia and that the literature on the latter is not appropriate to the former [57]. By viewing movement difficulty in children purely from the neurological level of the disturbance, Henderson fails to recognise the influence of motor control theory on feed-forward and feedback control of movement [34,36,38]. Open and closed loop systems theory of motor control clearly links cognitive planning difficulties to disturbance in motor coordination (even in light of the DSM-VI criteria) [38]. Missuina and Polatajko [59] argue that developmental dyspraxia is a sub-group of DCD. This labelling dilemma has recently become less of an issue in South Africa with the increasing adoption of the ICD-10 into clinical practice. It has led to the use of "Specific Developmental Disorder of Motor Function" as the overall diagnostic label, indicating the use of clearly defined terms in the ICD-10 as useful [47].

## 2.6 CONCLUSION

While the debate as to whether DCD is in fact Developmental Dyspraxia may rage on in some circles, perhaps it would be more beneficial to clarify the motor terminology used to evaluate children with movement difficulties, in order to ensure that comparison research is in fact comparing apples with apples. Fisher states, in discussing motor control,

> "*that while there is general agreement concerning the use of these terms, some theorists and researchers continue to apply the terms inconsistently, sometimes within a single discussion of motor control*" [6] (p 87).

A sound base of terminology would assist in attributing children's movement via a set of definitive, well understood criteria in order to determine if all these children do in fact fall into one group based on common clinical features.

# CHAPTER 3 – RESEARCH METHOD OVERVIEW

## 3.1 INTRODUCTION

This research project had five stages that necessitated the use of mixed methods of research, and thus combined the use of quantitative and qualitative research design [60] making use of a Delphi Technique. A similar research design was used by Krause et.al [61] in the successful development of a framework of exit-level outcomes for training physiotherapy students in South Africa.

In the five sequential stages of this study (figure 1.1 p5) the process was more quantitative in nature, but added qualitative methods and analysis were used to validate the study.

- The first stage was a qualitative analysis of the literature,
- The second stage yielded percentage representation data (quantitative),
- The third stage combined a Likert scale (quantitative) with qualitative record of the occupational therapist's definitions of the motor components,
- The fourth stage therapist groups made use of a quantitative open card sort, with the researcher taking qualitative field notes and discussion records,
- The final stage was a synthesis of the results of the first four stages.

The Delphi Technique applied in the study was not the conventional technique where a survey is sent out, the results analysed, the information reformulated, and the revised information resent to the surveyed group for additional comment [23,24]. Normally this cycle is then repeated until consensus is achieved [23,24,61]. Such research is often subject to attrition, and in many cases the repeat process is stopped due to lack of sufficient returns rather than due to consensus [24].

In this study a hybrid Delphi Technique was used, which was structured to minimise the dropout rate while ensuring that consensus was achieved. Two phases of survey were planned for this project - the first level to the general paediatric occupational therapist population and the second to expert occupational therapists. The survey stages were followed by an open card sort group stage, again with the expert occupational therapists.

Information, including both quantitative numeric data and qualitative open ended questions can be collected either simultaneously or sequentially in mixed methods research [60]. The Delphi Technique used in this study follows a sequential pattern, with quantitative data collection and analysis forming the foundation of the study and the third and fourth stages using a concurrent triangulation design [62] in which both quantitative and qualitative data were gathered and analysed [60,62]. The coming chapters discuss each stage separately and in detail with regards to research design, methods, data collection, data analysis used and discussion of the research stage.

An overview of the research design, methods and data analysis associated with each stage of the research is presented below. This illustrates the development of the study and provides evidence of the validity of the study.

### 3.1.1 Ethical Considerations

This study obtained ethical approval from the Wits Ethical Committee for study on Human Subjects prior to the study (APPENDIX B). Admission to the study was voluntary. A letter of informed consent was included with each survey (APPENDIX C1 and D) for stage 2 and 3 of the study and subjects indicated consent though their completion and return of the survey forms. Participants were free to omit their names if they felt preference for retaining anonymity. Confidentiality was maintained by separation of the biographical sections of the surveys from the survey forms on receipt as responses were not analysed according to biographical variables.

All participants in the open card sort groups (stage 4) indicated their informed consent on a form (APPENDIX E1) prior to attending the Open Card Sort Groups. Their attendance was voluntary and the participants could withdraw from the study at any time. Special permission was also obtained from the Open Card Sort Group participants to voice record and photograph the sessions. Participants were free to request feedback on the outcomes of the study.

## 3.2 STAGES OF THE STUDY

### 3.2.1 Stage 1: Definitional Audit of the Literature

The first stage (chapter 4 p29) of the study posed the research question: 'Which motor terms are used interchangeably, inconsistently and with a degree of ambiguity in the literature focused of children with LD and DD?'

The researcher did an extensive analysis of the literature in order to identify inconsistency, ambiguity and poor definition of motor terminology related to children with LD or DD. Definitions of motor related terms were gleaned from the literature and analysed for definitional precision and parsimony [21]. Terms that were consistently defined and not prone to precision or parsimony error were deemed to be unambiguous and thus not in need of further investigation. Terms whose definitions were shown to be prone to parsimony and precision errors in the literature were identified and put forward to the subsequent stages of the study.

### 3.2.2 Stage 2: Delphi Technique A: Term Clarification Survey

The research question for this stage (chapter 5 p43) was: 'How do occupational therapists practicing in the field of LD and DD commonly associate characteristics of movement to the motor components that were identified in the literature to be ambiguous, poorly defined, or inconsistently used?'

Motor components that were ambiguous and inconsistently used were identified in stage 1 along with common phrases of movement including characteristics of movement in children with LD or DD which were then compiled into a questionnaire (APPENDIX C1). Both the function and dysfunction aspect of each motor component was included and phrases related to characteristics of movement were randomly formulated in the context of motor function and motor dysfunction. The sample was a cohort of 68 South African occupational therapists practicing in the field of LD or DD, identified using cluster sampling [62] .

The Delphi A used a non-experimental survey design [60], where the data was analysed in terms of percentage of frequency. Those characteristics of movement that achieved above 50% frequency of association to a particular motor component were deemed to have met the threshold for that motor component. 68 surveys were returned, reflecting how the occupational therapists associated each characteristic of movement to the motor components. The resulting characteristics of movement that met the threshold for each motor component were formulated into a new questionnaire for the Delphi B.

### 3.2.3 Stage 3: Delphi Technique B: Expert Survey

The research questions for this stage (chapter 6 p64) were:

1. ‘How do occupational therapists who are experts in the field of DD and LD rate the relevance of the characteristics of movement identified as associating to each motor component?’
2. ‘How do these expert occupational therapists define each of the motor components?’

In this stage, the Delphi B survey (APPENDIX D) included a non-experimental component where therapists rated each characteristic of movement within the motor component identified in Delphi A on a nine point Likert scale, applying descriptive statistics to yield quantitative means. This stage also requested the participant’s opinions through defining the motor components, yielding qualitative units of meaning. The sample consisted of 28 expert occupational therapists with postgraduate qualifications and experience in the field working in the field of DD and LD. 16 respondent questionnaires were analysed.

The means and standard deviations of the rating of the characteristics of movement associated to functional motor components were compared to those of the corresponding dysfunctional components. Characteristics of movement with higher means and smaller standard deviations were considered to be more consensually representative of the associated motor component.

The definitions of each motor component provided by the respondents were individually analysed (coded [60,62]) and units of meaning were identified. The units of meaning that appeared more frequently in the definitions were considered to be more representative of the motor component. The units of meaning were synthesised into semantic clusters which assisted in the development of key parameter points for defining each motor component in the final stage. The units of meaning and characteristics of movement from this phase were placed on cards for the Delphi B.

The use of mixed methods research in this stage limited the possible researcher bias of the previous stage, as the participants were able to provide their own units of meaning to the research, and were not restricted to the list of 90 characteristics of movement provided in the Delphi A.

### 3.2.4 Stage 4: Delphi Technique C: Expert Open Card Sort

The research questions for this stage (chapter 7 p102) were:

1. 'Were the motor components selected at the start of the study those that would be representative of what the occupational therapists in the cohort would have identified, and are there other motor components that should be represented?'
2. 'Is there a strong level of agreement between the motor components identified by the open card sort group on motor function to those identified by the open card sort group on dysfunction?'

The Delphi C consisted of six open card sort groups, each containing four / five expert occupational therapists practicing in the field of LD and DD. The groups were held at various major cities in South Africa. An open card sort [63] was used to give quantitative and qualitative evidence in support of the data analysis of the Delphi B in the 3$^{rd}$ stage, contributing further to triangulation of evidence in the study. Alternate open card sort groups sorted the cards pertaining to characteristics of movement and units of meaning that related to each motor function component, while the other three open card sort groups sorted characteristics of movement and units of meaning that related to motor dysfunction components.

The groups consensually assigned cards to clusters and then assigned names to each cluster. This formed the quantitative data for this stage, which was compared for agreement between the six groups. Field observations and record of discussions were noted for qualitative triangulation [60,62]. This stage provided consensus on the clustering of motor terminology and a hierarchical structure for the FUMT.

### 3.2.5 Stage 5: Development of a Motor Taxonomy Outline

The results from the Delphi B were combined to the results of the Delphi A and were formulated into a motor taxonomy of motor components of both function and dysfunction, with the most relevant characteristics of movement and units of meaning used to assist in defining and describing each motor component. Similarly the results of Delphi Technique C were used to form a taxonomy of motor terminology. The two outlines were then synthesised with the literature from stage one to form the final FUMT for occupational therapists practicing in the field of LD and DD (chapter 8 p 127).

## 3.3 RATIONAL FOR SELECTION OF RESEARCH METHOD

The success of a research project is often in the research design and method. It is thus vital to plan a project to ensure that all aspects are covered, and that as many of the pitfalls as possible are accounted for [64].

A Delphi Technique was selected as it is designed to achieve consensus of opinion among experts in a particular field [24], and this study wished to reflect a consensus of how South African occupational therapists use the terminology related to the motor performance of children with LD or DD.

For the Delphi A (chapter 5) a wide spectrum of the population with varied level of experience was sampled, through a closed question system, in order to establish a broad but specific opinion base. It was important to have representation of a variety of levels of experience, as younger therapists may be more in touch with the literature, newer psychometric tests and current thinking in the field than some of the experienced independent practitioners. It was further important to include a wide sample as it is hoped that the final FUMT will be adopted for use by South African paediatric occupational therapists. If these occupational therapists feel that they have played a role in the development of the taxonomy, and that their opinions were valued in the process, they are more likely to be positive towards adopting the taxonomy.

The Delphi B (chapter 6) acknowledged the base set by the Delphi A, but there was concern that the list of 90 characteristics of movement could possibly have had some gaps that would result in an incomplete picture. Thus the participating expert occupational therapists were also asked to define the motor components via open ended questions in order to ensure that there were no omitted aspects of these terms. This ensured that the core characteristics of movement were comprehensively recorded. The bias of the researcher's initial list of characteristics was thus limited.

Consensus was forced in the Delphi C (chapter 7) in the use of open card sort groups. Participants had to agree on the placement of cards within each open card sort cluster (set). An open card sort was used as it does not restrict the participants to pre-labelled card clusters [63], but allows the group to generate their own clusters of cards and assign independent labels to each cluster. The open card sort method thus limited the researcher's bias of identification and selection of the motor component labels in the Delphi A of the study.

The Delphi Technique was a time efficient research method for participants as they were able to complete survey questionnaires in their own time, and the cards sort groups were limited to two to two and a half hours each.

## 3.4 VALIDITY OF THE STUDY

### 3.4.1 Audit Trail

Throughout the study an audit trail (APPENDIX F) was maintained of all decisions made, summary of discussions with supervisors, thoughts and ideas of the researcher, and observations during collection of data. An audit trail is often used in mixed methods research to assist in validating the research as it provides some context for the study, and the path the study took [62].

In this study, the audit trail provided evidence in support of selecting the open card sort group, as it was felt that there would be difficulty in achieving a third round of survey returns, and that focus groups would provide a lot of discussion, but gaining consensus would be more difficult. The task centred nature of the open card sort groups was identified as an appropriate research method.

### 3.4.2 Triangulation

Triangulation is the use of more than one data collection method and/ or data analysis method [60,62,65]. This study used mixed methods research, in stages, thus data was collected over time, in a variety of methods, both quantitatively and qualitatively.

These data collection methods included the use of qualitative analysis of literature in stage one, quantitative cross-sectional survey in stage two, cross-sectional survey using Likert scales [62,65] (quantitative) and open ended questions [65] (qualitative) in stage three and an open card sort [66] (quantitative) yielding discussion (qualitative) and field observations of the group (qualitative) in stage four.

Data analysis methods varied with each stage. The second stage used descriptive statistics of percentage representation; the third stage used means and standard deviations of the Likert scales and vertical and horizontal analysis of the open ended questions; and the fourth stage used the consensus of the group to determine motor components and their characteristics of movement for comparison between groups and the previous stage. This was supported by collateral information from field observations and the discussions during the open card sort groups.

### 3.4.3 Validity of the measuring tool

The survey was designed specifically for this research project, and was piloted on three non-paediatric occupational therapists to establish readability and appropriateness of the survey design. The adjustments made to the survey form are detailed in 5.2.4 (p45).

### 3.4.4 Member checking

This study did not use member checking as the qualitative aspects of the research were minimal, and participants had written down their responses to the open ended questions, and gave consensus during the open card sorts. There was data saturation through the use of six open card sort groups; it is unlikely that new data would emerge with additional open card sort groups. Thus the results were an accurate reflection of the participants' opinions. Member checking will be included in future stages of the study when the FUMT is integrated into clinical practice.

## 3.5 RELIABILITY AND RESEARCHER BIAS

The researcher conducted the study independently without the use of a research assistant in collection of data. As a result inter-rater reliability is not a concern in this study. The qualitative aspects of the study are not exposed to reliability constraints, but the open card sort groups could have been exposed to the influence of the researcher. This was easily controlled as the researcher observed the group, only contributing to ensuring that decisions were consensual and that all participants were actively involved. Being task centred the groups did not require facilitation of process or guidance of discussion thus the researcher had limited influence over the data.

The researcher had no direct contact with the participants during the first two stages of the study, limiting the researcher bias. Bias of the selection of the motor components being investigated were controlled for in the Delphi C by giving the participants the opportunity to create their own clusters, and assign their own labels (essentially motor component names) to their clusters.

## 3.6 CONCLUSION

The mixed methods design, using the Delphi Technique was selected for this study as it provides a valid method of conducting consensus research. It is relatively time efficient for the participants and results driven, avoiding needless excess data.

# CHAPTER 4 – STAGE 1: DEFINITIONAL AUDIT

## 4.1 INTRODUCTION

The first stage of the study posed the research question: ‘Which motor terms are used interchangeably, inconsistently and with a degree of ambiguity in the literature focused of children with LD and DD?’

Academic development is grounded in review of the existing literature, which is a possible source of confusion in terminology usage. Analysis of definitions of motor terminology in the literature was thus a logical first step in the research process.

## 4.2 METHODOLOGY

### 4.2.1 Research Design

The audit of the literature was a qualitative analysis of definitions and contexts of motor terminology use in the literature pertaining to LD and DD.

### 4.2.2 Data collection

The data was obtained through a literature search using EBSCO host, Science Direct and PubMed using the key words related to motor function in children with LD and DD such as “learning difficult*”, “developmental delay”, “motor performance AND children”, “motor function AND children”, “developmental coordination disorder”, “dyspraxia”. The asterisk indicates that the suffix of the word can change in the search. All available full text articles published after 1990 were included for analysis. Books published after 1990 that provided a significant contribution to the theories of occupational therapy treatment of children with LD and DD were included. Original theoretical works of pioneers within the context of this research, specifically the original work of A Jean Ayres [33] who is considered a pioneer in the field of sensory integration and Harrow [53] who developed the only other taxonomy that closely resembles the focus of this study were included. Psychometric assessment manuals of tests commonly used to measure the motor performance of children with LD and DD were also included.

All the texts were read and definitions or descriptions of motor terms were extracted exactly and tabulated for analysis. Data within the table was grouped according to similarity of terms to facilitate analysis (APPENDIX G1).

### 4.2.3 Data Analysis

The data was analysed vertically and horizontally for definitional precision and horizontally for definitional parsimony [21]. The definitions should be clearly stated, including all aspects that discriminate this term from other similar terms (Definitional Precision). Definitions should refine terms in such a way that any example of the term would be attributed solely to that term and not to any others (Definitional Parsimony). Parsimony error is more likely to occur when some of the terms being defined are used to define other terms within the same hierarchical level [21]. Synonyms for parsimony are stinginess, frugality and prudence [67] indicating the refinement and unique belonging of the features and characteristics to the particular term.

Definitional precision was investigated by noting:

1. the similarity / discrepancy of meaning of all the definitions gleaned pertaining to a particular term,
2. the presence of the term (or part of the term) within its own definition,
3. or the definitions for two different terms presenting with similar meaning.

Definitional parsimony was investigated by noting:

1. the interchangeable nature of terms,
2. or the frequency of use of other terms within a particular terms definition.

Other terms used within a term can indicate two variables, firstly that the other terms are hierarchically lower than the term (the term comprising of smaller units of the other terms); the second is that there is ambiguity and term confusion [21].

## 4.3 RESULTS

### 4.3.1 Literature accessed for definitional audit

There is a vast amount of literature covering motor development and developmental motor delay in children, arising from educational, psychological and therapeutic science professions. Surprisingly, little of the literature contains direct definitions of terms related to motor performance. Although over 80 journal articles were accessed, only 40 contained definitions or descriptions of motor terms. Table 4.1 shows the breakdown of literature accessed for the definitional audit. The full list of resources is in APPENDIX G2.

**Table 4.1** Literature accessed for definitional audit

| | |
|---|---|
| Books | 17 |
| Psychometric assessment manuals | 4 |
| Book chapters (not included in books list) | 10 |
| Journal articles | 40 |
| Thesaurus | 1 |

### 4.3.2 Audit of the Literature

Table 4.2 presents a portion of the list of definitions gleaned directly from the literature. As this is an audit of definitions, direct quotes from the sources have been taken in all instances. Quotation marks have thus not been included as all definitions are direct quotes. The first quotes in most instances are taken from the UIT-III [19], and The Framework [2]. Where the term is not used in either document, the first is then taken from a Sensory Integration source, and thereafter from other theories and practice domains. Words in bold italics at the start of a definition reflect the term defined in that particular text, that the researcher felt was synonymous with the main term being defined. While this is a comprehensive audit, it represents only a few of the available definitions for each term, in order to present the core of definitions available, and in the interests of efficient analysis. There are many other examples of each definition formulated slightly differently, but at least one of each version for a particular term has been included in order to highlight similarities and inconsistencies. In the list (v) refers to verb and (n) refers to noun.

#### 4.3.2.1 Audit of Definitional Precision Error

The literature highlighted definitional precision errors for motor terms, as can be seen in table 4.2. There are a variety of definitions available for "co-ordination", "postural control" and "skill" as seen by the colour highlights. One colour within a definition represents a single meaning unit for that particular definition. More than one highlighted colour shows more than one meaning unit represented from one definition to the next. The word "skills" appears often in the definitions for motor skills, and sequence appears in the second definition for sequencing. There is a relative sameness of the definitions for: "bilateral integration" and "bilateral co-ordination"; "skills" and "abilities" and "praxis" and "motor planning".

**Key to tables 4.2 – 4.4**

Text colour

| | |
|---|---|
| **Orange**: | words related to **co-ordination** |
| **Purple**: | words related to **postural control** |
| **Brown**: | words related to **motor control** |
| **Yellow-green**: | words related to **sequencing** |
| **Red**: | words related to **motor skills** |
| **Blue**: | words related to **integration of movement** |
| **Green**: | words related to **praxis** |

Highlighted text

Each colour in the first section table 4.2 reflects a different construct of meaning **within** the definition of **that** term. The colours are not of the same meaning from term to term. Example: coordination has two constructs of meaning, postural control has four.

**Table 4.2** Function related motor terms demonstrating precision errors

| **Motor function** | |
|---|---|
| **Discrepancy of meaning** | |
| **Coordination** (n) | ▪ Relates to using more than one body part to interact with task objects in a manner that supports task performance [2] pg 621 (this is a paraphrase of Fisher [1]).<br>▪ ***Coordinates*** ***(v)***: Uses two or more body parts together to stabilize and manipulates task objects during bilateral motor tasks [2] pg 621 (this is a paraphrase of Fisher [1]).<br>▪ Harmonization, organization, synchronization, bringing together [67].<br>▪ Regulating the force, range, direction, velocity and rhythm of movements and in maintaining the synergy that normally exists among the various muscles contributing to a motor behaviour [38] pg 279. |
| **Postural control** | ▪ Using righting and equilibrium adjustments to maintain balance during functional movements [19] p1053.<br>▪ ***Postural Reflexes***: Can be organised on a scale encompassing reflexes which cause little more than tonus (slight tensions) in certain body parts, to more tensions as an extensor rigidity, to even more specific complex **postural** adjustments such as placing and hopping reactions [53] p 49.<br>▪ **Postural** muscle contractions occur which not only stabilize the individual joints, but also may produce subtle movements of the trunk to counterbalance movements of the arms to maintain the body's centre of gravity within the **postural** base [68] p3.<br>▪ The body's position in space for the dual purpose of stability and orientation [68] p3.<br>▪ [It] has been closely associated with the ability to correctly perceive the environment through peripheral sensory systems, as well as to centrally process and integrate proprioceptive, visual, and vestibular inputs at the level of the central nervous system (CNS). That ability enables the CNS to form appropriate muscle synergies needed so that equilibrium can be maintained [69] p161.<br>▪ "Balance **control**", "balance regulation", "balance strategy", "equilibrium **control**" and "balance performance" are all used by Hatzitaki et.al [69] with little differentiation between the definitions of each. |
| **Skill** | ▪ Small units of performance. Features of what one does [2] p612.<br>▪ ***Performance skills***: Observerable elements of action which have implicit functional purpose [1] p113.<br>▪ Discrete behavioural elements [1] p113.<br>▪ The capacity of producing a performance result with maximum certainty, minimum energy or minimum time; developed as a result of practice [37].<br>▪ 2 aspects: 1) denotes an action or task that has a specific goal to achieve, using voluntary movement. 2) Indicate the quality of performance, the proficiency adherence to very stringent evaluation criteria [36] p10. |
| **Presence of term within its own definition** | |
| **Motor skills** | ▪ **Skills** in moving and interacting with task, objects and environment [2] p621.<br>▪ Observable operations used to move oneself or objects [1] p113.<br>▪ Movement of self or objects through space for the **skilful** execution of daily life task performance [1] p116.<br>▪ The result of the acquisition of a degree of efficiency when performing a complex movement task [53] p 77. |
| Gross **motor skills** | ▪ Catching, throwing, jumping, kicking, running, hopping, skipping with rope, balancing [70] p103.<br>▪ Characterized as involving large musculature and a goal where the precision of movement is not as important to the successful execution of the **skill** as it is for fine **motor skills** [36] p10.<br>▪ Fundamental motor **skills**, such as walking, jumping, throwing, leaping etc., are considered to be gross **motor skills** [36] p10 |

| | |
|---|---|
| Fine **motor skills** | ▪ Colouring-in, cutting out , pasting, writing, managing or manipulating puzzles or construction toys [70] p103.<br>▪ Can be used interchangeably with "hand **skills**", "fine motor **coordination**" and "dexterity" [71] p 304.<br>▪ **Skills** that require **control** of the small muscles of the body to achieve the goal of the **skill**. Generally, these **skills** involve eye-hand **coordination** and require a high degree of precision of movement for the performance of the particular **skill** at a high level of accomplishment. Writing, drawing, sewing and fastening a button are examples of fine **motor skills** [36] p10. |
| **Sequencing** | ▪ Placing information, concepts, and actions in an order [19] p 1053.<br>▪ The ability to appropriately order a series of actions, an important element of **motor planning**. This term also is sometimes used to refer to the ability to replicate a series of sensory stimuli in the correct order [54] p 411.<br>▪ Refers specifically to anticipatory projected movement **sequences** (i.e. the feedforward dependent **sequence** of movements necessary to get ones limbs to a particular place in time to act) [5] p8. |
| | **Relative sameness of definitions** |
| Bilateral **integration** | ▪ **Coordinating** both body sides during activity.[19] p 1053<br>▪ The brains function that enables **coordination** of function of the two sides of the body [54] p 410. |
| Bilateral **coordination** | ▪ The ability of the two sides to of the body to work together motorically [54] p 410.<br>▪ Refers to the use of two sides of the body, including the trunk [6]<br>▪ ***Bimanual coordination***: **Motor skills** in which successful performance depends on two arms performing simultaneously [36] p143.<br>▪ ***Bilateral hand use***: Use of two hands together to accomplish an activity [50] p 290. |
| | |
| Ability | ▪ Stable, enduring trait that, for the most part, are genetically determined and that underlie individuals' **skilled** performance [37] p 28.<br>▪ A component in performing a variety of **skills** [36] p 10. |
| **Skill** | ▪ Small units of performance. Features of what one does [2] p 612.<br>▪ ***Performance skills***: Observerable elements of action which have implicit functional purpose [1] p 113.<br>▪ Discrete behavioural elements [1] p 113.<br>▪ The capacity of producing a performance result with maximum certainty, minimum energy or minimum time; developed as a result of practice [37].<br>▪ 2 aspects: 1) denotes an action or task that has a specific goal to achieve, using voluntary movement. 2) Indicate the quality of performance, the proficiency adherence to very stringent evaluation criteria [36] p 10. |
| Motor ability | ▪ A general trait or capacity of an individual that is related to the performance of a variety of **motor skills** [36] p 10. |
| **Motor skills** | ▪ **Skills** in moving and interacting with task, objects and environment [2] p 621.<br>▪ Observable operations used to move oneself or objects [1] p 113.<br>▪ Movement of self or objects through space for the **skilful** execution of daily life task performance [1] p 116.<br>▪ The result of the acquisition of a degree of efficiency when performing a complex movement task [53] p 77. |
| | |
| **Praxis** | ▪ Conceiving and **planning** a new motor act in response to an environment demand [19] p1053.<br>▪ Is not just movement, but a *learned* ability to plan and direct a temporal series of **coordinated** movements towards achieving a result – usually a **skilled** and non-habitual act [33] p170.<br>▪ The ability to conceptualise, organise and execute non-habitual motor tasks (Ayres 1979, 1981) [Cited in 54] p 410. |
| **Motor planning** | ▪ The process of organising a **plan** for actions. This aspect of **praxis** is a cognitive process that precedes the performance of a new action [54] p 410. |

#### 4.3.2.2 Audit of Definitional Parsimony Error

The literature highlighted definitional parsimony errors noted in table 4.3. The use of colour highlights the frequency of terms appearing in the definitions of other terms. Definitional parsimony can be seen by definitions having more than one colour appearing, such as "visual motor integration" and "praxis". This is also demonstrated in the dysfunctional terms (table 4.4) for "dyspraxia". The words "control", "co-ordination", "integration" and "skills" are frequently used to define terms containing one of these four words.

**Table 4.3** Function related motor terms demonstrating parsimony errors

| Motor function | |
|---|---|
| **Interchangeable terms** | |
| Gross **co-ordination** | ▪ Using the large muscle groups for **controlled**, goal directed movements [19] p 1053.<br>▪ The ability to **coordinate** the action of several parts of the body while the body is in motion. Fleishman cited in [36] p260. |
| **Integration** | ▪ Addition, amalgamation, combination, assimilation [67]. |
| Visual- motor **integration** | ▪ **Coordinating** the interaction of information from the eyes with the body movements during activity [19] p1053.<br>▪ Refers to the interaction of visual **skill**s, visual perceptual **skill**s and **motor skills** [50] p 289.<br>▪ the degree to which visual perception and finger-hand movements are well **coordinated** [51] p 19. |
| Bilateral **integration** | ▪ **Coordinating** both body sides during activity [19] pg 1053.<br>▪ The brains function that enables **coordination** of function of the two sides of the body [54] p 410. |
| **Coordination** (n) | ▪ Relates to using more than one body part to interact with task objects in a manner that supports task performance [2] pg 621 (this is a paraphrase of Fisher [1]).<br>▪ ***Coordinates (v)***: Uses two or more body parts together to stabilize and manipulates task objects during bilateral motor tasks [2] pg 621 (this is a paraphrase of Fisher [1]).<br>▪ Harmonization, organization, synchronization, bringing together [67]. |
| Bilateral **coordination** | ▪ The ability of the two sides to of the body to work together motorically [54] p 410.<br>▪ Refers to the use of two sides of the body, including the trunk [6] p295.<br>▪ ***Bimanual coordination***: **Motor skills** in which successful performance depends of two arms performing simultaneously [36].<br>▪ ***Bilateral hand use***: Use of two hands together to accomplish an activity [50] p290. |
| Oral-motor **control** | ▪ **Coordinating** oropharyngeal musculature for **controlled** movements [19] p1053. |
| Fine **co-ordination**/ dexterity | ▪ Using small muscle groups for **controlled** movements, particularly for object manipulation [19] p1053. |
| **Sequencing** | ▪ Placing information, concepts, and actions in an order [19] p 1053.<br>▪ The ability to appropriately order a series of actions, an important element of **motor planning**. This term also is sometimes used to refer to the ability to replicate a series of sensory stimuli in the correct order [54] p 411.<br>▪ Refers specifically to anticipatory projected movement **sequences** (i.e. the feedforward dependent **sequence** of movements necessary to get ones limbs to a particular place in time to act) [5] p8. |

| | |
|---|---|
| **Praxis** | ▪ Conceiving and planning a new motor act in response to an environment demand [19] p 1053.<br>▪ Is not just movement, but a *learned* ability to plan and direct a temporal series of **coordinated** movements towards achieving a result – usually a **skilled** and non-habitual act [33] p 170.<br>▪ The ability to conceptualise, organise and execute non-habitual motor tasks (Ayres 1979, 1981) [Cited in 54] p 410. |
| Fine **motor skills** | ▪ Can be used interchangeably with "hand **skills**", "fine motor **coordination**" and "dexterity" [50] p 304.<br>▪ **Skills** that require **control** of the small muscles of the body to achieve the goal of the **skill**. Generally, these **skills** involve eye-hand **coordination** and require a high degree of precision of movement for the performance of the particular **skill** at a high level of accomplishment. Writing, drawing, sewing and fastening a button are examples of fine **motor skills** [36]. |

The dysfunction terms (table 4.4) demonstrated similar errors to the corresponding function terms, indicating consistency of ambiguity across both the function and dysfunction forms of the terms.

**Table 4.4** Dysfunction related motor terms demonstrating parsimony errors

| Motor dysfunction | |
|---|---|
| **Dyspraxia** | ▪ A disorder of sensory **integration** interfering with the ability to plan and execute **skilled** non-habitual motor tasks. Usually, there is some inability to relate the **sequence** of the motions to each other. The **dyspraxic** child can and does learn specific **motor skills** through repeated attempts and executions, but as long as he has not acquired the generalised ability to plan unfamiliar tasks, apraxia is still present [33] p 165.<br>▪ A developmental condition in which the ability to plan unfamiliar motor tasks is impaired [5] p 477.<br>▪ A generic term that refers to developmentally based **practic** disorders with a variety of etiologies [5] p 71.<br>▪ Difficulty translating sensory information into **planning** and/or **sequencing** physical movement, especially new or unfamiliar actions [72] p 207.<br>▪ Difficulty **planning motor** activities [72] p 207.<br>▪ A condition in which the individual has difficulty with **praxis**. In children, this term is usually used to refer to **praxis** problems that cannot be accounted for by a medical condition, developmental disability or lack of environmental opportunity [54] p 410. |
| Bilateral **integration** and **sequencing** deficits | ▪ A relatively high-level of sensory integrative based **dyspraxia** characterised by poor bilateral **coordination** and difficulty with projected action **sequences**; thought to have its base in poor processing of vestibular and proprioception information [5] p 477. |
| Bilateral **integration** deficits | ▪ The inability to use the two sides of the body together in a **co-ordinated** manner [6] p102. |
| Motor **coordination** difficulties | ▪ Other terms used to describe these difficulties include developmental **dyspraxia**, awkwardness, motor learning problems and more recently developmental **coordination** disorder (DCD) [73] p 279.<br>▪ Labels include clumsy, **dyspraxia**, **apraxic**, and physically awkward. More recently individuals manifesting such movement difficulties that cannot be attributed to intellectual deficiencies or to evident neurological structural abnormalities have been classified as exhibiting developmental **coordination** disorder [74] p 227.<br>▪ ***Ataxia***: an unsteadiness, incoordination or clumsiness of movement and is most often in the context of intended or volitional movement. [Movements] become halting, jerky and imprecise [38] p 279. |

4.3.2.3 Audit of Definitional Precision and Parsimony Consistency

The terms that form the foundation components for movement such as sensory perceptual terms related to motor function, the Neuromusculoskeletal functions of the body and the internal motor components, as seen in table 4.5 appear to be consistently used in the literature.

**Table 4.5** Function terms that are consistently free of precision and parsimony errors

| | |
|---|---|
| **Sensory Perceptual terms related to motor function** | |
| Body scheme | ▪ Acquiring an internal awareness of the body and the relationship of the body parts to each other [19] p 1053.<br>▪ An unconscious mechanism underlying spatial motor coordination that provides the central nervous system with information about the relationship of the body and it's parts in space [5] p 477.<br>▪ An internal representation of the body; the brain's map of body parts and how they interrelate [54] p 410. |
| Kinaesthesia | ▪ Identifying the excursion and direction of joint movement [19] p 1053.<br>▪ ***Kinesthesis***: Refers to all the information about the position and movement of the body parts received from receptors in the muscles, joints, and inner ear (or vestibular system) [11] p 130. |
| Tactile | ▪ Interpreting light touch, pressure, temperature, pain and vibration through skin contact / receptors [19] p 1052.<br>▪ ***Touch functions***: sensitivity to touch, ability to discriminate [2] p 625.<br>▪ Sensation derived from stimulation to the skin [5] p 480. |
| Proprioception | ▪ Interpreting stimuli originating in the muscles, joints and other internal tissues that give information about the position of one body part in relation to another [19] p 1052.<br>▪ ***Proprioception function***: Kinaesthesia, joint position sense [2] p 625.<br>▪ Sensations derived from movement (i.e. speed, rate, sequencing, timing and force) and joint position. Derived from stimulation to muscle and, to a lesser extent, joint receptors especially from resistance to movement [5] p 479. |
| Vestibular | ▪ Interpreting stimuli from the inner ear receptors regarding head position and movement [19] pg 1052.<br>▪ ***Vestibular function***: balance [2] p 625.<br>▪ Sensation derived from stimulation to the vestibular mechanism in the inner ear that occurs through movement and position of the head; contributes to posture and maintenance of a stable visual field [5] p 480. |
| **Neuromusculoskeletal functions of the body** | |
| Reflex | ▪ Eliciting and involuntary muscle response to sensory input [19] p 1053.<br>▪ ***Motor reflex functions***: stretch reflex, asymmetric tonic neck reflex [2] p 625. |
| Range of motion | ▪ Moving body parts through an arc [19] p 1053.<br>▪ Passive = mobility of joint functions [2] p 625. |
| Muscle tone | ▪ Demonstrating a degree of tension or resistance in a muscle at rest and in response to stretch [19] p 1053.<br>▪ ***Muscle tone functions***: degree of muscle tone (flaccidity, spasticity) [2] p 625. |
| Strength (muscle) | ▪ Demonstrating a degree of muscle power when movement is resisted, as with objects or gravity [19] pg 1053.<br>▪ Muscle power functions [2] p 652. |

| | |
|---|---|
| Endurance | ▪ Sustaining cardiac, pulmonary, and musculoskeletal exertion over time [19] p 1053.<br>▪ ***Endures (v)***: Persists and completes the task without obvious evidence if physical fatigue, pausing to rest, or stopping to "catch one's breath" [2] p621 (this is a paraphrase of Fisher[1] p119).<br>▪ Muscle endurance functions [2] p 625. |
| Postural alignment | ▪ Maintaining biomechanical integrity among body parts [19] p 1053.<br>▪ ***Aligns***: Maintains an upright sitting or standing position, without evidence of a need to persistently prop during the task performance [2] p 621.<br>▪ ***Aligns***: Maintains vertical alignment of the body. Maintain the even distribution of ones body over ones base of support [1] p 116. |
| Soft tissue integrity | ▪ Maintaining anatomical and physiological condition of interstitial tissue and skin [19] p 1053. |
| Diadokokinesia | ▪ Rapidly alternating movements; when testing for sensory integrative dysfunction we generally evaluate diadokokinesis of the forearms [5] p 477. |
| **Internal motor components** | |
| Laterality | ▪ Using the preferred unilateral body part for activities requiring a high level of skill [19] pg 1053. |
| Grasp | ▪ Attainment of an object with the hand [50] p 290 |
| Stabilizes | ▪ Maintains trunk control and balance while interacting with task objects such that there is no evidence of transient (i.e. quick passing) propping or lack of balance that affects task performance [2] p 621 (this is a paraphrase of Fisher [1] p 116).<br>▪ Steadying ones body and maintaining trunk control and balance. Maintain dynamic postural control during trunk or limb movements used in occupational performance [1] p 116. |
| Co-contraction | ▪ A pattern of activity characterized by the simultaneous contraction of the agonist muscles (i.e., those that produce the action) and the antagonist muscles (i.e., those that oppose the action) [37] p 195. |
| Positions | ▪ Positions body, arms, or wheelchair in relation to task objects and in a manner that promotes the use of efficient arm movements during task performance [2] p 621 (this is a paraphrase of Fisher [1] p 117). |
| Bends | ▪ Actively flexes, rotates, or twists the trunk in a manner and direction appropriate to the task [2] p 621(This is a paraphrase of Fisher[1] p 117 who had included that it requires trunk mobility). |
| In-hand manipulation | ▪ Adjustment of an object within the hand after grasp [50] p 290. |
| Manual Dexterity | ▪ When performing a manual task the head, the eyes, the hand and the trunk function as a unit [11] p 123. |
| Reaches | ▪ Extends, moves the arm (and when appropriate, the trunk) to effectively grasp or place the task objects that are out of reach, including skilfully using a reacher to obtain task objects [2] p 621 (this is a paraphrase of Fisher [1] p 117).<br>▪ ***Reach***: Movement of the hand to a desired location. Reach is coded for direction and distance in relation to the body scheme; the object's location in relation to a person is important for the action [5] p 479.<br>▪ ***Reach***: Movement of the arm and hand for the purpose of contacting an object with the hand [50] p 290. |
| Ideation | ▪ Conceptualizing an action; knowing what to do [5] p 478. |

4.3.2.4 Audit of Terms Not Frequently Found In Literature

Table 4.6 contains terms used be Fisher [1] and included in the Framework [2], that are seldom noted in research literature. These terms are evident in literature pertaining to the Assessment of Motor and Process Skills (AMPS) [52], and some literature on the MOHO, but are in limited use across professions and other occupational therapy research outside of the AMPS and MOHO.

**Table 4.6** Terms from Fisher [1,2] that are seldom implemented

| | |
|---|---|
| Manipulates (v) | ▪ Uses dextrous grasp-and-release patterns, isolated finger movements and coordinated in-hand manipulation patterns when interacting with task objects [2] p 621 (this is a paraphrase of Fisher [1]). |
| Flows (v) | ▪ Uses smooth and fluid arm and hand movements when interacting with task objects [2] p 621 (this is a paraphrase of Fisher [1]). |
| Moves (v) | ▪ Pushes, pulls, or drags task objects along a supporting surface [2] p 621 (this is a paraphrase of Fisher [1] who also included that it can be along a supporting surface or about a weightbearing axis). |
| Transports (v) | ▪ Carries task objects from one place to another while walking, seated in a wheelchair, or using a walker [2] p 621 (this is a paraphrase of Fisher[1] p 118). |
| Lifts (v) | ▪ Raises or hoists task objects, including lifting an object from one place to another, but without ambulating or moving from one place to another [2] p 621 (this is a paraphrase of Fisher [1] p 118). |
| Calibrates (v) | ▪ Regulates or grades the force, speed, and extent of movement when interacting with task objects (e.g., not too much or too little) [2] p 621 (this is a paraphrase of Fisher [1] p 118). |
| Paces | ▪ Maintains a consistent and effective rate of performance throughout the steps of the entire task [2] p 621 (this is a paraphrase of Fisher [1] p 119 who added: within a reasonable amount of time). |
| Walks | ▪ Ambulates on level surfaces and changes direction while walking without shuffling the feet, lurching, instability or using external supports or assistive devises (e.g. cane, walker, wheelchair) during the task performance [2] p 621.<br>▪ Ambulating on level surfaces. It includes the ability to turn around and to change direction while walking. Unsteadiness or shuffling, lurching, and ataxia are examples of difficulty in walking. Using a wheelchair or ambulating with an assistive device represent modified methods [1] p 117. |
| Grips (v) | ▪ Pinches or grasps task objects with no “grip slips” [2] p 621 (this is a paraphrase of Fisher [1] p 118). |

## 4.4 DISCUSSION

This stage of the study investigated the presence of ambiguity and inconsistency of use of motor terminology present in literature related to children with LD and DD. A possible source of ambiguity and confusion is that much of the literature investigated failed to provide definitions for the terms contained within the text. This was specifically evident in review of journal articles. Research investigates many aspects of motor function, yet the articles published on the studies frequently neglect to define the constructs that the study is measuring or investigating. This was particularly evident in Hatzitaki et.al [69] who, while investigating balance control in children, used several terms (“balance regulation”, “balance strategy”, “equilibrium control” and “balance performance”) related to balance and postural control without clarifying their similarity, difference or interchangeable nature. It is difficult to gain a clear understanding of the constructs being investigated in the study due to the ambiguous introduction to the article. The reader may use their own interpretation of each of these terms differently, thus altering the general meaning and context of the article as a whole.

The audit of the literature demonstrated that motor terminology is predominantly defined in the content of books, specifically academic text books, which contain definition lists or glossaries of terms. Another reliable source of definitions is within the manuals of psychometric assessments that are designed to measure specific aspects of motor function in children. There was limited evidence of definitions of motor terminology in research articles.

The motor component terms that form the fundamental units of movement (table 4.5) appear to be consistently used and well defined in the literature. These terms were also usually common across professions, and do not therefore require further investigation.

The AMPS [52], MOHO [1] and the Framework [2] all contain terms defined by Fisher that can be used to describe motor performance. In conducting the audit of the literature it was evident that many of these terms (see table 4.6) are not used in literature that does not refer to or investigate either the AMPS or MOHO. These terms were also unrepresented outside of occupational therapy literature. Inclusion of these terms within a FUMT related to LD and DD would not support the objective of the study which is to use terms that are familiar to occupational therapists within this FUMT. These terms were thus eliminated at this stage of the study.

The audit of the literature indicated that motor terms that pertain to clusters of movement and which are hierarchically higher developmentally and structurally, are the terms that were ambiguous and inconsistently used in the literature.

Precision errors in the definitions of motor components found in the literature were identified to focus on the functional terms of **co-ordination**, **integration**, **postural control**, **sequencing**, **motor skills** (and motor ability), and **praxis** (and motor planning). Parsimony error was evident in the motor components of **co-ordination**, **control**, **motor skills**, **integration**, **sequencing** and **praxis**. These errors were consistent in the dysfunctional context, although controlled movement failed to emerge here. The component **motor control** is strongly associated to motor learning theories [36] and thus is possibly a less ambiguous term in the literature.

## 4.5 CONCLUSION

There was strong evidence of precision and parsimony errors in the function terms related to "praxis", "postural control", "co-ordination", "integration of movements" (be it in the context of bilateral integration or visual motor integration), "sequencing of movements" and "motor skills". Similar precision and parsimony errors were evident in the dysfunction form of each of these terms. These six terms required further investigation into the manner that occupational therapists practicing in the field of LD and DD use these terms. Both the function and the dysfunction forms of these terms were put forward to the Delphi A (second stage) of the study.

# CHAPTER 5 – STAGE 2: DELPHI TECHNIQUE A: TERM CLARIFICATION SURVEY

## 5.1 INTRODUCTION

The Delphi A posed the research question: 'How do occupational therapists practicing in the field of DD and LD commonly associate characteristics of movement to the motor components that were identified in the literature during stage 1 to be ambiguous, poorly defined, or inconsistently used?'

The literature analysed in stage 1 indicated that basic biomechanical terms such as 'muscle tone', 'range of motion' and 'muscle strength' were consistently used and well defined. These terms did thus not need investigation within the study. As indicated in the review of the literature however there was much discrepancy regarding the use of terms like 'praxis', 'motor control', 'co-ordination', 'sequencing of movement', 'integration of movement', 'postural control' and 'motor skills'. As a result these terms were selected as the motor components to be investigated in this study, with their associated dysfunction related motor components being included as well.

## 5.2 METHODOLOGY

### 5.2.1 Research Design

A non-experimental survey research design was used for this stage of the research [65]. This design is efficient in determining the opinions or attitudes of the population at a given time [60,65]. In order to be representative of the population the sample group must be demographically representative of the population. This stage was cross-sectional in nature, where all data was collected over a period of 4 weeks.

### 5.2.2 Population

The population for this stage of the study were qualified occupational therapists registered with the Health Professions Council of South Africa (HPCSA) practicing in the field of paediatrics, and treating children with LD and/or DD. There are approximately 300 occupational therapists in this category, although this number is an estimate based on information from the Occupational Therapy Association of South Africa (OTASA) [3]. OTASA does not represent the full contingent of practicing occupational therapists, as there are therapists who are not affiliated to the professional association. There is no current published census available on how many HPCSA registered occupational therapists practice in each particular area of interest, thus the OTASA register was considered the most appropriate population indication. OTASA members were also the most accessible, as there was a comprehensive contact list, in many cases including email addresses.

### 5.2.3 Sample

Cluster sampling [62] was used for this stage of the study by distributing the self administered questionnaire to all members of OTASA (this limitation is discussed in 5.4.4 (p60). They received an information letter explaining the study, and the role that they were to play in this stage should they wish to participate.

Members were asked not to participate if they did not meet the following inclusion criteria:-

- Qualified occupational therapists practicing in Southern African Development Community (SADC)
- Occupational therapists registered with the HPCSA
- Occupational therapists practicing in the field of paediatrics, with a portion of the clientele having LDs and/or DD.

All OTASA members meeting the inclusion criteria (estimated 300 occupational therapists) had equal opportunity to participate and the occupational therapists who returned the survey questionnaires formed the participants for this stage of the study. Their informed consent was assumed through their active completion of the survey form.

The following exclusion criteria were used to eliminate a respondent's survey form from the sample as they did not fit the requirements identified:

- Occupational therapists who were doing their community service year.
- Occupational therapists who were practicing in paediatrics, but who did not indicate exposure to clients with DD or LD.

One survey form was received that was excluded based on these criteria.

### 5.2.4 Measuring Tool

The measuring tool for the survey was developed in the form of a cross-sectional, self administered questionnaire [60] (APPENDIX C1) This type of tool was selected as it was deemed a reliable and time efficient method of receiving data. The survey generated quantitative data from the sample that was representative of the views of the population, irrespective of their level of experience, physical location within the country or their undergraduate academic training centre.

The survey was designed specifically for this research project, and was piloted on three non-paediatric occupational therapists to establish readability and appropriateness of the survey design. Minor adjustments were made to the demographic part of the survey form (changed the breakdown of fields of practice), but the feedback indicated that the length of the survey was appropriate and that the design with the entire survey on a folded A3 page made the survey visually less daunting to the participant. The three therapists found the completion requirements of the survey to be logical and easily understandable with no ambiguity. The number of characteristics of movement was increased from 76 to 90, as one of the three therapists (whose area of practice was in adult physical occupational therapy) felt in the pilot of the survey form that the list could be more comprehensive, and that more dysfunction orientated phrases were needed.

The final survey listed 90 numbered phrases, which depict characteristics of movement. These characteristics of movement were gleaned from the literature and the researcher's clinical experience. Characteristics of movement were termed to reflect both movement function and movement dysfunction e.g. "cutting on a straight line" versus "difficulty cutting on a straight line".

The survey required the occupational therapists to place the number of each characteristics of movement under one or more of the following motor component headings related to function: praxis, postural control, integration of movement, sequencing of movements, co-ordination, and motor skill; or motor component headings related to dysfunction: dyspraxia, poor postural control, poor integration of movement, poor sequencing of movements, unco-ordinated movements, and poor motor skills. These were the motor components noted as being handled inconsistently in the literature (Chapter 4), resulting in ambiguity and poorly defined term usage. Occupational therapists were requested to use their personal judgement and the context of their own practice for making their decisions.

The participants were given the table of 90 numbered descriptive phrases (characteristics of movement) and another table with the six motor components related to function and the corresponding six motor components related to dysfunction. There was sufficient space under each motor component for the therapists to write (match) the number allocated to each of the characteristics of movement that they felt were associated to that motor component. This allocation process can be likened to a closed card sort [63]. This produced nominal data for analysis [65].

### 5.2.5 Data collection

The survey was posted (and duplicate e-mailed in some cases) to 1200 occupational therapists through the use of the OTASA all-member mailing. This was the full OTASA membership in 2003 [3] (when this stage of the study was conducted). The survey included an information letter (APPENDIX C1), and informed consent to participate was implied through completion and return of the survey form. The survey requested that only paediatric occupational therapists complete and return the survey. Email reminders were also sent a week after the postal survey was due to arrive in order to increase the rate of return. The researcher had no direct contact with the population.

### 5.2.6 Analysis

The data was analysed using descriptive statistics, in terms of percentage representation of a characteristic of movement in each motor component. This indicated the percentage of occupational therapist respondents who felt that a particular characteristic of movement represented or was associated to a specific component of motor function or dysfunction in children with LD or DD.

A representation of 50% or more was considered to be significant enough for inclusion of that characteristic of movement into the given motor component. This percentage had to be set at a level lower than the researcher anticipated (85%), as the consensus shown in the results was lower than had been expected under each component. A threshold of 50% representation was thus used to select the characteristics of movement that were associated to a motor component from those that were not. This supports the need for term clarification regarding the use of motor terminology among South African paediatric occupational therapists.

## 5.3 RESULTS

### 5.3.1 Sample Demographics

Approximately 50% of the practicing occupational therapists registered with OTASA are thought to be practicing in the field of paediatrics as determined by the OTASA membership information [3]. Of this, it is estimated that no more than half would be in the field of LD and DD, while the remainder may be in paediatric neurology (cerebral palsy), paediatric cognition (mental retardation) and paediatric psychiatry (Autism, Schizophrenia, Anorexia). Sixty eight surveys were returned from paediatric occupational therapists practicing in the field of LD and DD in South Africa. The return rate was thus 22.66%, which lower than the 30% common in mailed surveys [62], but was an expected level of return in light of the time constraints of practicing occupational therapists. Literacy was not considered a factor limiting response rate as the population for the study have higher education qualifications. Surveys were returned via post, email or fax, at the discretion and funding of the participant.

Response bias was considered in terms of the effect that the members of the target population who did not respond to the survey could have had on the survey results, had they chosen to participate [60]. Response bias was limited in this study as the demographics of the respondents was varied and adequately distributed across the study population. The latter stages of the study further serve to limit this bias in that the sample was selected for their knowledge and experience. The occupational therapists that did not respond to the research were unlikely to have swayed the results due to there being no significant group of paediatric occupational therapists that was omitted.

The respondents ranged from having 6 months to over 30 years of clinical paediatric occupational therapist experience. They were predominantly from Gauteng, but there was representation within the sample from each of the provinces of South Africa (figure 5.1), with the exception of the Northern Cape.

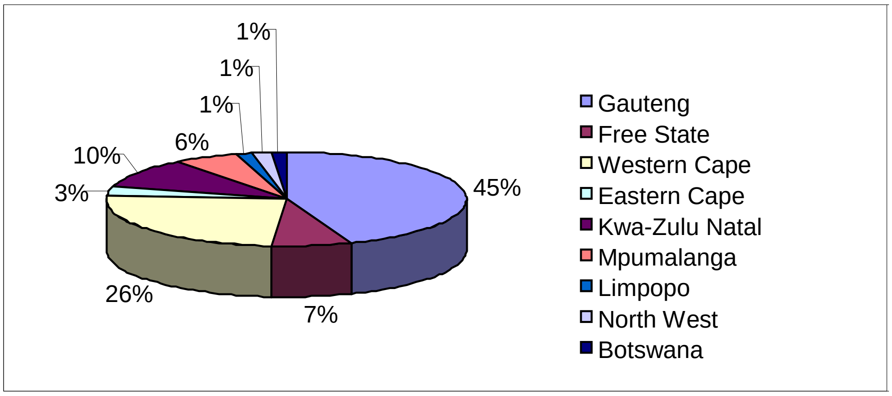



**Figure 5.1** Provincial Residential Distribution of the Sample

The respondents were also representative of each of the South African occupational therapist undergraduate academic training sites, reflecting the teaching practices across the country with limited bias towards the methods of a particular undergraduate training style.

The distribution of practice environment was weighted with the majority in Private Practice (86.76%), some working in Remedial Schools (13.24%), Hospitals (5.88%), Special Education Schools and Non-profit Organisations (4.41% each). It is not possible to determine if this weighting is proportionate to the population as there are no statistics available on practice environment. Some of the respondents indicated that they work in more than one setting, thus accounting for the sum of the percentages exceeding 100%.

In terms of qualifications, the majority of the sample had some postgraduate certification (54.41%) in either Sensory Integration or Neurodevelopmental Therapy. 35.29% of the sample had only a basic degree in occupational therapy, while 7.35% of the sample had a university accredited Postgraduate Diploma, with 2.94% having a Master of Science degree in occupational therapy. None of the respondents had a Doctor of Philosophy degree.

The number of years that an occupational therapist has practiced in the field of paediatrics was of importance, as this too determined their level of experience, and knowledge in the field of LD and DD. The majority of the sample had over ten years of experience (42.65%), with 33.82% having four to ten years experience, 14.71% had one to three years experience and only 7.35% of the sample had less than a year of experience.

As the first stage of the research, it was appropriate to draw the base information from a sample that was of mid-range experience and expertise. This provides a broad and diverse opinion base from which to draw and refine the FUMT related to children with LD or DD. The higher degree and more specialised therapists were then involved in further stages of the research.

### 5.3.3 Motor Components of Function

The six areas of motor function that were investigated were: **praxis**, **postural control**, **integration of movement**, **sequencing of movements**, **co-ordination**, and **motor skill**. Table 5.1 represents the characteristics of movement used by respondents to describe movement that reached the 50% threshold in each motor component and the percentage of representation (in descending order) that the characteristic of movement had within the specific motor component.

All of the phrases that reached significance in the motor skills component also reached significance in co-ordination, indicating that some therapists may use these terms interchangeably.

**Table 5.I** >50% frequency of characteristics of movement in the motor components related to function.

| **Praxis** | **%** | **Sequencing of movement** | **%** |
|---|---|---|---|
| Motor planning | 97.06 | Movements in an order | 85.29 |
| Conceptualisation of a movement | 89.71 | Rhythm | 76.47 |
| Copying a movement | 86.76 | Projected actions sequences | 67.65 |
| Imitation of movements | 82.35 | Thumb-finger touching | 66.18 |
| Goal directed actions | 80.88 | Playing hopscotch | 60.29 |
| Construction | 79.41 | | |
| Tie a bow behind back | 70.59 | **Co-ordination** | **%** |
| Initiates movement easily | 67.65 | Eye-hand | 89.71 |
| Motor engrams formation | 54.41 | Eye-hand-foot | 85.29 |
| Playing hopscotch | 52.94 | Cutting on a straight line | 73.53 |
| Pumping a swing to move | 51.47 | Bat and ball games | 69.12 |
| Body scheme | 50.00 | Smoothness of movement | 67.65 |
| | | Hand-hand | 66.18 |
| **Postural Control** | **%** | Pencil control | 63.24 |
| Co-contraction | 97.06 | Manual dexterity | 61.46 |
| Stability | 97.06 | In-hand manipulation | 61.46 |
| Dynamic balance on beam | 79.41 | Handwriting | 57.35 |
| Weight shift | 79.41 | Effective combining of movements of limbs | 54.41 |
| | | Thumb-finger touching | 52.94 |
| **Integration of movement** | **%** | Gross motor | 51.47 |
| Symmetrical movement | 79.41 | | |
| Bilateral arm and leg movements | 76.47 | **Motor Skill** | **%** |
| Midline crossing | 75.00 | Bat and ball games | 69.12 |
| Effective combining of movements of limbs | 72.06 | Manual dexterity | 60.29 |
| Eats with a knife and fork | 60.29 | Pencil control | 57.35 |
| Reciprocal movements | 58.82 | In-hand manipulation | 54.41 |
| Jumping two feet together | 55.88 | Handwriting | 54.41 |
| Playing hopscotch | 55.88 | Cutting on a straight line | 52.94 |
| Forward rolls | 50.00 | Forward rolls | 52.94 |

Function items (table 5.2) that did not reach significance in any of the motor components were discarded from further stages of the study.

**Table 5.2** Function items that did not reach the 50% threshold level in any motor component

| | praxis | Postural Control | Integration of movement | Sequencing of movement | Co-ordination | motor skill |
|---|---|---|---|---|---|---|
| 13. repeated motor acts | 14.71 | 4.41 | 11.76 | 41.18 | 8.82 | 17.65 |
| 24. imitation of movements | 22.35 | 2.94 | 10.29 | 22.06 | 1.47 | 8.82 |
| 45. dissociation of arm movements | 5.88 | 44.12 | 44.12 | 7.35 | 19.12 | 16.18 |
| 57. finger isolation | 26.47 | 10.29 | 23.53 | 13.24 | 42.65 | 22.06 |
| 74. automatic movement | 25 | 19.12 | 35.29 | 8.82 | 10.29 | 26.47 |
| 80. brainstem reflex integration | 5.88 | 45.59 | 48.53 | 0 | 0 | 10.29 |
| 84. development of preferred hand | 5.88 | 11.76 | 45.59 | 2.94 | 23.53 | 36.76 |

### 5.3.4 Characteristics of movement represented across all the motor components related to function

When considering the representation of a characteristic of movement across the different motor components, (figure 5.2) it can be seen that many characteristics of movement had near equal representation on all the functional components. Although a threshold of 50% was used for a characteristic of movement to be retained in the study, considering the spread of percentage of a characteristic of movement across all motor components.

Only the phrases (such as goal directed actions, motor planning, co-contraction) pertaining to **praxis** and **postural control** indicated strong selective representation as can be seen by their symbols being distinctly higher on the graph (figure 5.2) than the other symbols for that phrase.

Many of the characteristics of movement had representation in all the motor components, indicating that different respondents thought that the various characteristics of movement were applicable to different motor components, or that a specific characteristic of movement could be associated with more than one motor component. Respondents demonstrated indecision and poor confidence by allocating a characteristic of movement to multiple motor components. This is analysed by adding the percentage representation of a characteristic of movement for all motor components to gain a sum score. The higher the sum score the greater the respondent indecision and lack of confidence in allocation of the characteristic of movement to a single motor component.

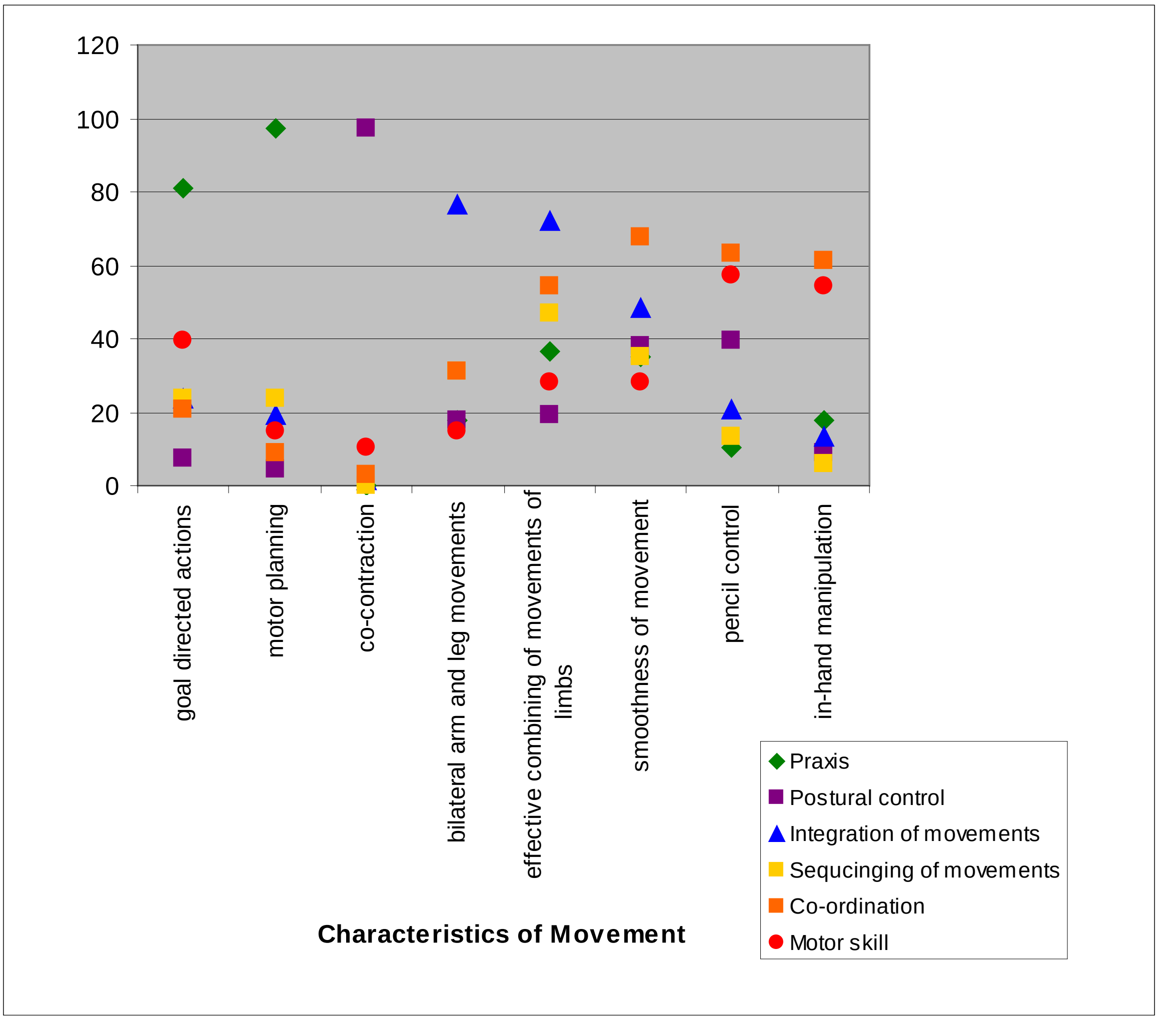



**Figure 5.2** Frequency of Characteristics of Movement Across Motor Components Related to Function

This can be seen (APPENDIX C2) by a characteristic of movement having a high sum of the percentages across the motor components (sum score greater than

160). A good example of this was “smoothness of movement” which had between 27% and 68% representation in all the motor components, although it was only over the 50% threshold in **co-ordination** (table 5.2). There is a sum score of 257.35 of representation across all motor components, indicating that many respondents allocated this characteristic of movement to multiple motor components. More selective allocation is indicated by a lower sum score of the percentages (near or below 100). The co-contraction characteristic of movement for example had a sum score of 111.76 indicating more consensual allocation of this characteristic of movement to the specific motor component of **postural control** (97.06) and less allocation to more than one motor component.

### 5.3.5 Motor Components of Dysfunction

The same six components were investigated from the perspective of dysfunction (table 5.3). Many of the phrases that reached significance for **dyspraxia**, also reached significance in other components such as **poor sequencing of movement** and **poor co-ordination**.

**Poor motor skills** had no characteristics of movement that met the 50% threshold level, and **poor integration of movement** had only one characteristic that met the threshold level. Characteristics of movement, however did achieve threshold for these two motor components when considering the functional aspects, thus yielding enough characteristics of movement for analysis. There were far more characteristics of movement that met the threshold for **poor postural control** than those for **postural control**. This supported the need to investigate both the functional and the dysfunctional aspects of each motor component.

**Table 5.3** >50% frequency of characteristics of movement in the motor components related to dysfunction.

| Dyspraxia | % | Poor Postural Control | % |
|---|---|---|---|
| Slow to learn a motor skill | 86.76 | Floppy | 98.53 |
| Trial and error approach to tasks performance | 83.82 | Hook feet around chair legs | 95.59 |
| Needs lots of practice | 76.47 | Fatigues easily | 94.12 |
| Poor anticipation of motor responses | 73.53 | Rest head on hand | 92.65 |
| Puts on shirt before vest | 70.59 | Low tone | 92.65 |
| Uses splinter skills | 64.71 | Neck hyperextension in sitting | 92.65 |
| Crossing out often in writing | 63.24 | Fixation | 91.18 |
| Clumsiness / accident prone | 63.24 | W-sitting on the floor | 91.18 |
| Hesitates between movements | 61.46 | Excessive body adjustments in sitting | 89.71 |
| Awkward | 58.82 | Poor equilibrium reactions | 86.76 |
| Lack of timing in action | 58.82 | Increased pencil pressure | 80.88 |
| Delayed reaction time | 55.88 | Anterior pelvic tilt | 79.41 |
| Misjudging a movement | 54.41 | Flexed sitting | 76.47 |
| | | Clumsiness / accident prone | 66.18 |
| **Poor Co-ordination** | % | Exaggerated movements | 57.35 |
| Over-shoot the outline in colouring in | 89.71 | Poor control of movement force | 55.88 |
| Poor tracing skills | 69.12 | | |
| Shaky drawing | 69.12 | **Poor Sequencing of Movement** | % |
| Misses the target in throwing | 69.12 | Miss times clapping patterns | 79.41 |
| Clumsiness / accident prone | 61.46 | Hesitates between movements | 67.65 |
| Poor movement accuracy | 60.29 | Puts on shirt before vest | 55.88 |
| Awkward | 55.88 | Dysdiadokokinesis | 55.88 |
| Intention tremor | 52.94 | Lack of timing in action | 54.47 |
| Tends to drop objects | 51.47 | Loses place in a task | 52.94 |
| **Poor Integration of movements** | % | **Poor Motor Skills** | % |
| Poor stabilising use of non-dominant hand | 69.12 | *None* | |

Dysfunction items that did not reach significance in any of the motor components were discarded from further stages of the study (table 5.4).

**Table 5.4** Dysfunction items that did not reach the 50% threshold level in any motor component

| | Dyspraxia | Poor Postural Control | Integration of movements | Sequencing of Movement | Poor Co-ordination | Poor Motor skill |
|---|---|---|---|---|---|---|
| 37. tends to do things too fast | 19.12 | 45.59 | 30.88 | 14.71 | 25 | 29.41 |
| 61. prefers to sketch rather than draw a solid line | 16.18 | 19.12 | 13.24 | 5.88 | 39.71 | 22.06 |
| 67. involuntary movements | 8.82 | 32.35 | 26.47 | 1.47 | 33.82 | 13.24 |
| 86. over use of tactile feedback | 38.24 | 14.71 | 25 | 0 | 14.71 | 16.18 |

### 5.3.6 Characteristics of movement represented across all the motor components related to dysfunction

In the motor components related to dysfunction (figure 5.3) greater selectiveness was noted, particularly where **poor postural control** was considered. The findings similar to those seen in figure 5.2 for the motor components related to function. There are characteristics of movement that were very selectively allocated. The sum of percentage allocation of “rest head on hand” was 100%, with 92.65% allocation to **poor postural control** and the remaining responses limited to **poor integration of movement** (4.41%), **poor co-ordination** (1.47%) and **poor motor skills** (1.47%). This shows (figure 5.3) that there was allocation of this characteristic of movement to one specific motor component and there was high agreement that this characteristic of movement is related to **poor postural control**. “Floppy” and “hooks feet around chair legs” were similarly associated to **poor postural control**.

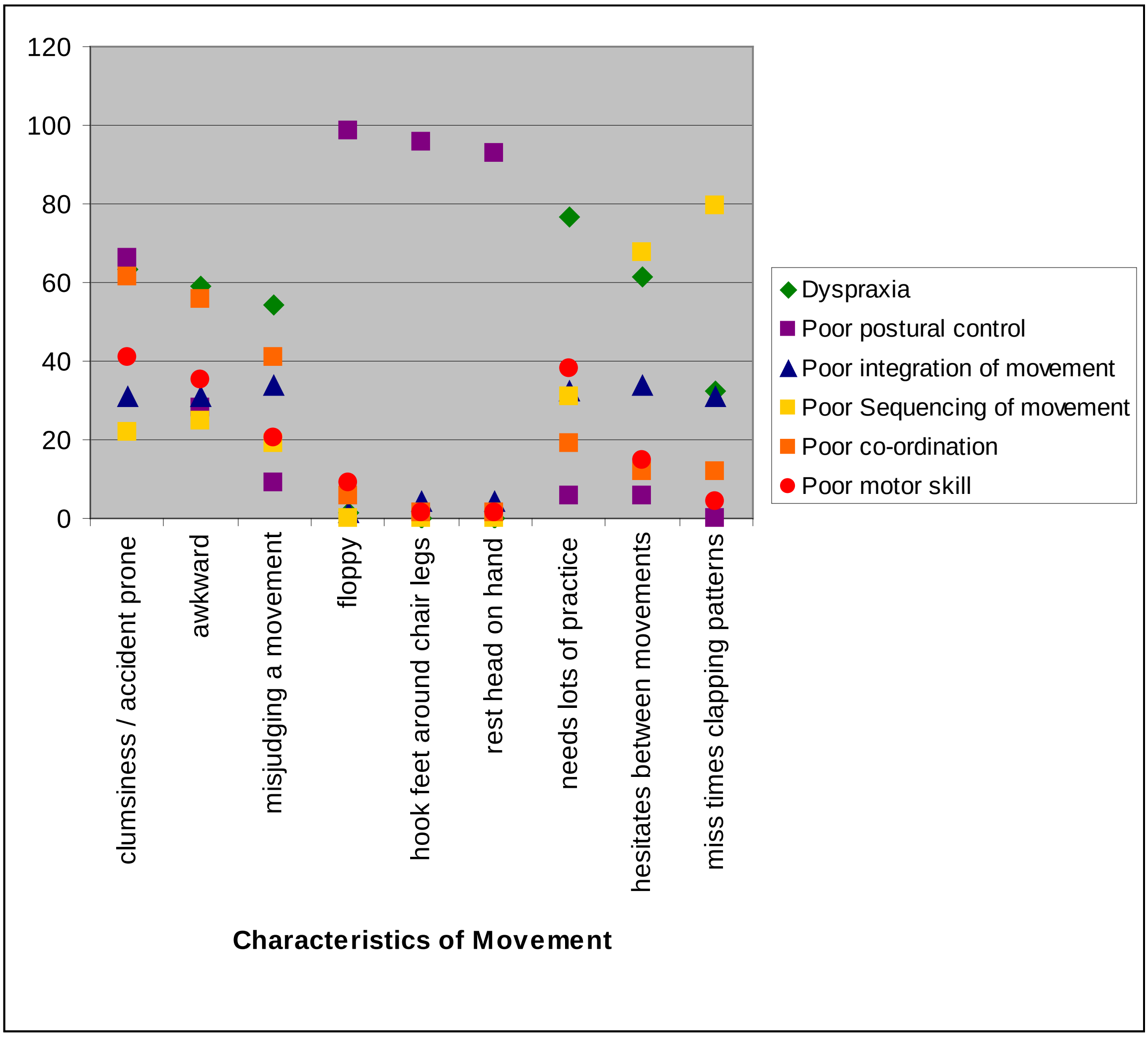



**Figure 5.3** Frequency of Characteristics of Movement Across Motor Components Related to Dysfunction

Other characteristics of movement reached the 50% threshold in only one motor component, but were not consistently allocated to that specific component, as illustrated by "needs a lot of practice" (figure 5.3). This characteristic was clearly reflective of **dyspraxia** (76.47%) as there is a 38.32% difference between its allocation to this motor component and its allocation to the next nearest component (**poor motor skills**). It was however represented in three other motor components by over 30%, having a sum score of 202.94 (APPENDIX C2), indicating confusion as to where to allocate this characteristic of movement, and the ambiguity of its relationship to components other than **dyspraxia**.

Figure 5.2 and 5.3 effectively illustrate the inconsistency of term usage among respondents by the lack of distinct selectiveness between symbols. A possible rationale for this is individual occupational therapists each have their own interpretation of each characteristic of movement given, and not just the confusion regarding the motor components.

## 5.4 DISCUSSION

### 5.4.1 Discussion of Motor Components related to Function

The component **praxis** was used by the majority of respondents in conjunction with phrases such as: "goal directed action", "motor planning", "copying a movement", "conceptualising a movement" and "construction" (table 4.1). It is interesting to note that phrases such as "body scheme" and "motor engram formation" showed much lower representation even though these are deemed to be strong contributing functions to **praxis** in many sources, primarily in the theory of Sensory Integration[5,6]. Sugden and Cambers[75] also discussed the significance of these two characteristics of movement in **praxis**, although their terms are "kinaesthetic perception" (for body scheme), "motor programme" (for motor engram) and "planning and organisation of movement" (for **praxis**). The low percentage of allocation in the Delphi A of these to characteristics of movement was possibly due to the varied experience level of the respondents and the fact that these two aspects are extremely difficult to observe and measure objectively. In 6.4.2 these motor components are validated by the experts of the Delphi B.

**Postural control** showed the highest consistency for term usage by having a small number of characteristics of movement (table 4.1), which reached high (above 75%) representation, and all the remaining characteristics of movement failed to reach significance. Although this indicates strong consistency for term usage within this component, it has to be noted that there could possibly have been characteristics of movement that were omitted from the list of 90 that were presented to the respondents. This supported the need for the qualitative component of the Delphi B (stage 3) of the study.

**Integration of movement** and **co-ordination** emerged as having the common characteristic of movement: "effective combining of limb movements" reached the 50% threshold in both, but it received higher representation in **integration of**

**movement** than in **co-ordination**. This implies that using both hands together or using a foot and hand simultaneously could be considered **integration** or **co-ordination** of movement. Characteristics of movement that imply combining movements of the limbs such as "hand-hand" and "eye-hand-foot" reached the threshold in **co-ordination** and but did not reach the threshold in **integration of movement**. This illustrates the possible looseness of term usage among respondents. Occupational therapists often use the term "eye-hand" said in conjunction with the word co-ordination as in "eye-hand co-ordination". It is thus likely that the respondents are used to saying it as such and thus do not think through the actual meaning or implication of the term.

The characteristics of movement for the **sequencing of movement** component that reached the 50% threshold were all associated to a sequential or ordered movement process, indicating some level of consistency within the understanding of this motor component.

The **motor skill** component included characteristics of movement that reached the 50% threshold which were mostly practiced, learnt tasks (handwriting, forward rolls), but some aspects of accuracy and quality were also reflected (manual dexterity, pencil control). This indicates that the respondents view **motor skills** as being learnt actions, but that they also associate the need for quality and accuracy to the action.

The characteristics of movement that did not reach the threshold in any motor component were discarded. It is notable that "development of a preferred hand" is strongly related in sensory integration literature to integration of the two sides of the body [5,50], yet it fell just below the threshold for **integration of movements**. "Brainstem reflex integration" and dissociation of arm movement in the literature are strongly related to the development of **postural control** [35], yet were almost equally divided just below the threshold between **integration of movements** and **postural control**. This indicates that the motor component **integration of movement** may not be well isolated from other motor components

### 5.4.2 Discussion of Motor Components related to Dysfunction

Only one characteristics of movement (table 5.3) reached significance for **poor integration of movement**, which was "poor stabilising use of non-dominant hand", and no characteristics of movement reached significance for **poor motor skills**. This may be due to design of the questionnaire, which stated more phrases in the function-orientated manner than in a dysfunction-orientated manner (e.g. "handwriting" vs. "untidy handwriting").

The component **poor postural control** again displayed high percentages (table 4.2) for the characteristics of movement that reached the 50% threshold, showing high consensus among therapists regarding this component. **Postural control** can thus be clearly differentiated from other motor performance terms. It has been shown that defining it should include co-contraction, stability, dynamic balance and weight shift and indicators of **poor postural control** include resting of head on hand, hooking feet around the legs of the chair, fatigues easily, poor equilibrium reactions, fixation, tight pencil grip, low tone, increased pencil pressure and w-sitting on the floor. This is as a result of the good consensus among the respondents regarding the characteristics of movement that are associated with **poor postural control** (figure 5.3) with low sum percentages of these characteristics across the other motor components related to dysfunction, and a large percentage gap between **poor postural control** and the other motor components of dysfunction.

### 5.4.3 Theme discussion

There were two themes to the characteristics of movement that reached the 50% threshold for **co-ordination** (table 5.2). The first is combining of movement or synchronising the movement of one body part with that of another, and the second is the smoothness and control of the movement. The characteristics of movement that reached the threshold for **unco-ordinated movement** (table 5.3) seemed to relate to characteristics of movement that describe the smoothness and control reflecting only one of the two aspects identified in the function aspect of the motor component.

### 5.4.4 Limitations of stage 2

The study population was limited to members of OTASA. Although this narrowed the population the researcher felt this contact list was accessible and up to date, and that members of their professional association are more likely to be professionally active and thus make good respondents. It is however a limitation that the respondents were all members of a single body, which isnot representative of all paediatric occupational therapists.

#### 5.4.4.1 Critique of the Measuring Tool

There is some indication that the density of the measuring tool (a long list of characteristics of movement) may have lead to some fatigue and thus an element of carelessness during the completion of the questionnaire by some respondents. This can be seen in APPENDIX C2 where some characteristics of movement that relate of the function aspect of a motor component have been allocated to a motor component related to dysfunction or vice verse. There was a sum of 17.64% allocation of the function related characteristic of movement “in-hand manipulation” across the motor components related to dysfunction. Only one characteristic of movement that related to dysfunction, “w-sitting on the floor” had a 0% representation across the motor components related to function. All characteristics of movement related to function had some representation in the motor components related to dysfunction. This could also possibly have been due to some second language respondents having mild confusion between function and dysfunction, or to the general need for uniform terminology regarding motor performance in children with LD and DD. It could also relate to some concentration and fatigue influencing the respondent’s choices.

## 5.5 CONCLUSION

There is poor consistency of motor term usage by South African paediatric occupational therapists practicing in the field of LD and DD. This stage of the research did not undertake to determine why this is so, as the intention was to determine how occupational therapists use the terms. Possible reasons may be that therapists are required to utilise generic terms when explaining the conditions to their clients or client caregivers, and that poor consistency within current literature exacerbates the problem.

Only the component **postural control** showed high consistency in both the function and dysfunction aspect of term usage among therapists, thus enabling formation of a set of phrases that are associated with this component. The other components lacked this consistency. This is possibly due to the relative difficulty in observing and measuring these characteristics of movement and motor components objectively.

The apparent “looseness” of term usage has significant impact on the professional standing of occupational therapists. While communicating within the multidisciplinary team it is important that the nature of a client’s difficulties is effectively and consistently communicated. Clients that seek second opinions should receive consistent information in order to build the professions reputation to the consumer. The professional development of clinical occupational therapists can also be influenced due to misconceptions and misunderstandings born out of poor consistency of term usage.

The Delphi B (chapter 6) reformulated the results of this stage in order to prioritise the characteristics of movement within each motor component (Likert scale). This was to ensure that there were no characteristics of movement that were not incorporated into the list for this stage by adding qualitative defining of each motor component and to develop some structure to the nature of the characteristics related to each motor component.

### 5.5.1 Summary of Delphi A Findings

Table 5.5 provides an overview of the findings of the Delphi A, that was incorporated into the Delphi B survey.

**Table 5.5** Summary of the results of the Delphi A

| FUNCTION | DYSFUNCTION |
|---|---|
| **Praxis** | **Dyspraxia** |
| Motor planning | Slow to learn a motor skill |
| Conceptualisation of a movement | Trial and error approach to tasks performance |
| Copying a movement | Needs lots of practice |
| Imitation of movements | Poor anticipation of motor responses |
| Goal directed actions | Puts on shirt before vest |
| Construction | Uses splinter skills |
| Tie a bow behind back | Crossing out often in writing |
| Initiates movement easily | Clumsiness / accident prone |
| Motor engrams formation | Hesitates between movements |
| Playing hopscotch | Awkward |
| Pumping a swing to move | Lack of timing in action |
| Body scheme | Delayed reaction time |
| | Misjudging a movement |
| **Postural Control** | **Poor Postural Control** |
| Co-contraction | Floppy |
| Stability | Hook feet around chair legs |
| Dynamic balance on beam | Fatigues easily |
| Weight shift | Rest head on hand |
| | Low tone |
| | Neck hyperextension in sitting |
| | Fixation |
| | W-sitting on the floor |
| | Excessive body adjustments in sitting |
| | Poor equilibrium reactions |
| | Increased pencil pressure |
| | Anterior pelvic tilt |
| | Flexed sitting |
| | Clumsiness / accident prone |
| | Exaggerated movements |
| | Poor control of movement force |
| **Integration of movement** | **Poor Integration of movements** |
| Symmetrical movement | Poor stabilising use of non-dominant hand |
| Bilateral arm and leg movements | |
| Midline crossing | |
| Effective combining of movements of limbs | |
| Eats with a knife and fork | |
| Reciprocal movements | |
| Jumping two feet together | |
| Playing hopscotch | |
| Forward rolls | |
| **Sequencing of movement** | **Poor Sequencing of Movement** |
| Movements in an order | Miss times clapping patterns |
| Rhythm | Hesitates between movements |
| Projected actions sequences | Puts on shirt before vest |
| Thumb-finger touching | Dysdiadokokinesis |
| Playing hopscotch | Lack of timing in action |
| | Loses place in a task |
| **Co-ordination** | **Poor Co-ordination** |
| Eye-hand | Over-shoot the outline in colouring in |
| Eye-hand-foot | Poor tracing skills |
| Cutting on a straight line | Shaky drawing |
| Bat and ball games | Misses the target in throwing |
| Smoothness of movement | Clumsiness / accident prone |
| Hand-hand | Poor movement accuracy |
| Pencil control | Awkward |
| Manual dexterity | Intention tremor |
| In-hand manipulation | Tends to drop objects |
| Handwriting | |

| | |
|---|---|
| Effective combining of movements of limbs | |
| Thumb-finger touching | |
| Gross motor | |

| Motor Skill | Poor Motor Skills |
|---|---|
| Bat and ball games | *None* |
| Manual dexterity | |
| Pencil control | |
| In-hand manipulation | |
| Handwriting | |
| Cutting on a straight line | |
| Forward rolls | |

# CHAPTER 6 – STAGE 3: DELPHI TECHNIQUE B: EXPERT SURVEY

## 6.1 INTRODUCTION

The Delphi Technique B (third stage of the study) posed the following research questions:

1. ‘How do occupational therapists who are expert in the field of DD and LD rate the relevance of the characteristics of movement identified as associating to each motor component?’
2. ‘How do these expert occupational therapists define each of the motor components?’

The Delphi A (chapter 5), a survey on term clarification, established a set of characteristics of movement which more than 50% of the sample of 68 occupational therapists felt pertained to each of six motor components (and their respective dysfunction). These motor components were noted in the literature to have least consistency. The results of the initial survey highlighted confusion of motor term usage.

The characteristics of movement that met the 50% threshold for each motor component and motor dysfunction component was synthesised into the second survey for further analysis. Respondents were also canvassed for their own definitions of each motor component.

## 6.2 METHODOLOGY

### 6.2.1 Population

The population for this stage of the study was occupational therapists who replied to the Delphi A, who were considered to be experts in the field of treating children with LD and DD. A therapist was considered to be an expert if they had been practicing in the field of paediatrics with children who have LD or DD for seven or more years and have a post graduate certification in Sensory Integration, Neuro-

Developmental Therapy, Postgraduate Diploma in Occupational Therapy, Masters of Science in Occupational Therapy or Doctorate of Philosophy.

### 6.2.2 Sample

This stage of the study used respondents from the second stage (chapter 4) who met the criteria for being an expert in the field of LD and DD. There were 30 occupational therapists, who met the inclusion criteria, but one did not provide further contact details, and another practiced outside of South Africa, thus a sample of 28 expert occupational therapists were contacted for this stage of the study.

The inclusion criteria that a subject had to meet in order to be included in the sample were:

- Occupational therapists registered with the HPCSA
- Occupational therapists practicing in the field of paediatrics for seven years or more, with a clientele having LD and/or DD.
- Occupational therapist in possession of evidence of completion of one of the following postgraduate study activities:
  - Sensory Integration Certification
  - Neuro-developmental Therapy Certification
  - Postgraduate Diploma in Occupational Therapy
  - Master of Science in Occupational Therapy
  - Doctorate of Philosophy

The exclusion criteria used to eliminate a possible second stage (chapter 4) respondent from the sample for this stage were:

- Qualified occupational therapists not practicing in South Africa.
- Occupational therapists who were practicing in paediatrics, but who did not indicate treatment of clients with DD or LD.

### 6.2.3 Measuring Tool

The measuring tool for the survey was in the form of a cross-sectional, self administered questionnaire [60] (APPENDIX D) This was in keeping with the Delphi Technique where the results of the Delphi A (chapter 5) were synthesised into a new survey questionnaire [23,62,76]. It is common in this method to request that respondents rate their agreement on Likert scales [62], which was implemented in this study.

The survey was designed specifically for this stage of the study (APPENDIX D). Each characteristic of movement that met the 50% threshold for a motor component in the second stage of the study was associated with a nine point Likert scale, as shown in figure 6.1.

Please complete the following rating scales and questions based on your knowledge and experience. There is no right or wrong answer!

The rating scale is:

1 = extremely poor indicator
2 =very poor indicator
3 = poor indicator
4 = below average indicator
**5 = average indicator**
6 = above average indicator
7 = good indicator
8 = very good indicator
9 = extremely good indicator

This is not a prioritisation. Please view each characteristic individually in terms of the movement component. (i.e. there can be 3-4 items that score 8)

Please rate each characteristic of movement for it strength of indicating this component of motor function.

PRAXIS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Goal directed action | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Motor planning | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Imitation of movements | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Playing hopscotch | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Motor engrams formation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Initiates movement easily | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Conceptualisation of a movement | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Construction | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Good timing in action | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Copying a movement | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Pumping a swing to move | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Tie a bow behind back | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Quick to learn an action | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Anticipates motor responses | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Good reaction time | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **praxis** (in your own worlds)

______________________________________________

______________________________________________

______________________________________________

**Figure 6.1** Excerpt from the Delphi B Survey

While it is more common to use a five or seven point [65] Likert scale, a nine point scale was selected to increase the sensitivity of the scale as the respondents in the second stage had already demonstrated a 50% agreement that these characteristics of movement were associated with the motor component. Only one characteristic of movement met the threshold of 50% for “poor integration of movements” and no characteristics of movement met the 50% threshold for “poor motor skills”. To provide more characteristics of movement for these dysfunction motor components, the characteristics of movement related to the function of “integration of movements” and “motor skills” which met the 50% threshold in the previous stage of the study were converted into a dysfunction form.

The respondents were also asked to use their own words to define each motor component (function and dysfunction related).

### 6.2.4 Method

The survey was posted (and duplicate e-mailed) to the 28 occupational therapists who were identified from the Delphi A (chapter 5) who met the inclusion criteria for this stage. Informed consent was again implied through return of the completed survey. Email reminders and telephonic reminders were used, where these contact details were known to the researcher, to increase the rate of return. Survey questionnaires were returned by email, fax or postal services.

### 6.2.5 Research Design and Analysis

A non-experimental survey design, using a concurrent triangulation strategy [60,62] was used for this stage of the study. Mixed methods research using concurrent triangulation implements two different data collection strategies simultaneously, one quantitative and one qualitative, in order to increase the validity of the study [60]. This stage was cross-sectional in nature, where all data was collected over a period of six weeks.

The data from the Likert scales was analysed using descriptive statistics, in terms of means (central tendency) and standard deviations (relative position) [62,65] of a characteristic of movement in each motor component. The means (M) represented the degree of association that the respondents felt each characteristic of movement had to each motor component of function or dysfunction. The higher the mean (above a mean of seven), the stronger the expert occupational therapists felt that the characteristic of movement was associated to the motor component of function or dysfunction. The standard deviations (SD) represented the level of agreement between the respondents. A larger standard deviation indicated a poorer consensus among the expert occupational therapists (greater than 1.7) as to the strength of the association of the characteristic of movement to the motor component. Results below a SD of 1.4 indicated a higher level of agreement as their ratings were all similar for a particular characteristic of movement within that motor component.

The data from the definitions of each motor component were analysed into units of meaning by reading each experts definition and extracting short phrases. This procedure of breaking down qualitative information is consistent with the code analysis [60,62,77]. Units of meaning are thus phrases used in the definitions that were separate in meaning to other phrases within the same definition. This analysis is the breaking down of each respondent's definition into units of meaning. The data was then cross-case [62] (horizontally) analysed by comparing the units of meaning of each motor component across all the respondents' responses for common trends. These trends were identified as semantic clusters.

## 6.3 RESULTS

### 6.3.1 Sample Demographics

There were 16 expert respondents to this survey, forming the sample for this stage of the study. The majority were from Gauteng (12), two were located in the Western Cape, and one in each of Mpumalanga and the Free State.

### 6.3.2 Results of the Likert Scales

All means and standard deviations were plotted on the graphs in terms of strong, average or weak association to the motor component. Characteristics of movement where the mean (red square) fell to the left of the green line on figures 6.2 to 6.13 indicated strong association to the motor component (M>7), between the green and blue lines indicated an average association (M = 6.5-7) and to the right of the blue line were indicative of a weak association (M<6.5). A weak association still reflected an association of the characteristic of movement to the motor component as this was determined in the second stage (chapter 4) of the study, and validated by a weak association still being above a mean of 5.00.

The strength of consensus among the participants is reflected in the standard deviation score. The smaller the standard deviation that greater the consensus as to the strong, average or weak association of a characteristic of movement to the motor component. The standard deviation is represented by the length of the line between the blue diamonds.

The six areas of motor function that were investigated were: ”praxis”, “postural control”, “integration of movement”, “sequencing of movements”, “co-ordination”, and “motor skill”. The same was represented for the motor components related to dysfunction. Figures 6.2 to 6.13 represent the means and the standard deviations of how the expert occupational therapists rated the characteristics of movement that reached 50% threshold of each motor component in the previous stage of the study.

6.3.2.1 Motor Components: Praxis and Dyspraxia

In considering **praxis** (figure 6.2), “Goal directed action” and “motor planning” were the two characteristics of movement that obtained a high mean rating on the Likert scales, 7.9 and 8.1 respectively. There was also high consensus that these two characteristics of movement are strongly associated with **praxis** as the standard deviations were small, 1.2 and 0.95 respectively. “Playing hopscotch” received a low mean rating (M=5.4) and a standard deviation (SD=1.65) indicating that it is not as strongly associated to **praxis**, and there is some disagreement among the participants as to the strength of this association.

Figure 6.2 further shows that “Copying a movement”, “tying a bow behind back”, and “good reaction time” had the largest standard deviations for **praxis** (SD=1.95, 1.85 and 1.80 respectively), indicating that these characteristics were least consensually rated by the participants, i.e. there was less agreement on the strength of the association of these characteristics of movement to **praxis**.

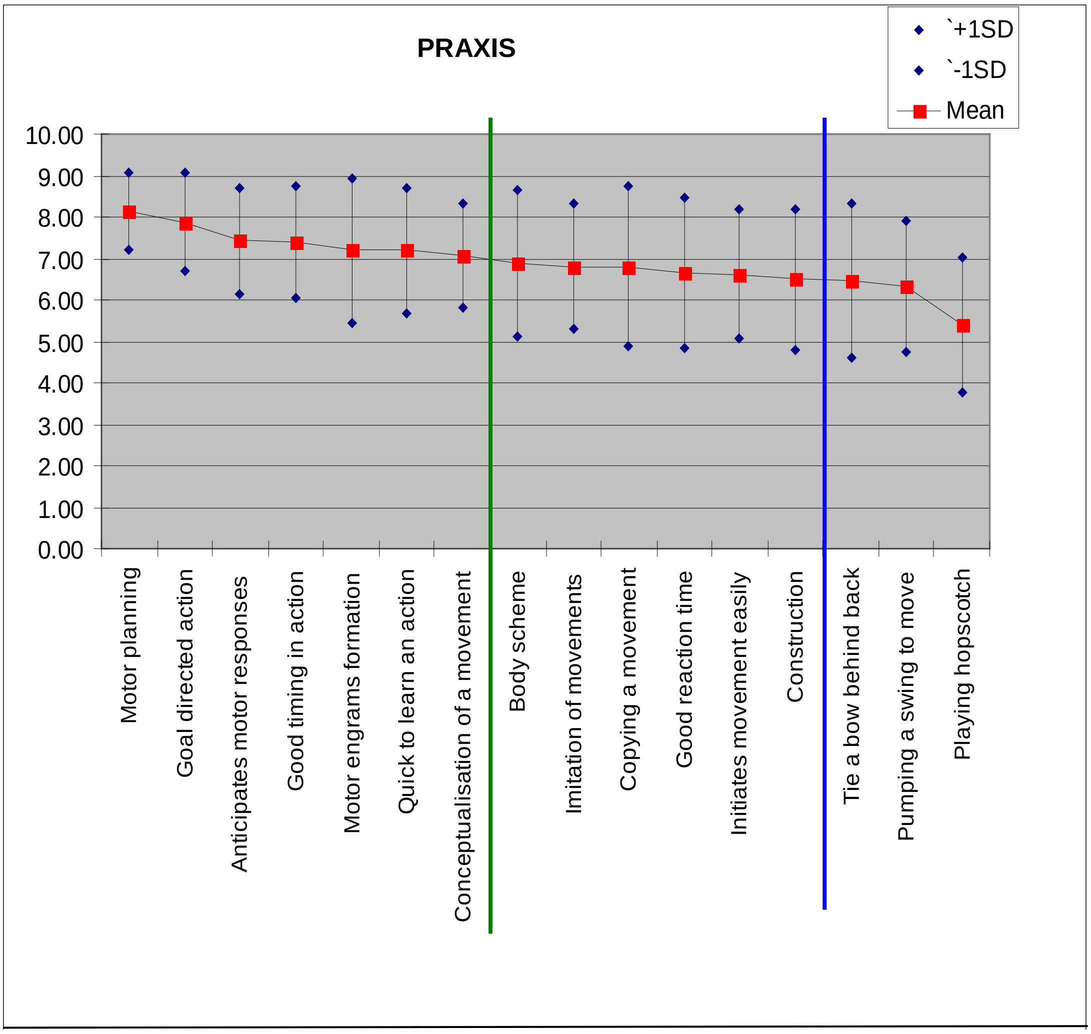



**Figure 6.2** Means and Standard Deviations of the **Praxis** Motor Component

"Poor motor engram formation" (M=7.9, SD=1.5) and "poor anticipation of motor responses" (M=7.7, SD=1.35) were the strongest associated characteristics of movement to the motor component of **dyspraxia**, as seen in figure 6.3. "Needs a lot of practice" (M=7.2, SD=1.0) and "difficulty initiating movement" (M=7.2, SD=1.1) were both strongly associated with **dyspraxia**, and with high level of agreement among the expert occupational therapists.

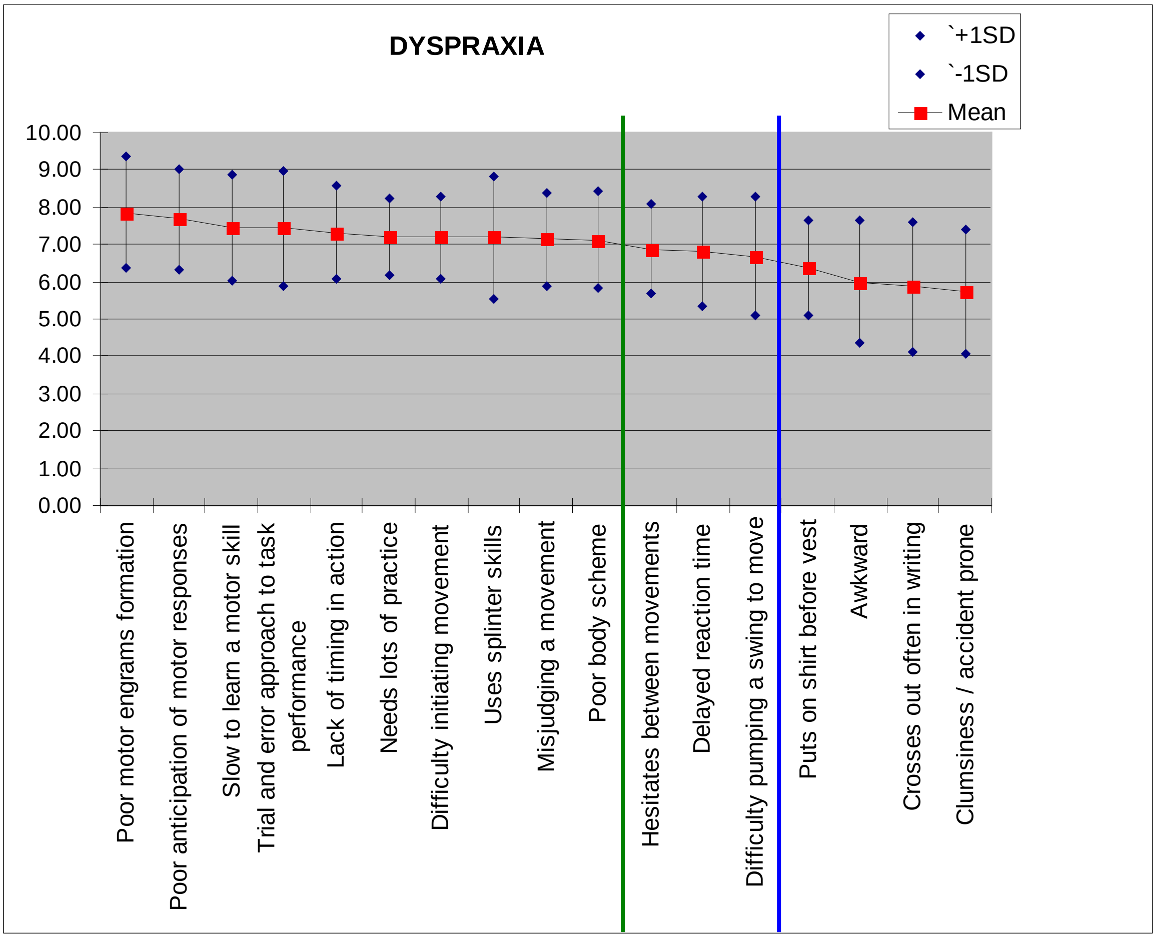



**Figure 6.3** Means and Standard Deviations of the **Dyspraxia** Motor Component

6.3.2.2 Motor Components: Postural Control and Poor Postural Control

"Postural background movements" (M=7.5, SD=1.15) and "stability" (M=7.4, SD=1.2) were rated the highest characteristics of movement (figure 6.4) associated to **postural control**, with a high level of agreement among the participants (figure 6.4). "Dynamic balance on the beam" (M=6.0, SD=1.8) and "control of movement force" (M=6.45, SD=1.9) were the lowest rated, and also presented the least agreement by the participants as to the strength of their association to **postural control**.

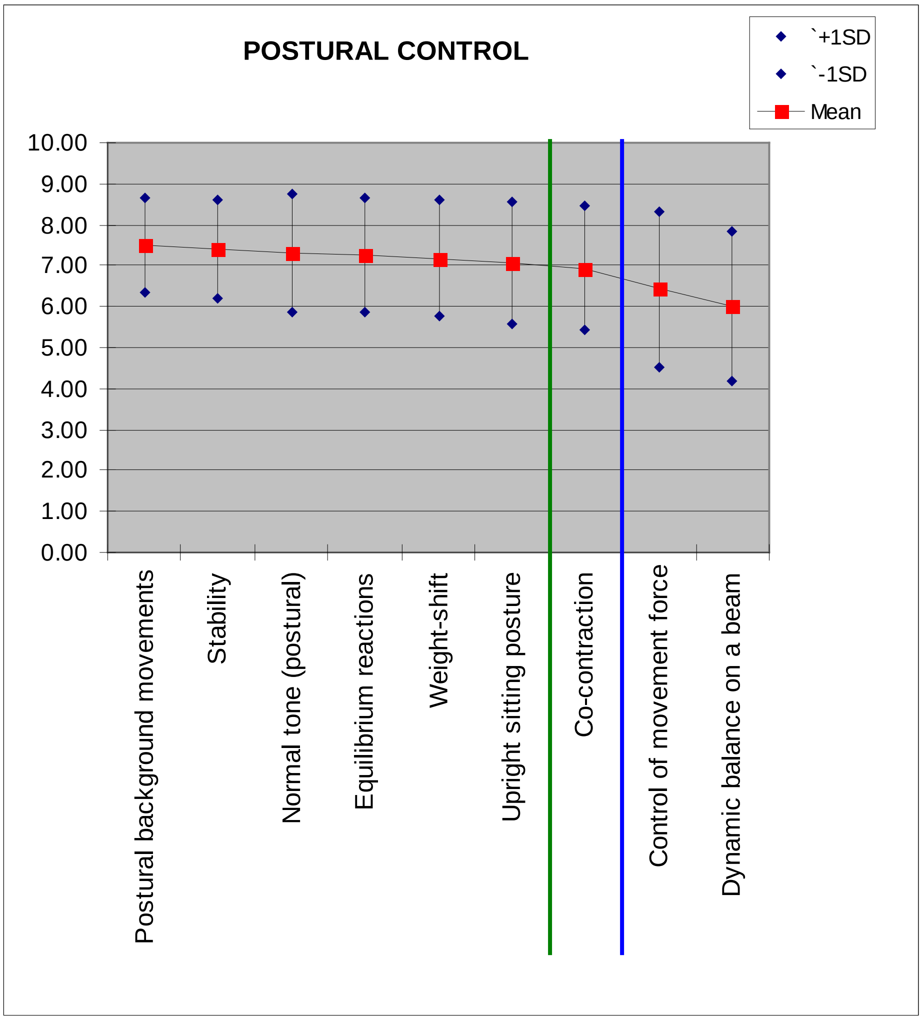



**Figure 6.4** Means and Standard Deviations of the **Postural Control** Motor Component

Figure 6.5 illustrates that "poor stability" (M=7.75, SD=1.05) and "fixation" (M=7.7, SD=1.1) were consensually rated high as characteristics of movement associated with **poor postural control**. "Increased pencil pressure" (M=6.0, SD=1.6), "tight pencil grip" (M=6.15, SD=1.65), and "clumsiness / accident prone" (M=6.2, SD=1.6) were weakly associated to **poor postural control**.

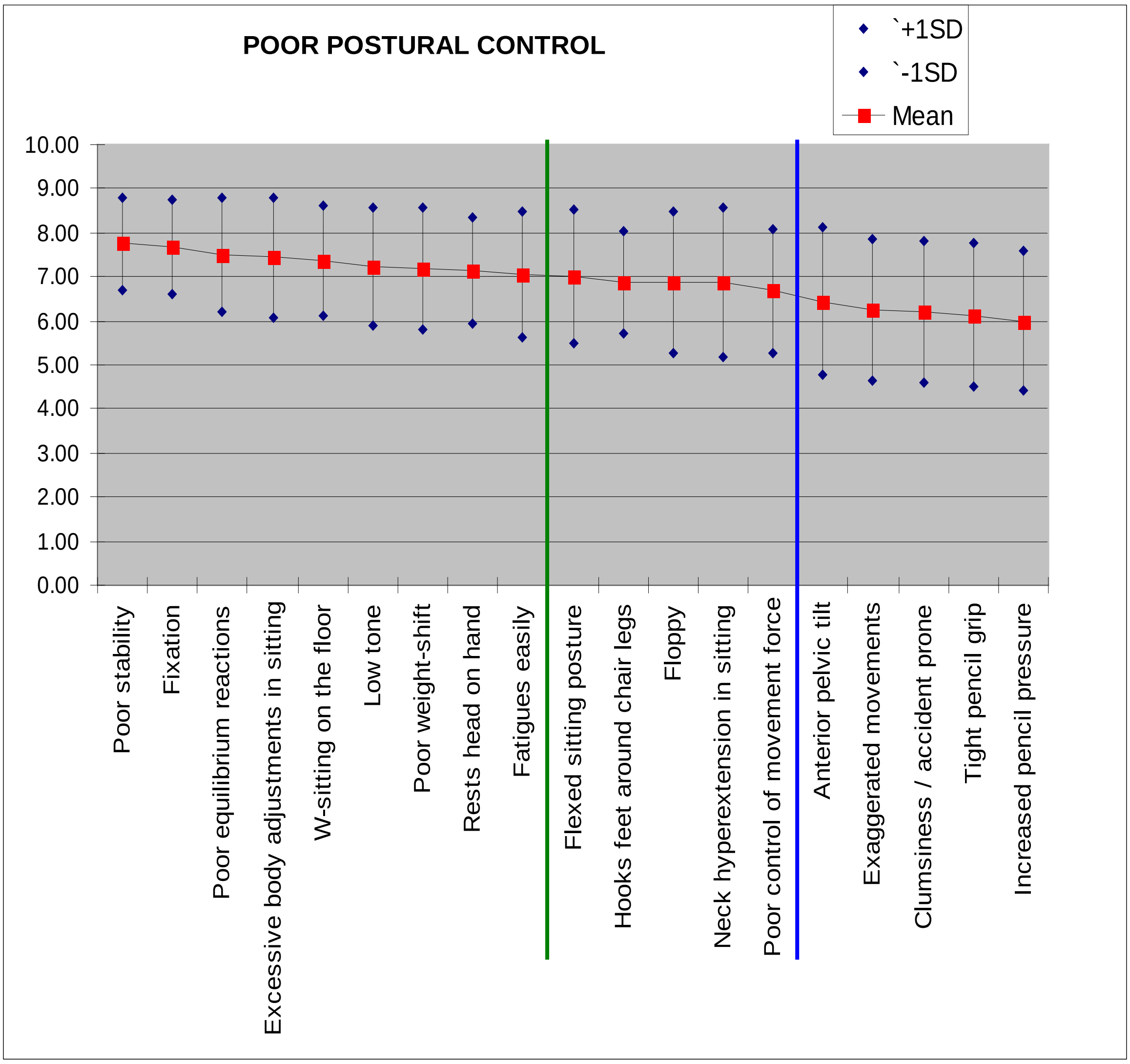



**Figure 6.5** Means and Standard Deviations of the **Poor Postural Control** Motor Component

### 6.3.2.3 Motor Components: Integration of Movements and Poor Integration of Movement

Figure 6.6 illustrates the participants rating of **integration of movement**. "Effective combining of movement of limbs", "bilateral arm and leg movements" and "reciprocal movement" were the only three items to rate above a mean of 7.00 (M=7.15) on the Likert scales, with "reciprocal movements" having received the highest level of agreement among the participants with a standard deviation of 1.45. "Playing hopscotch" was rated the lowest (M=5.6) with a good agreement (SD=1.6) among the participants that this is the least strongly associated characteristic of movement to this motor component.

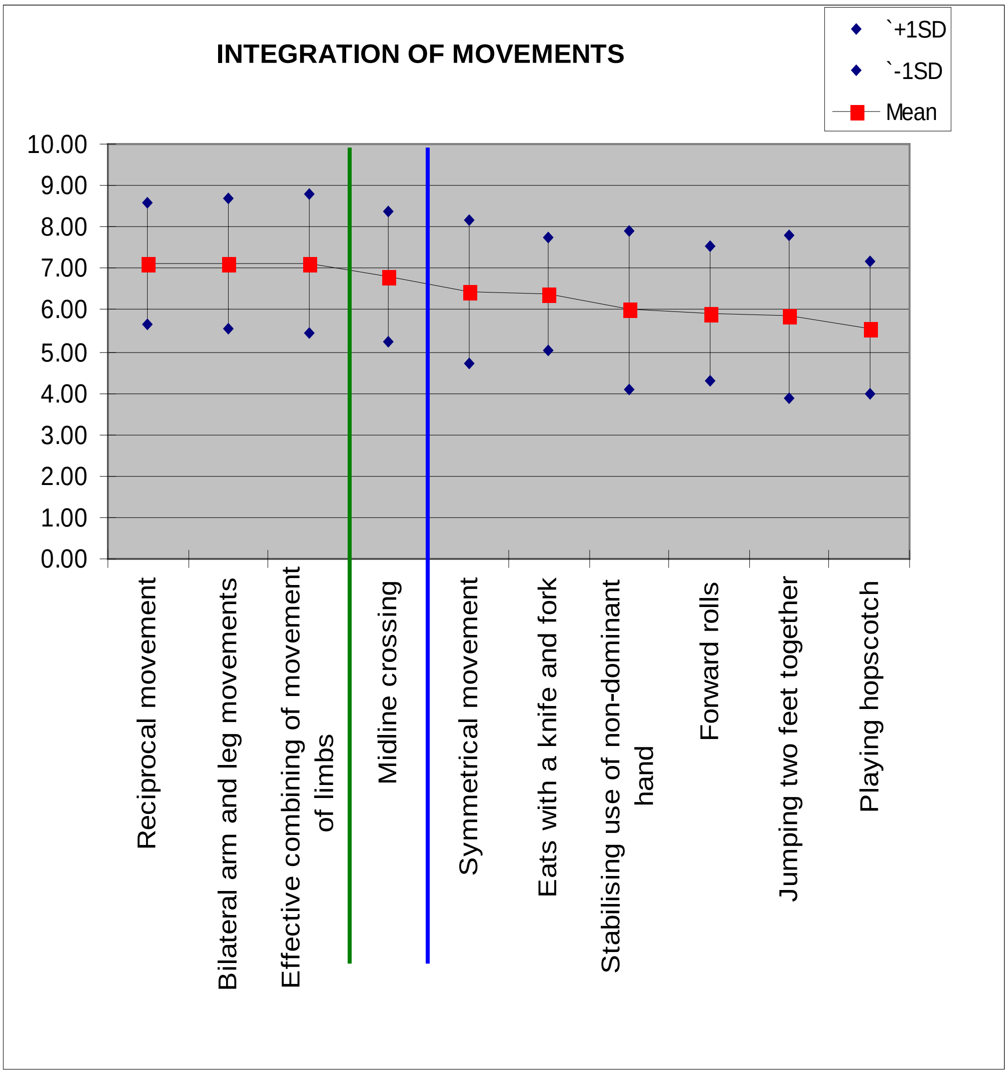



**Figure 6.6** Means and Standard Deviations of the **Integration of Movements** Motor Component

"Poor bilateral arm and leg movements" (M=7.5, SD=1.3) and "ineffective combining of movements of limbs" (M=7.4, SD=1.25) were consensually rated as strongly associated with **poor integration of movements**, as illustrated in figure 6.7. "Difficulty jumping two feet together" (M=6.25, SD=1.7) was the weakest rated characteristic of movement for this motor component.

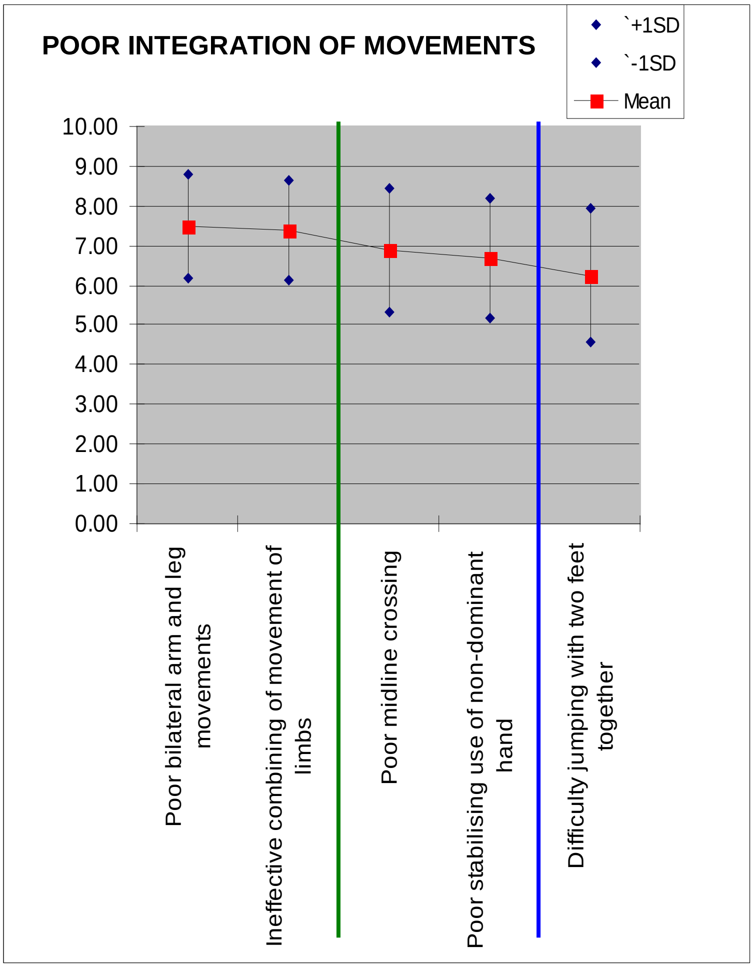



**Figure 6.7** Means and Standard Deviations of the **Poor Integration of Movement** Motor Component

### 6.3.2.4 Motor Components: Sequencing of Movements and Poor Sequencing of Movement

Only three characteristics of movement were rated above 7.00 by the participants (figure 6.8). “Projected action sequences” (M=7.6, SD=1.35) was consensually (high level of agreement) rated the strongest associated to **sequencing of movement**. Although “smooth transition between movements” received a high mean rating (M=7.3) there was poor agreement among the participants (SD=1.75). “Diadokokinesis” and “playing hopscotch” received the lowest ratings in this motor component, with poor agreement among the participants; both had a mean of 6.0 with a standard deviation of 1.7. “Timing of clapping patterns” had the lowest level of agreement among the participants with a standard deviation of 2.0.

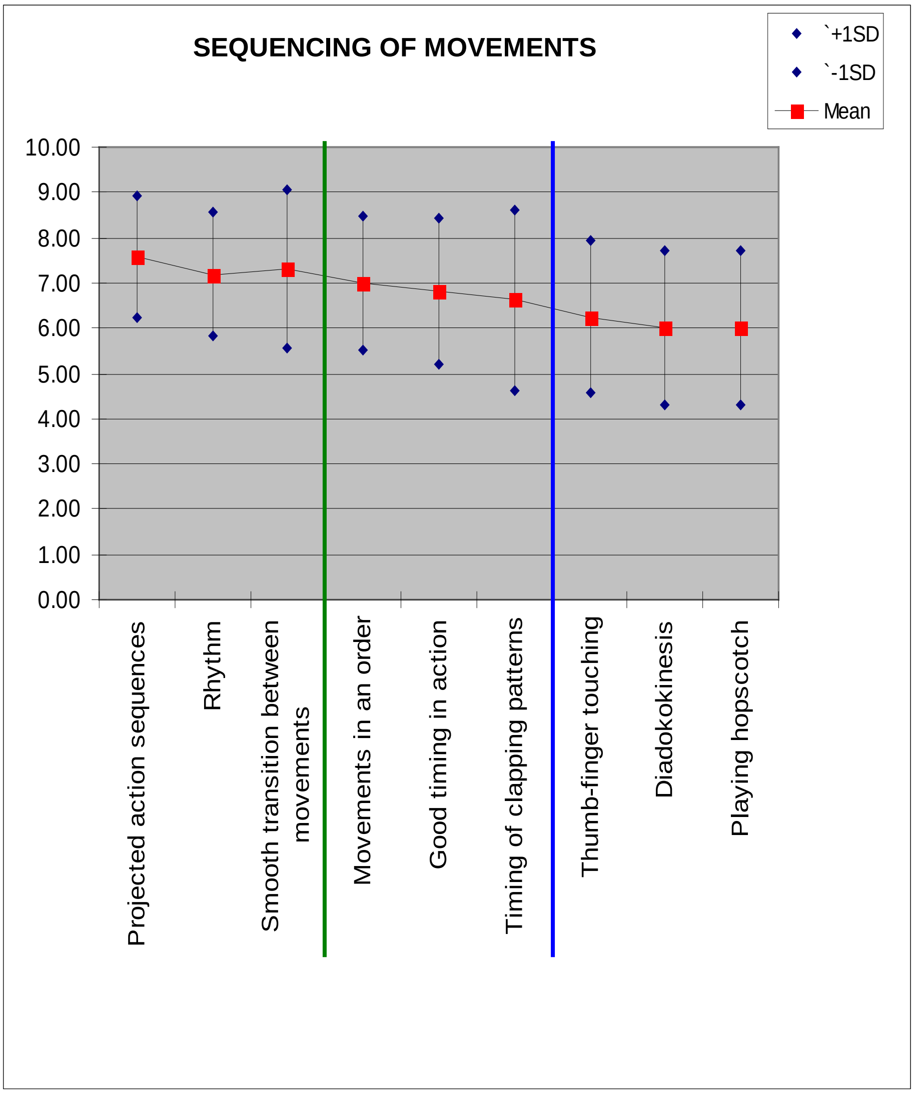



**Figure 6.8** Means and Standard Deviations of the **Sequencing of Movements** Motor Component

Figure 6.9 illustrates the participant's ratings of the characteristics of movement associated to **poor sequencing of movement**. It shows that "hesitates between movements" and "miss times clapping patterns" were the strongest characteristics of movement associated to **poor sequencing of movement** (means of 7.25 and 7.2 respectively), and "puts shirt on before vest" was the weakest associated characteristic of movement (M=6.05). There was generally a low level of agreement by the participants across all these characteristics of movement as can be noted by the standard deviations ranging from 1.5 to 1.8.

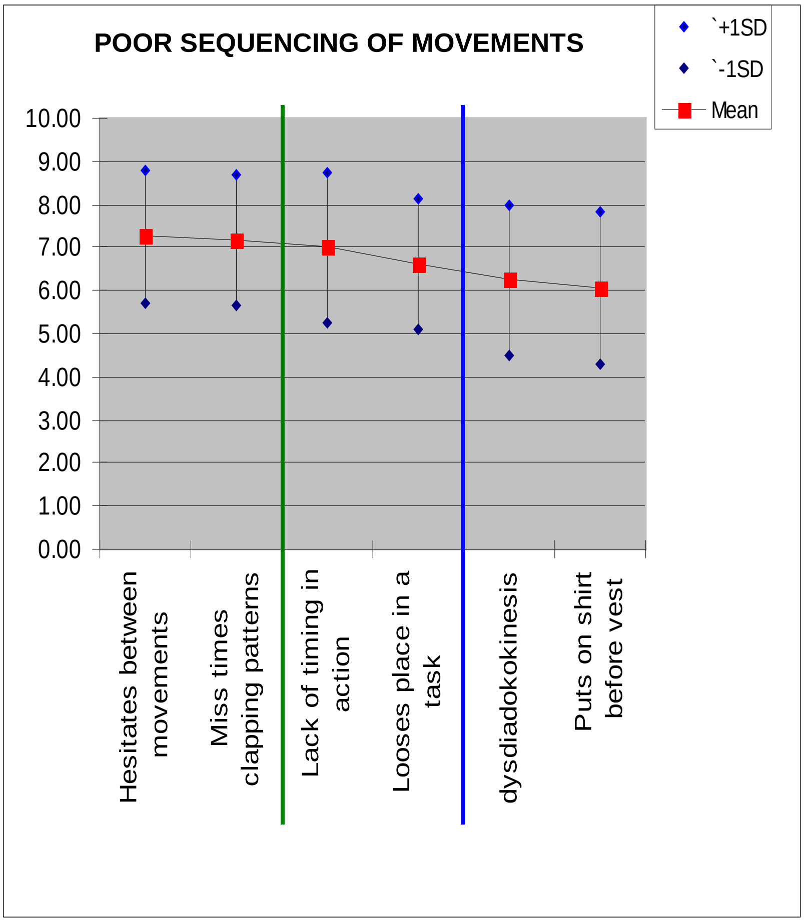



**Figure 6.9** Means and Standard Deviations of the **Poor Sequencing of Movement** Motor Component

### 6.3.2.5 Motor Component: Co-ordination and Poor Co-ordination

"Smoothness of movement" (M=7.45) and "movement accuracy" (M=7.3) were rated the highest of the characteristics of movement associated to **co-ordination** (figure 6.10), but their level of agreement among the participants was not that high (SD=1.6 each). "Eye-hand" (M=7.15, SD=1.3) and "hand-hand" (M=7.2, SD=1.35) were strongly associated to **co-ordination**, with higher agreement of the participants. "Effective combining of limb movements" also rated strongly with a mean of 7.2. "Cutting on a straight line" was the weakest associated to **co-ordination** (M=5.5), with "handwriting" also rating low (M=5.95). "Pencil control" (M=6.2, SD=2.0) was weakly associated to co-ordination with a poor level of agreement among the participants.

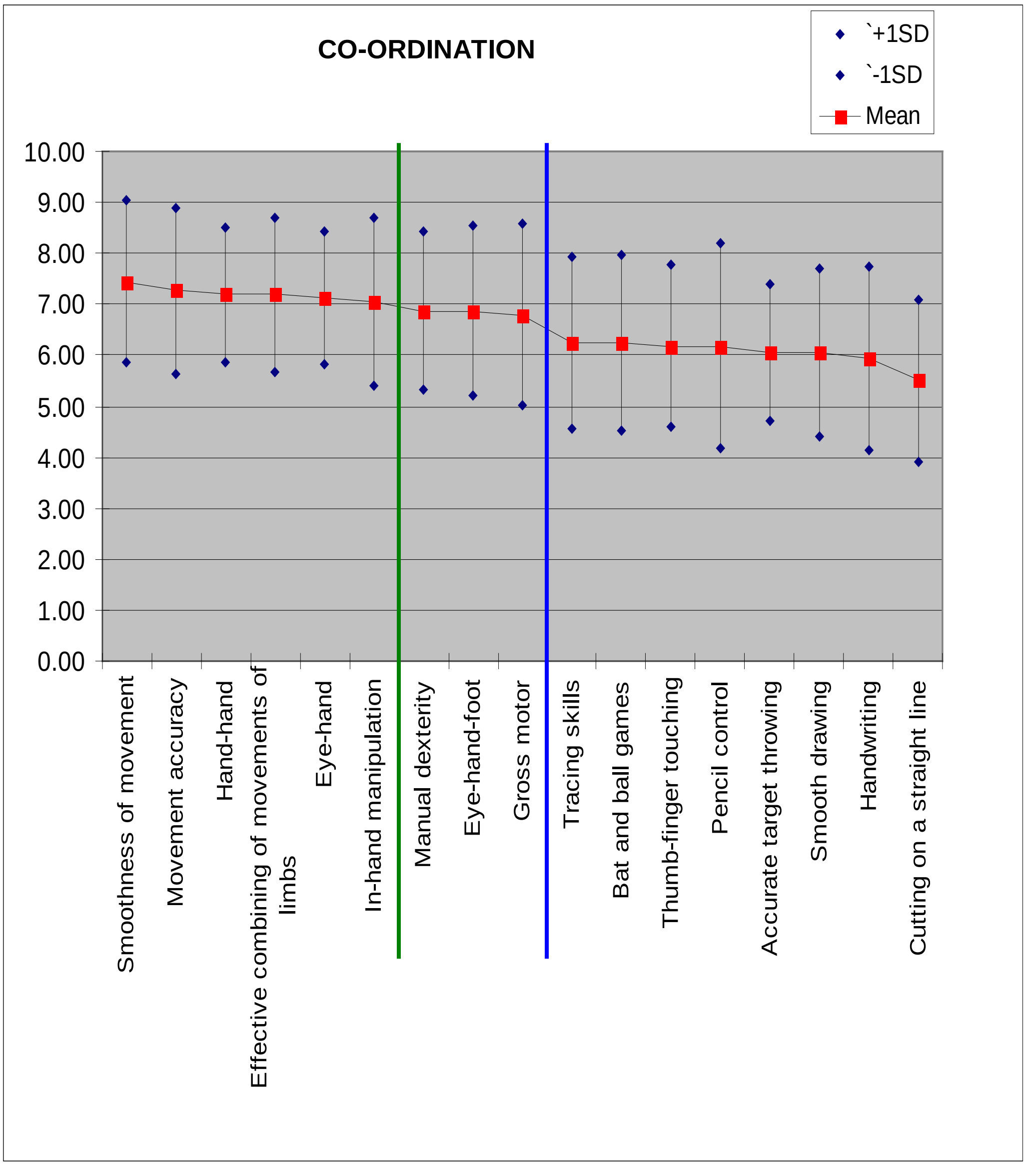



**Figure 6.10** Means and Standard Deviations of the **Co-ordination** Motor Component

In figure 6.11 it is seen that "poor eye-hand" and "poor gross motor" were the strongest associated characteristics of movement to **poor co-ordination**, both with a mean rating of 7.3. There was also a high level of agreement among the participants as to this rating, with a standard deviation of 1.1 and 1.15 respectively.

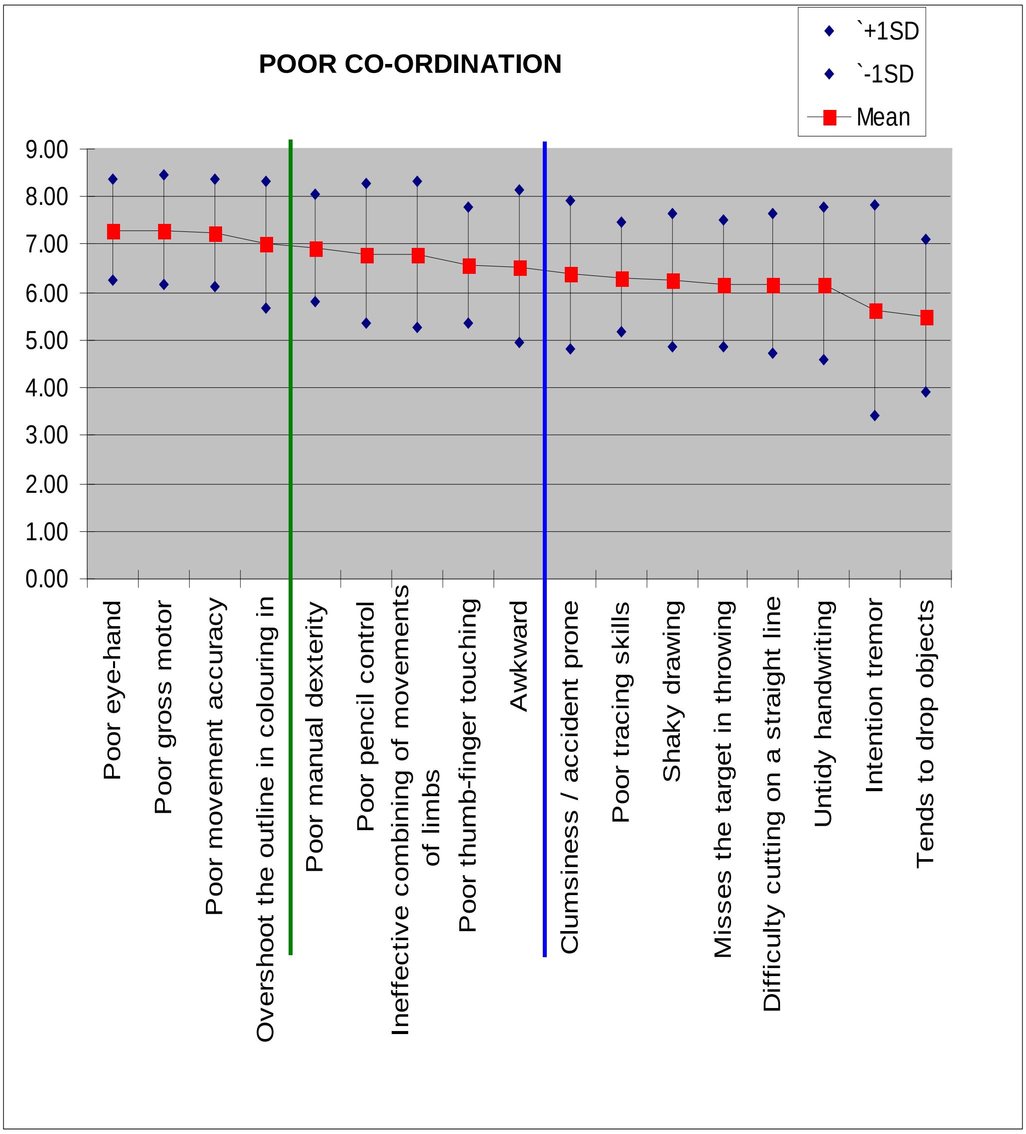



**Figure 6.11** Means and Standard Deviations of the **Poor Co-ordination** Motor Component

The weakest associated characteristic of movement was "tends to drop objects" (M=5.5, SD=1.6). It is important to note that "intention tremor" showed strong disagreement among the participants as to the strength of its association to **poor co-ordination** as it had a large standard deviation of 2.2.

### 6.3.2.6 Motor Component: Motor Skills and Poor Motor Skills

"Manual dexterity" (M=7.2, SD=1.15) and "quality of motor act" (M=7.1, SD=1.45) were consensually rated as strongly associated to **motor skills** (figure 6.12). Most of the other characteristics of movement in this component had a standard deviation greater than 2.0 indicating large levels of disagreement among the participants as to the strength of their association to **motor skills**.

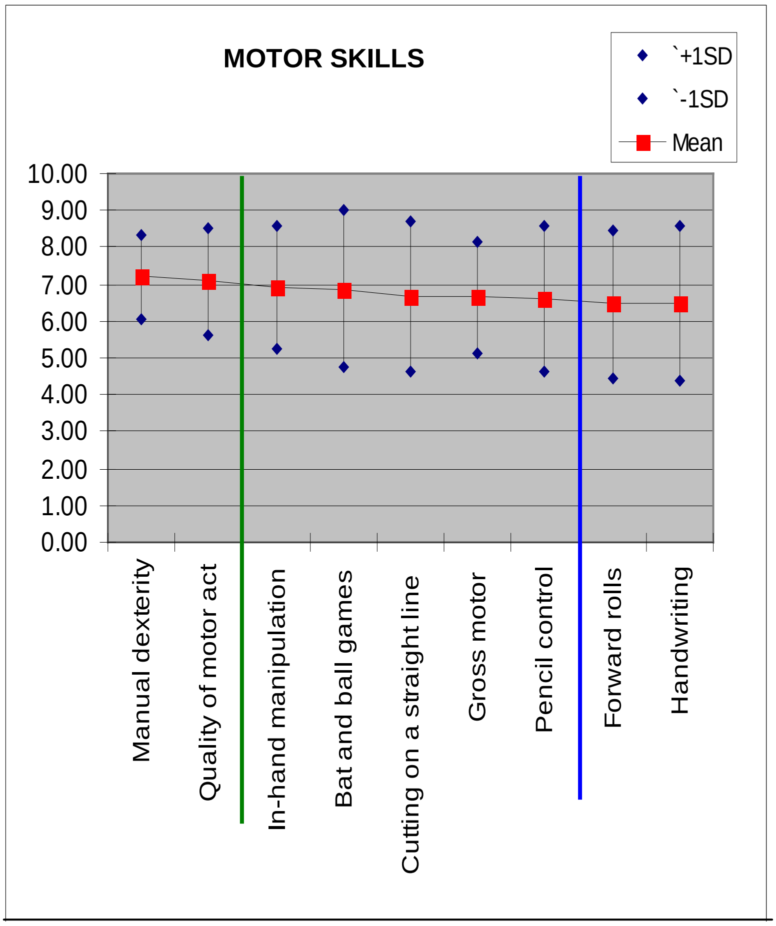



**Figure 6.12** Means and Standard Deviations of the **Motor Skills** Motor Component

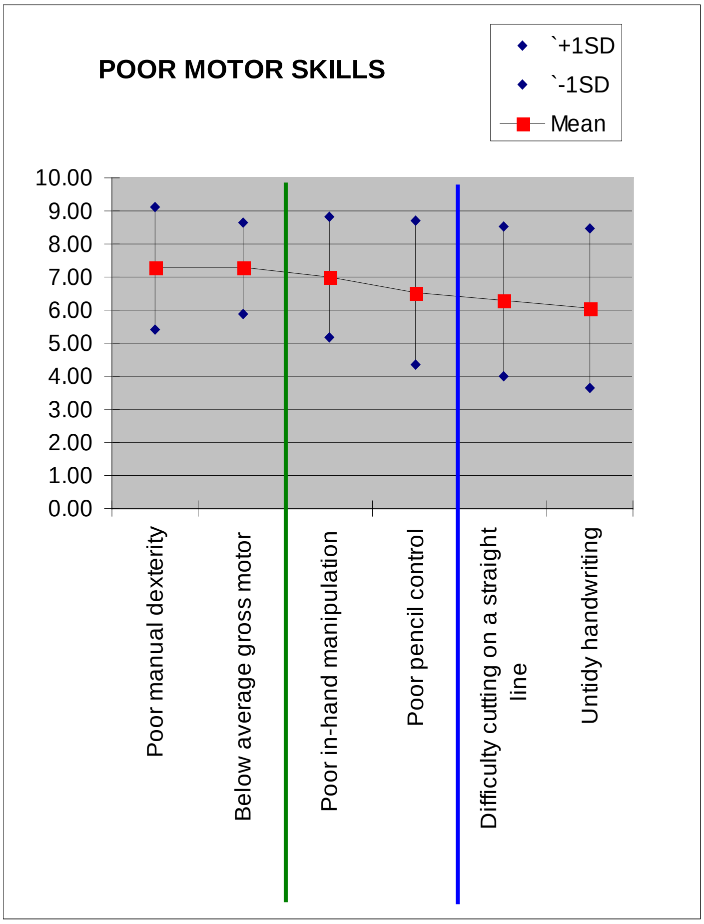



**Figure 6.13** Means and Standard Deviations of the **Poor Motor Skills** Motor Component

Figure 6.13 illustrates that "Below average gross motor" (M=7.3, SD=1.4) was consensually the strongest associated to "poor motor skills", with "poor manual dexterity" also being rated a mean of 7.3, but with poorer consensus (SD=1.9). There was a high level of disagreement among the participants across the other characteristics of movement in this motor component as noted by the standard deviations scoring above 2.0, except for "poor in-hand manipulation" (M=7.0, SD=1.8).

### 6.3.2.7 Summary of Likert Scale Results.

Table 6.7 (p87) provides a summary of the characteristics of movement that were rated above a mean of 6.5 (above the blue line) that were matched to other units of meaning or characteristics of movement and were thus retained for the Delphi C. All characteristics of movement that were rated below 6.5 were discarded at this stage.

## 6.3.3 Motor Components of Function and Dysfunction: Definitions

The definitions of each motor component given by the participants were coded to extract units of meaning. The units of meaning were grouped into semantic clusters. Tables 6.1 to 6.6 list the units of meaning for the motor components related to function and dysfunction, within each semantic cluster. Red units of meaning were frequently cited in definitions, orange occasionally cited, and yellow seldom cited.

### 6.3.3.1 Praxis and Dyspraxia

| |
|---|
| >5 |
| 3 to 5 |
| <3 |

Key to tables 6.1 to 6.6: Red indicates that more than 5 participants included the meaning unit in their definition, orange is 3 to 5, and yellow is under 3. This was not reflected as a percentage of participants due the qualitative nature of this part of the analysis. Percentage representation creates an impression of poor consensus.

**Table 6.1** Units of meaning for participant definitions of praxis and dyspraxia

| Semantic Cluster | Praxis | Dyspraxia |
|---|---|---|
| New, unlearnt | learn movement | difficulty learning new motor tasks |
| | unfamiliar / new movement | difficulty learning unfamiliar motor tasks |
| | Un-established / unpractised | |
| Ideation | **conseptualising** | inability to form an idea of what to do |
| | on command | inability to conceptualise / visualise how to do it |
| | prepare / anticipate | poor ideation |
| | see potential in objects | difficulty seeing potential in an object / situation |
| | | unable to work out what to do with your body |
| Meaningful | goal directed purposeful | difficulty achieving a goal directed action |
| | success | |
| | interact with the environment | |
| Sensory | motor engrams | difficulty using body scheme / poor developed |
| | previously learnt patterns | |
| | use motor skills | inefficient somatosensory input and feedback |
| | body scheme | |
| | imitate movements | |
| Motor planning | **Planning / motor plan** | **Poor motor planning** |
| | organised | poor anticipation |
| | | poor organisation of movement |
| Sequence / order | adapt a sequence | lack sequenced movement |
| | sequence of movement/pattern | |
| Monitored / controlled | guided/controlled by sensory feedback | lack fluid, controlled movement |
| | feed-forward | poor smoothness of movement |
| | correct / refine | poor timing |
| | proprioception | |
| Execute movement | co-ordinated / timed fluid execution | **difficulty performing motor output / execute task** |
| | **execute movement** | poor output on command (visual / verbal) |
| | | poor output on own ideas |
| | | body can't do what you want it to |
| Uniquely human | uniquely human | |
| Anticipate / adapt | adapt a sequence | difficulty engage effectively in the environ |
| | | inability to Generalise a motor task |
| Not biomechanical | | not muscular dysfunction |

The colour in the semantic clusters for table 6.1 and 6.2 are for clarity in the discussion only (6.4).

The units of meaning that featured strongly in the Praxis and Dyspraxia (table 6.1) motor component definitions were: new and unfamiliar tasks, conceptualising, meaningful, body scheme, motor planning, sequencing, feedback and feed-forward control, and movement execution, and the dysfunction form of each. All the semantic clusters (except the last three in table 6.1) contained a high frequency of units of meaning. According to Participant 3,

> "*Praxis involves the conceptualization of a sequence of unfamiliar movements, the formulation of a motor plan which involves drawing on the memory of motor engrams & the use of body schema, to then execute the planned sequence of movement task in a co-ordinated & fluid manner using sensory & feedback clues appropriately & effectively to guide movements.*"

This expert's definition was a comprehensive representation of the semantic clusters that emerged.

This motor component had good consensus of definitions represented as many of the units of meaning are red or orange, indicating a higher frequency of these units of meaning being cited by participants.

6.3.3.2 Postural Control and Poor Postural Control

Table 6.2 illustrates that the units of meaning that featured strongly in "postural control" and "poor postural control" are: control and stability of the trunk, maintaining position, postural background movement, antigravity alignment, tone and balance components, and a base for control of movement, and the dysfunction form of these units of meaning. The high frequency semantic clusters featuring in this motor component were: "central / proximal of the body", "stability", "hold / sustain", "background adjustment", "alignment", and "base for movement control".

**Table 6.2** Units of meaning for participant definitions of postural control and poor postural control

| Semantic Cluster | Postural Control | Poor Postural Control |
|---|---|---|
| Central, proximal of body | **trunk / proximal** | |
| | control of neck and head | |
| | shoulder and hip girdles | |
| **Stability** | control of trunk muscles | **poor trunk stability / control** |
| | Stability | fixing patterns |
| | co-contract | poor control of neck |
| | synchronous use | controlling posture |
| | synergic muscles/agonist-antagonist | poor movement control / efficient / effective |
| | balanced muscle tone | |
| Hold / sustain | hold position | **difficulty maintain position** |
| | **maintaining posture** | increased effort |
| | assume positions | |
| | while static | |
| **Background adjustment** | adapt postural mechanisms /adjust | inability to adjust posture / subtle shift |
| | automatic postural preparations/ background shift | inability to prepare posture |
| | smooth postural background | lack control of background movements |
| **Alignment** | upright posture/optimal position | Can't keep body upright |
| | correct alignment | correct alignment of trunk |
| | against gravity | **against gravity** |
| **Control During movement** | during movement/activity ; dynamic | |
| | Transitions | |
| | give **ease** of task | |
| | fluid / correct movement patterns | |
| **Components** | righting reactions | poor equilibrium reactions |
| | equilibrium reactions | improper / low muscle tone |
| | balance | poor weight-shift |
| | adequate muscle tone/normal | poor transition of movement |
| | postural reflex mechanisms | Poor isolation of movement |
| | dependant on inhibition of spinal/brainstem reflex activity | not comfortable |
| | small postural muscles | poor extended posture |
| | sufficient stretch | inadequate rotation |
| | | needs external support |
| Functional | age appropriate | |
| | engage in activity / functional | |
| | cope with demands of task | |
| sub-conscious | sub-conscious | |
| **Base for movement control** | base for controlled movements | excessive / limited movements |
| | free body parts to perform a task | difficulty co-ordinate distal movement |
| | and limbs/extremities | to perform the task |
| | | inability to perform a task with specific body parts |
| | | for the activity |
| | | difficulty meeting the demands of an activity |
| Imbalance muscles | | poor muscle balance / imbalance of muscle length |
| | | over-stretched and shortened muscles |

Postural control was defined by Participant 8 as being

> "*to be able to make the automatic postural preparations to engage in an activity and to adapt your postural mechanisms automatically during the activity, so that you can cope with the demands of the task. The task could require movements or it could be just to stay stable in a position etc.*"

This was a more general definition than one provided by Participant 9, who highlighted the components in her definition:

> "*Postural control is dependent on the development of the postural reflex mechanism dependent on the inhibition of spinal and midbrain reflex activity and the development of righting, balance and equilibrium reactions*."

#### 6.3.3.2 Integration of Movements and Poor Integration of Movements

The dominant features cited by the participants in their definitions of "integration of movements" and "poor integration of movements" is that it involves both sides of the body, bilateral, midline crossing, combining limb movements, smoothness and control of movement and sequencing. This was also reflected in the dysfunction form. "Bilateral" emerged as a frequently cited semantic cluster in this motor component. There was also a frequency of units of meaning in the semantic clusters of "quality of control", "combining body parts" and "sequence".

While many units of meaning emerged for this motor component, there was large discrepancy among the participants, as can be noted by the majority of units of meaning being represented in yellow on table 6.3.

**Table 6.3** Units of meaning for participant definitions of integration of movements and poor integration of movements

| Semantic Cluster | Integration of Movements | Poor Integration of Movement |
|---|---|---|
| Bilateral | **co-ordinate 2 sides of body, bilateral** | **Poor co-ordinating 2 sides of body / brain** |
| | crossing midline | poor midline crossing |
| | between all limbs | |
| | upper and lower | |
| | symmetrical | |
| | reciprocal | |
| | asymmetrical / different actions | |
| | bilateral integration | |
| Combining Body parts | in all planes | combine limb movements |
| | one muscle group to another | limb movements not work together |
| | synchrony of CNS structures | |
| | performer vs. support muscles | |
| | fluid transition between movement | |
| | **co-ordination/synchronise/integrate work effectively tog / combining** | |
| Quality of control | fluency of movement/harmonious | walking like Pinocchio |
| | rhythm | poorly executed movement |
| | control of movement /smoothness | not smooth, rhythmical, co-ordinated |
| | force | poor adjustment of speed, force, dexterity |
| | judgement in movement | clumsy |
| | timing | |
| Sequence or pattern | sequencing of movement / movement patterns | poor transition from 1 movement to another |
| | | poor sequence of actions |
| Skilled and effortless | automatic or voluntary | ineffective use of energy |
| | skilled | minimal effectiveness |
| | effortlessly adjusted | |
| Components | feedback and feed forward | not use isolated, selected movements patterns |
| | postural adaptation | inefficient automatically pre-programmed movements |
| | dissociation of movement | |
| | appropriate sensory feedback/input | poor somatosensory feedback |
| Unilateral | unilateral | |
| Output | in activity | |

Participant 13 viewed "poor integration of movement as pertaining more to the "bilateral" semantic cluster by defining it as the,

> "*Inability to use the two sides of the body together in a co-ordinated manner. They have difficulty crossing the midline and to perform a sequence of actions*."

The "quality of control" semantic cluster was more evident in Participant 16's definition:

> "*Poor integration of movements means that there is a lack of smooth continuity between a sequence of different or slightly varied movements. There is also poor adjustment of speed force and dexterity*."

Participant 11 failed to offer a definition of this motor component, stating:

> "*I am struggling to this as a concept! Not sure, would specify bilateral integration and define it accordingly if I was using the term*."

This indicates her view that the "bilateral" semantic cluster is relevant.

### 6.3.3.4 Sequencing of Movements and Poor Sequencing of Movements

**Table 6.4** Units of meaning for participant definitions of sequencing of movements and poor sequencing of movements

| **Semantic Cluster** | **Sequencing of Movements** | **Poor Sequencing of Movements** |
|---|---|---|
| Sequence / order | **specific order movements** | **string a sequence of different movements together** |
| | **sequence / series** | smooth combination of movements |
| | consecutive / one after another | compile parts of a movement |
| | movement transitions | **poor order** |
| | string movement together | poor sequential order of a task (making tea) |
| | systematic | |
| | compiling parts of movement | |
| | movement pattern | |
| | different but related motions | |
| Quality | No hesitation between movement / interruption | not stopping between movement |
| | | slowness / hesitation between movements |
| | fluid flow | poor flow of movements |
| | correct movement patterns | poor movement patterns |
| | timing | poor timing |
| | co-ordinate separate movements | poor use of feed forward |
| | time and space | reciprocal movement |
| | | awkwardness of movement |
| Execute | **execute / carry out** | **execute activity / complete a task** |
| | motor act | |
| Outcome | specific outcome | not the outcome expected |
| | functional / purposeful / meaningful | Pinocchio trying to run |
| | activity | |
| | in a task | |
| | achieve end pattern | |
| Related components | advanced bilateral integration | |
| | praxis components ideation and planning | |
| | postural stances | |

"Sequencing of movement" was defined by the participants (table 6.4) using predominantly the following units of meaning: sequencing and order of movements, fluid flow and timing of movement, and execution of task with the corresponding dysfunction forms representing "poor sequencing of movement". The semantic cluster that featured the most was that of "sequence / order". Participant 2 summed up "sequencing of movement" as,

> "*The ability to string movements together with appropriate timing and order.*"

### 6.3.3.5 Co-ordination and Poor Co-ordination

**Table 6.5** Units of meaning for expert definitions of co-ordination and poor co-ordination

| **Semantic Cluster** | **Co-ordination** | **Poor Co-ordination** |
|---|---|---|
| quality of control | smooth | Movements not smooth |
| | rhythmical | jerky movement |
| | effortless | difficulty controlling movement / motor control |
| | control of movement | poor co-ordinated movement |
| | fluid / fluent | poor pressure |
| | automatic | poor force |
| | Correct pressure | poor direction |
| | correct speed | poor speed |
| | correct force | |
| accuracy | accurate / precise | poor efficiency of movement |
| | efficiently | poor accuracy of movement |
| combining Body parts | co-ordinated movements | poor combination of eye and hand |
| | combine movement patterns | poor combination of eye and foot |
| | movement pattern | poor use of more than 1 body part to perform task |
| | functions on background of stability for distal mobility | poor use of dominant hand with non-dominant hand |
| | use of arms and legs | poor combining groups of muscles for action |
| | move hand, foot or eye in required way | poor transition between movements |
| | more than one body part | poor purposeful combination of movement |
| | combine groups of muscles | |
| Time | Within time limits | poor timing |
| planning | feed forward and feedback | poor motor response without cognitive aspect of movement |
| | not motor planning | |
| | planned | seen at start of activity |
| | practiced movements | |
| output | gross and fine motor movement | poor gross motor movements |
| | look at end product | poor visual regard |
| | effective execution | poor hand function |
| | purposeful | poor use of dominant hand |
| | output of movement | poor learnt motor skills |
| | skilled movement sequence | poor eye convergence |
| | | end product of poor postural control |
| | | end product of poor bilateral motor co-ordination |
| | | end product of poor sequencing |
| | | end product of poor praxis |
| | | poorly executed movement |
| | | poor performance of movement skills / end products |
| adaptive | match requirements of environment | |

There was a diverse cohort of units of meaning associated in the definitions cited by the participants for co-ordination and poor co-ordination, with the strongest emerging features being that of smoothness, combining movement, accuracy and timing of movement, and difficulty of these (table 6.5.). The two semantic clusters that have contextually different implications are that of “quality of movement” and “combining body parts” both contained a high frequency of units of meaning. These two units of meaning were well illustrated in "*poor co-ordination means that one is unable to accurately and smoothly co-ordinate a part or parts of one's body to achieve successful transition between movements in a functional task*",

provided by Participant 16. Participant 8 used a definitional precision error in her definition of "co-ordination", as she used the term within its own definition:

"*Moving different parts of the body, or the eye and limbs in a **co-ordinated** manner*."

This motor component, like integration of movements yielded many units of meaning, but few that were consistently cited by participants.

### 6.3.3.6 Motor Skills and Poor Motor Skills

**Table 6.6** Units of meaning for expert definitions of motor skills and poor motor skills

| **Semantic Cluster** | **Motor Skill** | **Poor Motor Skills** |
|---|---|---|
| learnt / practiced | learnt motor act | **cant do learnt / familiar skills** |
| | practiced tasks | battles to learn a new skill |
| | skilled movement | poor performance with practice |
| | repeated with good quality | poor ability to become skilled at a motor act |
| | acquired | |
| quality of movement execution | executed in a co-ordinated manner | poor smoothness |
| | automatically executed | poor precision / accuracy |
| | require less concentration | components are not integrated into skill |
| | less effort / efficient | **poor execution** |
| | execute accurate movement | difficulty in approach to motor act |
| | control ones movements | poor performing of a motor task |
| | sequenced | poor movement efficiency |
| perform task | ability | poor task process |
| | perform a motor task | poor task completion |
| | approach to tasks | needs conscious effort when shouldn't |
| | motor function | not look at the end product/model |
| | | not a problem of process |
| Body | whole body | |
| | one or more body parts | |
| | gross and fine motor movement | |
| Success / meaningful | meeting set criteria | not meet movement criteria / standards |
| | successful | can't do desired movements |
| | goal directed | |
| | own satisfaction | |
| outcome | for a specific task | poor gross and fine motor acts |
| | for fine activities and games | poor movement as measured by teachers |
| | not look at the end product | poor end-product / outcomes of movement |
| | fulfil child's occupational role (scholar) / | difficulty with functional tasks |
| | functional | result of poor praxis / co-ordination |
| development | age related | poor performance of age appropriate motor tasks |
| | development | |

Table 6.6 shows that the main feature cited by the expert occupational therapists about "motor skills" and "poor motor skills" was units of meaning related to the

semantic cluster of "learnt / practiced" tasks, and "quality of execution" of tasks, that are age or developmentally appropriate. These were featured in both the function and the dysfunction forms of the units of meaning, and were included in the response from Participant 9,

> "*Motor skill is an acquired successful action gained by repetition and practicing the skill*."

Motor skills and poor motor skills also demonstrated a low level of consistency among participants.

### 6.3.4 Synthesis of Results for Likert Scales and Definitions

The results presented in table 6.7 show a synthesis of the ratings on the Likert scales for each motor component and the analysis of the definitions provided by the participants. These were synthesised to establish trends across both data sets, as well as between the function and dysfunction forms of the motor components.

Results were linked according to meaning, for example "motor engrams", "motor engrams formation" and "poor motor engrams formation" were matched for analysis. Matched sets were then ranked according to the strength of their rating in the Likert scales, combined with the frequency with which they were cited in the participant definitions. Units of meaning and characteristics of movement that could not be matched were discarded. Those matched sets in which all were ranked below a mean of 6.5 on the Likert scales or cited by less than three participants in the definitions were also discarded.

The blank cells on table 6.7 indicate that there was not a match for that column of units of meaning or characteristics of movement in that row.

**Table 6.7** Summary of the results of the Delphi B used in the development of the phase 1 FUMT

**KEY:**

| | |
|---|---|
| **Units of meaning from participant definitions that were cited by >5 participants** | **Characteristics of movement that were rated M>7 on the Likert Scales by participants** |
| Units of meaning from participant definitions that were cited by 3-5 participants | Characteristics of movement that were rated M=6.5 - 7 on the Likert Scales by participants |
| Units of meaning from participant definitions that were cited by <3 participants | Characteristics of movement that were rated M<6.5 on the Likert Scales by participants |

| **Praxis** | | **Dyspraxia** | |
|---|---|---|---|
| **Definition Units of Meaning** | **Likert Scale** | **Definition Units of Meaning** | **Likert Scale** |
| **Planning / motor plan** | **Motor planning** | **Poor motor planning** | |
| **Conseptualising** | **Conceptualisation of a movement** | Inability to conceptualise / visualise how to do it | |
| Learn movement | **Quick to learn an action** | Difficulty learning new motor tasks | **Slow to learn a motor skill** |
| Unfamiliar / new movement | | Difficulty learning unfamiliar motor tasks | **Uses splinter skills** |
| Body scheme | Body scheme | Difficulty using body scheme / poor developed | **Poor body scheme** |
| Motor engrams | **Motor engrams formation** | | **Poor motor engrams formation** |
| **Execute movement** | | **Difficulty performing motor output / execute task** | |
| Sequence of movement/pattern | | Lack sequenced movement | Hesitates between movements |
| | **Good timing in action** | Poor timing | **Lack of timing in action** |
| | **Anticipates motor responses** | Poor anticipation | **Poor anticipation of motor responses** |
| Guided/controlled by sensory feedback | | Inefficient somatosensory input and feedback | **Trial and error approach to task performance** |
| Goal directed purposeful | **Goal directed action** | Difficulty achieving a goal directed action | |
| | Initiates movement easily | | **Difficulty initiating movement** |
| Co-ordinated / timed fluid execution | Good reaction time | | Delayed reaction time |
| Imitate movements | Imitation of movements | | **Needs lots of practice** |

| Postural Control | | Poor Postural Control | |
|---|---|---|---|
| **Definition Units of Meaning** | **Likert Scale** | **Definition Units of Meaning** | **Likert Scale** |
| Stability | **Stability** | **Poor trunk stability / control** | **Poor stability** |
| **Maintaining posture** | **Upright sitting posture** | **Difficulty maintain position** | |
| Adapt postural mechanisms /adjust | **Postural background movements** | Inability to adjust posture / subtle shift | **Excessive body adjustments in sitting** |
| Automatic postural preparations/ background shift | **Weight-shift** | Poor weight-shift | **Poor weight-shift** |
| Equilibrium reactions | **Equilibrium reactions** | Poor equilibrium reactions | **Poor equilibrium reactions** |
| Adequate muscle tone/normal | **Normal tone (postural)** | Improper / low muscle tone | **Low tone** |
| Co-contract | Co-contraction | Fixing patterns | **Fixation** |
| Against gravity | | **Against gravity** | |
| Give **ease** of task | | Increased effort | **Fatigues easily** |
| Base for controlled movements | Control of movement force | Poor movement control / efficient / effective | Poor control of movement force |
| Control of neck and head | | Poor control of neck | **Rests head on hand** |
| Hold position | | Can't keep body upright | Floppy |

| Integration of Movements | | Poor Integration of Movements | |
|---|---|---|---|
| **Definition Units of Meaning** | **Likert Scale** | **Definition Units of Meaning** | **Likert Scale** |
| **Co-ordinate 2 sides of body bilateral** | **Bilateral arm and leg movements** | **Poor co-ordinating 2 sides of body / brain** | **Poor bilateral arm and leg movements** |
| **Co-ordination / synchronise / integrate work effectively tog / combining** | **Effective combining of movement of limbs** | Combine limb movements | **Ineffective combining of movement of limbs** |
| Crossing midline | Midline crossing | Poor midline crossing | Poor midline crossing |
| Reciprocal | **Reciprocal movement** | | |
| | Stabilising use of non-dominant hand | | Poor stabilising use of non-dominant hand |
| Control of movement / smoothness | | Not smooth, rhythmical, co-ordinated | |
| Fluency of movement/harmonious | | Poor adjustment of speed, force, dexterity | |
| Sequencing of movement / movement patterns | | Poor sequence of actions | |

| Sequencing of Movements | | Poor Sequencing of Movements | |
|---|---|---|---|
| **Definition Units of Meaning** | **Likert Scale** | **Definition Units of Meaning** | **Likert Scale** |
| Consecutive / one after another | **Smooth transition between movements** | Smooth combination of movements | **Hesitates between movements** |
| **Specific order movements** | Movements in an order | **Poor order** | |
| **Sequence / series** | **Projected action sequences** | **String a sequence of different movements together** | |
| Timing | Good timing in action | Poor timing | Lack of timing in action |
| **Execute / carry out** | | **Execute activity / complete a task** | |
| | Timing of clapping patterns | | **Miss times clapping patterns** |

| Co-ordination | | Poor Co-ordination | |
|---|---|---|---|
| **Definition Units of Meaning** | **Likert Scale** | **Definition Units of Meaning** | **Likert Scale** |
| accurate / precise | **Movement accuracy** | poor accuracy of movement | **Poor movement accuracy** |
| **smooth** | **Smoothness of movement** | Movements not smooth | |
| move hand, foot or eye in required way | **Eye-hand** | poor combination of eye and hand | **Poor eye-hand** |
| gross and fine motor movement | Gross motor | poor gross motor movements | **Poor gross motor** |
| | **Effective combining of movements of limbs** | poor purposeful combination of movement | Ineffective combining of movements of limbs |
| | Manual dexterity | | Poor manual dexterity |
| | Pencil control | | Poor pencil control |
| | Thumb-finger touching | | Poor thumb-finger touching |

| Motor Skills | | Poor Motor Skills | |
|---|---|---|---|
| **Definition Units of Meaning** | **Likert Scale** | **Definition Units of Meaning** | **Likert Scale** |
| Execute accurate movement | **Quality of motor act** | Poor precision / accuracy | |
| | **Manual dexterity** | | **Poor manual dexterity** |
| | Gross motor | Poor gross and fine motor acts | **Below average gross motor** |
| Learnt motor act | | **Cant do learnt / familiar skills** | |
| Executed in a co-ordinated manner | | **Poor execution** | |
| | In-hand manipulation | | Poor in-hand manipulation |
| | Pencil control | | Poor pencil control |
| Age related | | Poor performance of age appropriate motor tasks | |
| | Cutting on a straight line | | Difficulty cutting on a straight line |

## 6.4 DISCUSSION

It can be seen by figures 6.2 to 6.13 that a mean of above five on the Likert scale was achieved by all characteristics of movement. This suggests that the participants felt that all the characteristics of movement were associated with the relevant motor components. This was expected as these were allocated to the motor component by more than 50% of the occupational therapists sampled in the Delphi A (chapter 5) of the study. This consistency noted across all six motor components and their corresponding dysfunctions, validates the results of the Delphi A.

### 6.4.1 Critique of the measuring tool

The questionnaire for this stage of the study was ten A4 pages in length, and although much of it was taken by the Likert scales which only required a mark of the relevant number, the length of the tool may have influenced participation. Subject fatigue was evident in that some respondents did not complete section C of the questionnaire, or gave a short phrase in response. One respondent (participant 13) failed to complete any of the Likert scales for “motor skills” and “poor motor skills” as well as many of the scales for “praxis”. Participant fatigue was further evident in that many respondents gave detail to their definitions of the function related components, and then little detail for the dysfunction related components, with some indicating that the definition for the dysfunction component was “the opposite of function”. This demonstrates a level of participant fatigue as a reliability factor [65] in this stage of the study, however there was sufficient data obtained to analyse section A and B of the questionnaire. Section C comments were taken into account in the analysis, but were not specifically analysed, due to poor completion of this section.

### 6.4.2 Discussion of Praxis and Dyspraxia

A number of the semantic clusters (table 6.1 p82) identified in the analysis of the definitions supplied by the participants in this stage are included in Ayres’ original (1974) definitions of praxis and dyspraxia. The use of colour matches the semantic clusters to these definitions. Ayres defines praxis as "*not just movement, but a* **learned** *ability to* ***plan*** *and direct a temporal* ***series*** *of coordinated movements towards* ***achieving a result*** *– usually a* ***skilled*** *and* ***non-habitual*** *act*" [33] p170.

She defined dyspraxia as,

"*a disorder of* ***sensory*** *integration interfering with the ability to* ***plan*** *and* ***execute skilled non-habitual*** *motor tasks. Usually, there is some inability to relate the* ***sequence of the motions*** *to each other. The dyspraxic child can and does learn specific motor skills through repeated attempts and executions, but as long as he has not acquired the generalised ability to* ***plan unfamiliar*** *tasks, apraxia is still present*" [33] p165. (At this time Ayres still referred to dyspraxia as "developmental apraxia").

She was a pioneer in investigating the nature of developmental based dyspraxia within her theory of Sensory Integration. Her work has been strongly extended since the early 1970's into the practice of occupational therapy in the field of LD and DD. The evidence of the influence of Ayres' work on South African occupational therapists' interpretation of this motor component is clear. It is illustrated by the use of colour (in the Ayres definitions) to highlight the semantic clusters (table 6.1) that emerged from the definitions provided by the experts, and the characteristics of movement that rated higher in association to this component.

There is a generally high level of consensus (table 6.7 p91) among the expert occupational therapists as to the nature and features of praxis and dyspraxia. Consensus can't be measured in percentage here due to the qualitative aspects of the mixed methods data analysis. The features were consistent through the participants rating the characteristics of movement (above a mean of 6.5) associated to both praxis and dyspraxia. These were supported in the analysis of the definitions provided by the participants with three or more citations. Consensual features of praxis and dyspraxia were "**motor planning**", "conceptualisation of movement", "**learning movements** that are **new / unfamiliar**", "**body scheme**", "**formation of motor engrams**", "**motor execution**" "**sequencing of movement**", "timing of movement", "anticipation of motor responses", "**sensory feedback**" and "**goal directed action**". The colour use again matches the semantic clusters from table 6.1. These features were common in praxis and dyspraxia, as well as between the Likert scale results and the qualitative analysis of the definitions provided by the participants. The features not listed here, though reflected on table 6.7, were lower ranked, thus weaker features of this other component.

The characteristics of movement that rated low on the Likert scales (such as “playing hopscotch”, “construction”, “pumping a swing to move”, “awkward”, and “crosses out often in writing”) were not represented in the analysis of the definitions provided by the participants, indicating that they are not strong features of praxis and dyspraxia. Their association from the Delphi A (chapter 5) may be more related to a product of praxis rather than praxis itself.

The Delphi A (table 5.1 p50) also noted that phrases such as “body scheme” and “motor engram formation” showed low representation even though these are deemed to be strong contributing functions to praxis in the literature [5,6,11]. Both of these emerged as strongly associated to “praxis” in this stage of the study, and were supported in the analysis of the definitions of “praxis” and “dyspraxia”.

Sequencing did not feature from the Delphi A in association to praxis and dyspraxia, but emerged in the definitions of praxis and dyspraxia in this stage of the study. This supports the validity of the research method selected in the study, as there was the opportunity for data to emerge, thus controlling for researcher bias in the study.

### 6.4.3 Discussion of Postural Control and Poor Postural Control

The Delphi A (chapter 5) yielded many characteristics of movement that were associated to postural control and poor postural control, more than any of the other motor components that were investigated. Some of these characteristics were attributed to postural control and poor postural control by more than 75% of the occupational therapists. This high level of agreement was again noted in this stage of the study, as only three characteristics of movement across both “postural control” and “poor postural control” had a high SD (>1.7) indicating a level of disagreement in only three characteristics of movement.

There is strong evidence from this stage of the study (table 6.7 p 91) indicating that occupational therapists view postural control as involving **stability of the trunk and proximal girdles**, the ability to **sustain upright alignment** of the body, with **subtle background shift**, as a **base for controlled movement**, using **postural tone** and **postural reflex mechanisms** (**equilibrium reactions**, **weight shift**, **co-contraction**). This was consistently demonstrated through high rating (M>6.5) on the Likert scales (figure 6.4 and 6.5), and as semantic clusters (table 6.2) that emerged from the expert's definitions, across both the function and dysfunction forms of this motor component. The colour again matches the discussion to the semantic clusters in table 6.2

This is supported in much of the literature, as stated in The Framework, posture relates to **stabilizing** and **aligning** one's body **while moving** in relation to task objects with which one must deal" [2] p621. The Framework definition though falls short of including the reflexive nature of postural control, which is emphasised by Harrow (1972) who termed this motor component "postural **reflexes**" [53]. The Framework however, may have accounted for this in a hierarchically lower level.

### 6.4.4 Discussion of Integration of Movement and Poor Integration of Movement

The audit of the literature showed that the word "integration" is often used in defining other motor components related to motor control or co-ordination [19] , or is attached to another word to create a motor component such as "visual motor integration", "bilateral integration" and "sensory integration". The Delphi A (table 5.5 p62) demonstrated an overlap of this motor component with the "co-ordination" motor component. While this overlap persisted in this stage of the study, "integration of movement" and "poor integration of movement" demonstrated a stronger association to "bilateral integration" or the use of both sides of the body in a co-ordinated manner [19,54] (table 6.7 p91). "Midline crossing" was also a characteristic of movement that emerged strongly in this motor component. Synonyms for the word "integration" are addition, combining, amalgamation and assimilation which all reflect a fusing or coming together, as opposed to synchronise or harmonize which reflect "co-ordination" [67]. Although a subtle difference this can be used in the FUMT (chapter 8) to effectively discriminate between the two terms.

### 6.4.5 Discussion of Sequencing of Movement and Poor Sequencing of Movement

'Sequence' is a basic term in the English language meaning put into series or order [67]. This construct emerged strongly in the results through both the Likert scales and the participant definitions. "Movement pattern" emerged in the participant definitions, which supports the construct of movements in a series, one action after another. "Timing of movement" was also a consistent feature of sequencing of movement as noted in table 6.7 (p91).

Sensory Integration theory tends to refer to sequencing more in terms of "projected action sequences" which involves the ability to predict the timing of an interaction with change in the environment in order to have the body in the right place at the right time to perform the movement [5]. This may account for the strong timing and flow of movement semantic cluster that emerged and for "projected action sequences" being rated high (M=7.57) by the participants on the Likert scales (figure 6.8 p76).

The characteristics of movement that rated low on the Likert scales relate to the output of sequencing, and these were not evident in the participant definitions. One participant commented that she had never seen a client with a difficulty that resulted in a client "putting on shirt before vest" or anything similar. While this characteristic of movement rated the lowest, with the greatest disagreement, it still rated a mean of 6.05, indicating that it is considered to involve "poor sequencing of movement", even though in reality it is unlikely to occur. This result questions how vigilant occupational therapists are in questioning their beliefs in the context of what happens in practice.

### 6.4.6 Discussion of Co-ordination and Poor Co-ordination

Smooth control of movement, and combining movements of different body parts continue to be the two strong constructs that characterise the use of "co-ordination" and "poor co-ordination" by occupational therapists. These two constructs have different bases in the literature.

The smooth control of movement has it's literature base in DCD and DAMP [30], which are both characterised by motor clumsiness, and are strongly associated with Dyspraxia [5,8,28], as well as literature on motor learning and motor control [36]. "Clumsiness / accident prone" and "awkward" are well documented as characteristics of movement related to DCD [8,28] and DAMP [30], but were rated low on the Likert scales (6.3.2.5 p78), possibly as occupational therapists view these as poor descriptors of movement, and these did not emerge in the participant definitions. They viewed this as smoothness of movement, and control of movement (for co-ordination) or difficulties with motor control or having jerky movements (poor co-ordination).

Combining movements seems to be derived more from using it in conjunction with phrases like "eye-hand" or "poor gross motor" as noted in the Delphi A. This emerged through the Likert scales and the participant definitions. "Effective combining movements of the limbs" was slightly higher with slightly better agreement (M=7.2, SD=1.5) in the motor component of "co-ordination" than in "integration of movements" (M=7.15, SD=1.65).

An emerging construct for co-ordination and poor co-ordination was the greater emphasis on "execution of movement" as an end-product of other motor abilities, which was noted in the analysis of the participant definitions (table 6.5 p87). When combined with the Likert scale results, however, this emphasis was again suppressed (table 6.7 p91).

### 6.4.7 Discussion of Motor Skills and Poor Motor Skills

The Likert scales (6.3.2.6 p80) indicated that the participants rated underlying movement abilities such as "manual dexterity" and "quality of motor act" consensually higher than learnt and practiced abilities. This reflects the definition from the Framework that motor skills are "*observable operations used to move oneself or objects*" [1] (p113). The participant definitions however strongly reflected that motor skills are learnt and practiced and are outcomes of movement. This is more likened to the definition by Harrow who viewed it as "*the result of the acquisition of a degree of efficiency when performing a complex movement task*" [53] (p77).

It is interesting that "handwriting" is considered a fine motor skill in the literature [70] but rated low with very poor agreement among the participants (M=6.45, SD=2.1), and the poorest agreement in poor motor skills was "untidy handwriting" (SD=2.4). This illustrates that there is still poor consensus related to the use of "motor skills" and "poor motor skills" by occupational therapists. Notable too is that the dominant semantic clusters (table 6.6 p89) representing motor skills ('leant / practiced" and "quality of motor act") have persisted from the themes identified in Delphi A (5.4.1 p57).

## 6.5 CONCLUSION

The Delphi B – Expert Survey has assisted in identifying characteristics of movement that are more strongly related to each of the function and dysfunction of six motor components. The Delphi A (chapter 5) provided a foundation to investigate motor term usage, but all the characteristics of movement and investigated motor components were provided within in the questionnaire. The Delphi B has allowed the occupational therapists to provide their own definitions, yielding units of meaning of new characteristics of movement that had not emerged though the second stage. In doing this semantic clusters associated with the terms emerged which were not evident after the second stage.

There continues to be inconsistency and overlap between these motor component terms but trends did emerge during this stage. The motor components of "Praxis" and "Postural control" emerged with better consistency than the other motor components. There is a clear indication that motor terms are used by South African occupational therapists in more than one context with diversity of meaning and varied implication on clinical practice. This continues to impact negatively on the quality of professional communication within occupational therapy as well as between occupational therapists and the other professionals and parents with whom they interact. This inconsistency also has bearing on research within the profession as much of our basic terminology is unclear within the research community itself and research may thus be misinterpreted.

While a third survey of the Delphi Technique would be beneficial in gaining further consensus, before the FUMT is finalised, the attrition rate of 42.86% from participants who responded to the first survey, to participants responding to the second survey raised concerns that the return rate of a third survey would be poor. The results of this stage clearly demonstrated the trends of term usage, but the inconsistencies warrant further investigation. The open card sort groups were identified as a suitable methodology for the Delphi C.

#### 6.5.1 Summary of Delphi B

A summary of the Delphi B is presented in table 6.7 on page 91. The synthesis of the results of the participant's ratings of the characteristics of movement from the Delphi A and the qualitative analysis of the definitions for each motor component provided by the participants was carried into the first phase of the development of the FUMT (chapter 8).

# CHAPTER 7 – STAGE 4: DELPHI TECHNIQUE ROUND C: EXPERT OPEN CARD SORT

## 7.1 INTRODUCTION

This stage forms the fourth stage of the study. In the Delphi B some consistencies of term usage emerged, specifically related to "praxis" and "postural control", but the level of consensus was still considered to be unacceptable, especially for "co-ordination" and "motor skills". A third survey round was unlikely to have a high return rate, and thus an alternative method of gaining consensus was needed.

The Delphi Technique has become a popular method for consensus research [24,62,76]. It has proved a very successful method of investigating the common opinions of experts in a particular field, as each expert has equal opportunity to put forward her opinion [23,24,62,76]. The Delphi Technique investigates a specific query within the experts' field of interest through a survey questionnaire [23,24,76]. Experts in the field of LD and DD should thus have fairly consensual view of how the terminology is categorised and used, as much of the terminology is derived from the theory and treatment frames of reference. The Delphi Technique was initially selected for participant anonymity from other participants, which is not achieved with other forms of consensus research [62,76,78]; the quantitative nature of the research method [62] and evidence of success for similar research [61,76,78,79]. The prevalence of ambiguity and worrying confusion in the use of the motor terms was highlighted through the Delphi A and B.

Criticism of the Delphi Technique has noted participant attrition at the third and fourth rounds as a common limitation of this method [24,76], and that it is often poor return rate in these rounds that ends the Delphi Technique rather than the achievement of consensus [76]. The undesirably low level of consensus generated out of the Delphi A and B in this study raised the concern that further rounds would not yield the consensus needed to develop the FUMT. A change in methodology was required in order to force consensus. Open card sorts are often used in usability research by computer software and website developers [63]. Other card sorting techniques include:

- "Closed card sorts" where the participants are asked to sort cards into pre-defined categories [66].
- "Q-methodology" in which participants sort cards that describe their personal feelings on a subject from 'strongly agree' to 'neutral' to 'strongly disagree' on a nine-point scale. A pyramid schematic is used to place the cards defining the amount of cards that can be placed in each column (point on the scale). The results of all participants are interpreted through factor analysis [62].

These two methods are very prescriptive, limiting the flexibility of the results. Although open card sorting is not commonly used in health science research its perceived value in this research was evident, and thus implemented. This method is also sometimes called a "pile sort".

An open card sort provides participants with a pack of cards that are labelled with phrases related to the topic being investigated. Participants then create clusters of cards that they feel meaningfully fit together. Their reasons for the fit are unique to each participant's feelings, experience and way of thinking. Participants then label their own clusters with a word or phrase that they feel represents the cluster. Participants may create sub-categories if appropriate [63,66]. This methodology assisted in forcing consensus as participants had to agree within their group on card placement and cluster labels, and it provided the opportunity for the six motor components investigated in Delphi A and B to come under review. Participants were no longer bound to the six motor components.

## 7.2 METHODOLOGY

The motor components that were identified in the literature (first stage of the study) were used in Delphi A and B to focus the opinions of the participants. This however was of limited success, as there was a lower than anticipated level of consensus in the Delphi B, in defining each motor component, despite the ascribed characteristics of movement to each motor component being given.

The characteristics of movement from the Delphi A and B and the units of meaning of the Delphi B were used to derive the content of the cards for the card sort. Each characteristic of movement and unit of meaning was placed on a card. The cards related to dysfunctional motor components (179 cards) were kept separate from cards relating to functional motor components (202 cards). Where the same phrase emerged from both the characteristics of movement and units of meaning lists, only one card was retained, all duplicates were eliminated. For example: “poor weight shift” was both a characteristic of movement and a unit of meaning associated with “poor postural control” (table 6.7 p 91), only one card labelled “poor weight shift” was included in the dysfunction cards.

Six open card sort groups were held, three groups sorted the cards related to the functional motor components and three sorted the cards related to the dysfunctional motor components. The six groups were held across four major South African cities: two in Johannesburg which included two experts from Pretoria (function group 1 and dysfunction group 1), one in Durban (function group 2), two in Cape Town (dysfunction group 2 and function group 3), and one in Bloemfontein (dysfunction group 3), in order to get a well represented sample. These cities were selected based on the prevalence of experts in this field, and the academic training centres are predominantly located in these cities. There were four participants in each group, except for in Bloemfontein where there were five participants.

Open card sorts are often done individually, but as this research was focusing on consensus, group card sorting was selected. Optimal group size for a card sort is suggested to be between three and five participants in order to enhance participation of all participants, Kauffman suggests that five groups of three participants is optimal [66].

Informed consent was obtained prior to the group meeting. All participants agreed to voice recording of the session and photographs being taken of the group process. Participants were informed that they were free to withdraw from the study at any time, and all completed the informed consent form (APPENDIX E1). Participant confidentiality was maintained by labelling the voice recordings and card sort envelopes with an open card sort group name i.e. “dysfunction group 2”. All consent forms were filed and stored separate from the data obtained in the open card sort groups.

### 7.2.1 Participant Selection

The inclusion criteria for participants in the study were determined in order to create an expert panel. The participants were deemed suitable for inclusion if they were practicing in the field of LD and DD, if they had more than ten years of clinical experience in the field, and if they were certified in either Neurodevelopmental Therapy or Sensory Integration or had a postgraduate degree or diploma in the field of LD and DD. Participants were excluded if they were not available to attend for the full 2 to 3 hours of the scheduled group time. Participant selection was through the networking (or snowball) method [62,80], where an expert in each city was asked to identify other known experts in the area. This expert in each city was approached based on their participation in the Delphi B. This non-probability sampling method was used as there is no register or list of occupational therapy experts in the field of LD and DD in South Africa.

The list of occupational therapists registered with the HPCSA proved ineffective as it contains the year of undergraduate qualification in occupational therapy, but does not contain information about fields of practice, and has limited (incomplete) postgraduate certification and qualification information. While the professional association list (OTASA) proved more useful in terms of fields of practice it too was ineffective as less than a half of the registered occupational therapists are members [3] of the professional association. Difficulty identifying members of the desired population is the accepted rationale for using this non-probability sampling technique [62,80]. The implementation of the networking method of participant sampling reduced sample bias, as many of the participants were not known by the researcher.

Once experts were identified, they were approached to attend an open card sort group, at the home or practice of one of the group members who volunteered a venue in the city that the group was to take place. Participants attended the venue closest to their home if there was more than one group being held in the city (i.e. Johannesburg or Cape Town).

### 7.2.2 Data Collection Process

Three open card sort groups were given 202 motor function related cards and the other three open card sort groups were given 179 motor dysfunction related cards to sort. All the cards were laid face up on a large table prior to the arrival of the group participants. The instructions were read to the participants at the beginning of the session. Instructions were consistent across all the open card sort groups.

Participants were instructed to always interpret the phrases on the cards in the context of movement or motor performance in children with LD or DD (APPENDIX E2). They were encouraged to sort the cards into clusters of cards that they felt were similar or matched together in any meaningful way. The card sort groups were free to create any number of card clusters, the card clusters were not prescribed to the group. This allowed that participants to create their own motor component labels and they were not bound to the motor components identified in the definitional audit (stage 1, chapter 4) investigated in the Delphi A and B.

Participants were asked to ensure that it was group consensus that allocated each card to a cluster of cards. Due to the large volume of cards, A4 white envelopes were placed on the table to provide cluster borders (figure 7.1 and 7.2). Groups were free to increase or decrease the number of envelopes as they saw fit. Once all cards were sorted into clusters, groups were asked to subdivide any clusters that they felt should be divided, A5 brown envelopes were provided for this purpose (figure 7.2).

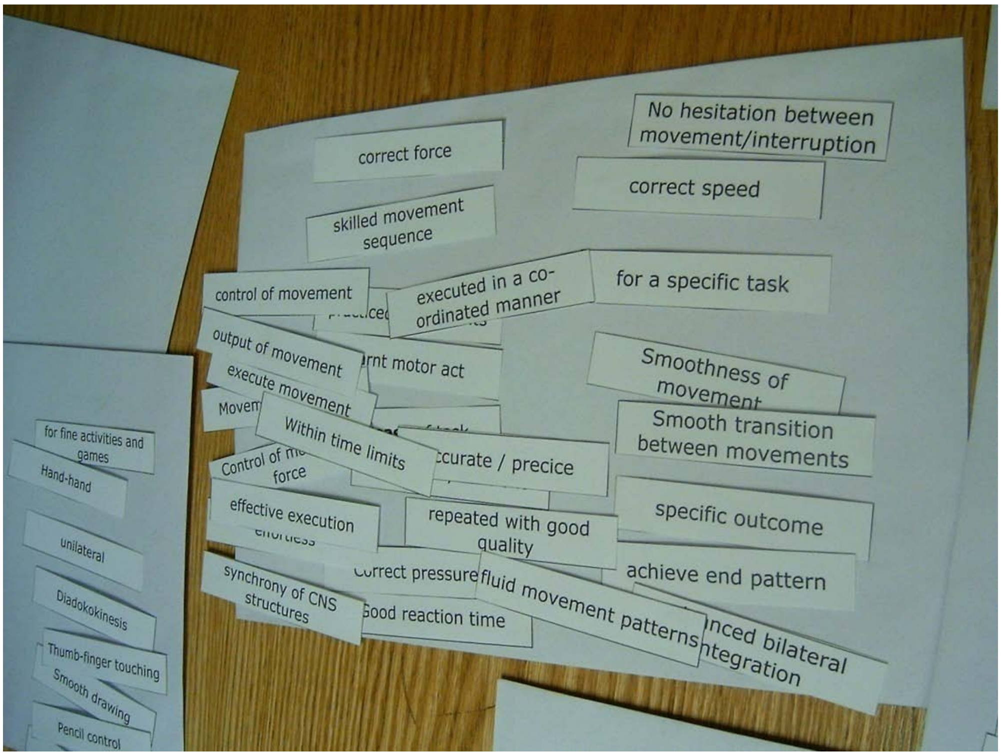



**Figure 7.1** Card Sorting into Clusters on Large Envelopes

**Figure 7.2** Card Sorting Dysfunction Cards into Clusters on Large Envelopes by Dysfunction Group 1

**Figure 7.3** Card Sorting Function Cards into Sub-Clusters on Smaller Envelopes by Function Group 1

The cards on each brown envelope were then placed inside the envelope, and the group was asked to label the envelope with a term that encapsulated the sub-cluster. All brown envelopes for a cluster were put into the larger white envelope, and participants were asked to label this cluster (new motor components – not necessarily those investigated in the earlier stages of the study.). The labelled envelopes, with smaller envelopes containing cards formed the data for each card sort group.

The researcher played the minor role of ensuring participation and consensus of card placement, and had little to no influence over the discussions or the group decisions. All group sessions were voice recorded, which provided anecdotal information, but did not influence the results of the research.

### 7.2.3 Data Analysis

The results of the Delphi A and B were not considered in this stage of the study, other than to provide the phrases for the cards.

The data from each open card sort group was captured in an Excel spreadsheet, with the data from the three function related groups in side-by-side columns on one sheet, and the data from the three dysfunction related groups similarly structured on another sheet. A fourth column was then used on each sheet to analyse the common and discrepant clusters, sub-clusters, and cards across each card sort group. Cards that were commonly clustered by all three groups (100%) were coded in red, cards commonly clustered by two groups (66.6%) were coded in orange, and cards uncommonly clustered were coded in yellow. The cards were then sorted hierarchically from red to yellow within each cluster, the red cards providing strongest evidence of consensus.

The hierarchical columns of the function cards were then compared to the hierarchical columns of the dysfunction cards. There was not a one-to-one match of function to dysfunction cards, as the cards emerged out of the earlier stages of the research. Some dysfunction terms cannot be associated with a paired function term (for example “winging scapulae” is a feature of dysfunction of postural stability). It was however useful to match the cards that paired easily such as “manual dexterity” in the function cards with “poor manual dexterity” in the dysfunction cards. The comparison was interpreted for use in the development of the FUMT.

Sub-clusters provided anecdotal evidence, as it was found that there was insufficient consistency to analyse the sub-clusters. Factor analysis could be considered in analysis the sub-clusters for a greater sample size, but six groups would be criticised for low potential to yield meaningful results (ten data sets per variable is recommended to avoid a type 1 error) [62]. Although Capra [63] had only eight participants in her card sort factor analysis of 70 cards, this could be considered a limitation of her study. Visual analysis was thus selected for this study [63], which yielded some consistency in the “motor skills – poor motor skills” cluster (7.3.7 p 117).

## 7.3 RESULTS

The results presented in this chapter are only of the Delphi C. The previous staged of the study were merged with this stage only in the formation of the final phase of the FUMT. The clusters of cards that emerged through this stage of the study are different to the motor components investigated in the Delphi A and B, though three components and clusters are common. These are “praxis – dyspraxia”, “postural control – poor postural control” and “motor skills – poor motor skills”, the latter having poor consensus results in previous stages, but the former two being consistent through all the stages.

The cards of each cluster were categorised according to the frequency with which they appeared in a cluster. Cards that were consistently placed in a cluster by all groups were coded in red (100%). Those placed by two out of three groups were coded orange (66.6%), and those placed by only one group were represented in yellow (33.3%). All cards that were coded red and orange are represented in tables 7.2 to 7.7. For the main emerging clusters, cards represented in yellow were discarded as these cards reflected poor consensus among groups.

### 7.3.1 Demographics of the Participants

The demographics of the participants were primarily in terms of location and qualification. There were eight expert participants living in Cape Town, six in Johannesburg, five in Bloemfontein, four in Durban and two in Pretoria. These experts have all be practicing in the field of LD and DD for more than 10 years.

**Table 7.1** Qualification demographics of experts

| Qualification | Percentage |
|---|---|
| Sensory Integration Certificate | 84% |
| Neurodevelopmental Therapy Certificate | 32% |
| Master of Science (Occupational Therapy) | 24% |

Of the 25 experts who participated in the open card sort groups, 44% were in possession of two of the three qualifications considered for participation, thus accounting for the total percentage exceeding 100% in table 7.1. This validates the expert nature of the participants.

### 7.3.2 Results for Praxis and Dyspraxia

The card sort groups that had the function related cards consensually only allocated 12 cards (24%) to praxis (table 7.2), with 12 cards having 66.6 % consensus (24%) and 26 cards non-consensually allocated to this cluster (52%).

In the dyspraxia cluster, 19 cards (26.8%) were consensually featured, 18 cards had 66.6% representation (25.4%) and 34 cards (47.8%) were allocated by only one group.

**Table 7.2** Card sort results for praxis and dyspraxia

| FUNCTION CARD SORT GROUPS | % |
|---|---|
| **Timing** | **100** |
| **prepare / anticipate an action** | **100** |
| **feed-forward** | **100** |
| **Conceptualisation of a movement** | **100** |
| **Anticipates motor responses** | **100** |
| **praxis components ideation and planning** | **100** |
| **compiling parts of movement** | **100** |
| **Copying a movement** | **100** |
| **Good timing in action** | **100** |
| **imitate movements** | **100** |
| **feedback and feed forward** | **100** |
| **unfamiliar / new movement** | **100** |
| Quick to learn an action | 66.6 |
| goal directed, purposeful | 66.6 |
| action on command | 66.6 |
| judgement in movement | 66.6 |
| match requirements of environment | 66.6 |
| time and space | 66.6 |
| Planning / motor planning | 66.6 |
| Projected action sequences | 66.6 |
| Un-established /un-practiced | 66.6 |
| Motor engrams formation | 66.6 |
| learn movement | 66.6 |
| adapt a sequence | 66.6 |

| DYSFUNCTION CARD SORT GROUPS | % |
|---|---|
| **ideation** | **100** |
| **inability to form an idea of what to do** | **100** |
| **inability to conceptualise / visualise how to do it** | **100** |
| **seen at start of activity** | **100** |
| **difficulty seeing potential in an object / situation** | **100** |
| **Trial and error approach to task performance** | **100** |
| **Poor anticipation of motor responses** | **100** |
| **poor use of feed forward** | **100** |
| **poor anticipation of movement** | **100** |
| **Poor motor planning** | **100** |
| **poor output on own ideas** | **100** |
| **body can't do what you want it to** | **100** |
| **difficulty learning new motor tasks** | **100** |
| **difficulty learning unfamiliar motor tasks** | **100** |
| **Uses splinter skills** | **100** |
| **difficulty engage effectively in the environ** | **100** |
| **inability to Generalise a motor task** | **100** |
| **difficulty in approach to motor act** | **100** |
| **poor output on command (visual / verbal)** | **100** |
| can't do desired movements | 66.6 |
| Puts on shirt before vest | 66.6 |
| poor sequential order of a task (making tea) | 66.6 |
| end product of poor praxis | 66.6 |
| poor ability to become skilled at a motor act | 66.6 |
| poor organisation of movement | 66.6 |
| ineffective use of energy | 66.6 |
| Needs lots of practice | 66.6 |
| poor task process | 66.6 |
| poor motor response without cognitive aspect of movement | 66.6 |
| needs conscious effort when shouldn't | 66.6 |
| Difficulty initiating movement | 66.6 |
| poor execution | 66.6 |
| poor end-product / outcomes of movement | 66.6 |
| unable to work out what to do with your body | 66.6 |
| Poor motor engrams formation | 66.6 |
| execute activity / complete a task | 66.6 |
| poor transition between movements | 66.6 |

### 7.3.3 Results for Postural Control and Poor Postural Control

**Table 7.3** Card sort results for postural control and poor postural control

| FUNCTION CARD SORT GROUPS | % |
|---|---|
| balanced muscle tone | 100 |
| Co-contraction | 100 |
| postural reflex mechanisms | 100 |
| free body parts to perform a task | 100 |
| combine groups of muscles | 100 |
| Normal tone (postural) | 100 |
| adequate muscle tone/normal | 100 |
| correct alignment | 100 |
| control of neck and head | 100 |
| Upright sitting posture | 100 |
| postural stances | 100 |
| shoulder and hip girdles | 100 |
| trunk / proximal | 100 |
| control of trunk muscles | 100 |
| maintaining posture | 100 |
| upright posture /optimal position | 100 |
| small postural muscles | 100 |
| against gravity | 100 |
| base for controlled movements | 100 |
| Stability | 100 |
| Postural background movements | 100 |
| smooth postural background movement | 100 |
| automatic postural preparations / background shift | 100 |
| dissociation of movement | 100 |
| performer vs support muscles | 100 |
| postural adaptation | 100 |
| functions on background of stability for distal mobility | 100 |
| assume positions | 100 |
| righting reactions | 100 |
| Equilibrium reactions | 100 |
| dependant on inhibition of spinal / brainstem reflex acitivity | 100 |
| Weight-shift | 100 |
| balance | 100 |
| movement in all planes | 100 |
| during movement / activity; dynamic | 66.6 |
| adapt postural mechanisms / adjust | 66.6 |
| synergic muscles / agonist-antagonist | 66.6 |
| one muscle group to another | 66.6 |
| while static | 66.6 |
| hold position | 66.6 |

| DYSFUNCTION CARD SORT GROUPS | % |
|---|---|
| poor control of neck | 100 |
| poor controlling of posture | 100 |
| poor ability against gravity | 100 |
| correct alignment of trunk | 100 |
| Flexed sitting posture | 100 |
| over-streched and/ shortened muscles | 100 |
| Anterior pelvic tilt | 100 |
| improper / low muscle tone | 100 |
| poor trunk stability / control | 100 |
| fixing patterns / fixation | 100 |
| Neck hyperextension in sitting | 100 |
| poor extended posture | 100 |
| Hooks feet around chair legs | 100 |
| difficulty maintain position | 100 |
| Fatigues easily | 100 |
| Excessive body adjustments in sitting | 100 |
| inability to adjust posture / subtle shift | 100 |
| inadequate rotation | 100 |
| Poor weight-shift | 100 |
| Poor equilibrium reactions | 100 |
| Floppy | 100 |
| Rests head on hand | 100 |
| poor muscle balance / imblance of muscle length | 100 |
| difficulty co-ordinate distal movement | 100 |
| W-sitting on the floor | 100 |
| lack control of background movements | 100 |
| Can't keep body upright | 100 |
| excessive / limited movements | 66.6 |
| Poor isolation of movement | 66.6 |
| inability to prepare posture | 66.6 |
| poor combining groups of muscles for action | 66.6 |
| needs external support | 66.6 |
| end product of poor postural control | 66.6 |
| inefficient automatically pre-programmed movements | 66.6 |

A high consistency was achieved in the open card sort groups with 34 function cards (57.6%) and 27 dysfunction cards (50%) being consistently placed within this motor component by all groups (table 7.3). This high level of consistency represents good consensus within the “postural control – poor postural control” cluster, the highest of all the clusters. The function cards had 10.2% in the orange and 33.2% in the yellow (low consensus range), while the dysfunction cards had 13% cards placed in this cluster by 66.6% of the dysfunction groups, and 37% of cards with poor consensus.

### 7.3.4 Results for Bilateral Integration and Sequencing and Poor Bilateral Integration and Sequencing

**Table 7.4** Card sort results for bilateral integration and sequencing and poor bilateral integration and sequencing

| FUNCTION CARD SORT GROUPS | % | DYSFUNCTION CARD SORT GROUPS | % |
|---|---|---|---|
| **Reciprocal movement** | **100** | **poor use of dominant hand** | **100** |
| **Bilateral arm and leg movements** | **100** | **poor use of dominant hand with non-dominant hand** | **100** |
| **Symmetrical movement** | **100** | **Poor co-ordinating 2 sides of body / brain** | **100** |
| **Midline crossing** | **100** | **end product of poor bilateral motor co-ordination** | **100** |
| **co-ordinate 2 sides of body bilateral** | **100** | **Poor bilateral arm and leg movements** | **100** |
| **sequencing of movement patterns** | **100** | **Poor midline crossing** | **100** |
| **bilateral integration** | **100** | Difficulty jumping with two feet together | 66.6 |
| **effective combining of movements of limbs** | **100** | limb movements not work together | 66.6 |
| sequence of movement/pattern | 66.6 | reciprocal movement | 66.6 |
| string movement together | 66.6 | poor use of more than 1 body part to perform task | 66.6 |
| sequence / series | 66.6 | string a sequence of different movements together | 66.6 |
| consecutive / one after another | 66.6 | not smooth, rhythmical, co-ordinated | 66.6 |
| movement transitions | 66.6 | poor sequence of actions | 66.6 |
| synchronous use | 66.6 | Miss times clapping patterns | 66.6 |
| advanced bilateral integration | 66.6 | compile parts of a movement | 66.6 |
| Unilateral | 66.6 | lack sequenced movement | 66.6 |
| work effectively tog / combining | 66.6 | Ineffective combining of movement of limbs | 66.6 |
| co-ordinate separate movements | 66.6 | Poor stabilising use of non-dominant hand | 66.6 |
| between all limbs | 66.6 | end product of poor sequencing | 66.6 |
| asymmetrical / different actions | 66.6 | Difficulty pumping a swing to move | 66.6 |
| | | Looses place in a task | 66.6 |

Bilateral integration and sequencing (or the dysfunction there of) was a cluster that consistently emerged in all six card sort groups, with all groups having a cards pertaining to the use of both sides of the body, and all groups except dysfunction group 3 having cards related to sequencing (table 7.4). It should be noted that dysfunction group 3 labelled this cluster “bilateral components”. “Midline crossing” and “poor midline crossing” featured consistently across all card sort groups for this cluster, yet had poor representation in the Delphi B (table 6.3 p86).

There was 100% consensus regarding the placement of 22.0% of the function cards, and 18.2% of the dysfunction cards into this cluster. There was 31.6% placement of function cards and 45.4% placement of dysfunction cards by 66.6% of the participants. There was poor consensus in the placement of 47.4% function and 36.4% dysfunction cards into the “bilateral integration and sequencing – poor bilateral integration and sequencing” cluster.

### 7.3.5 Results for Motor Control and Poor Motor Control

The “motor control - poor motor control” cluster (table 7.5) emerged in this stage of the study, and while there was a definite consensus in the clustering of these cards, each group assigned a different label to the cluster. The labels were: “quality of motor performance”, “descriptive motor outcomes”, and “motor learning” for the function cards and “poor motor control / quality of movement”, “dysfunction of control” or “poor efficiency of movement” for the dysfunction cards. Cards pertaining to smoothness, accuracy and fluidity of movement were consensual across all card sort groups for this cluster.

There was high consensus (100%) for 18.3% of function cards and 31.6% of dysfunction cards allocated to this cluster. Two thirds of the groups placed 38.3% or function cards and 26.3% of dysfunction cards into this cluster. 43.3% of function cards and 42.1% of dysfunction cards that were allocated to this cluster were discarded due to low consensus.

**Table 7.5** Card sort results for motor control and poor motor control

| FUNCTION CARD SORT GROUPS | % | DYSFUNCTION CARD SORT GROUPS | % |
|---|---|---|---|
| **give ease of task** | **100** | **jerky movement** | **100** |
| **fluid movement patterns** | **100** | **difficulty controlling movement / motor control** | **100** |
| **Movement success** | **100** | **poor force** | **100** |
| **Movement accuracy** | **100** | **poor accuracy of movement** | **100** |
| **execute movement** | **100** | **poor smoothness of movement** | **100** |
| **effortlessly adjusted** | **100** | **Poor control of movement force** | **100** |
| **Smoothness of movement** | **100** | **Exaggerated movements** | **100** |
| **practiced movements** | **100** | **lack fluid, controlled movement** | **100** |
| **effective execution** | **100** | **Misjudging a movement** | **100** |
| **No hesitation between movement/interruption** | **100** | **not stopping between movement** | **100** |
| **repeated with good quality** | **100** | **poor flow of movements** | **100** |
| achieve end pattern | 66.6 | **poor movement control / efficient / effective** | **100** |
| accurate / precise | 66.6 | poor speed | 66.6 |
| Control of movement force | 66.6 | poor transition of movement | 66.6 |
| Smooth transition between movements | 66.6 | poor transition from 1 movement to another | 66.6 |
| effortless | 66.6 | Lack of timing in action | 66.6 |
| correct speed | 66.6 | Hesitates between movements | 66.6 |
| correct force | 66.6 | Delayed reaction time | 66.6 |
| output of movement | 66.6 | poorly executed movement | 66.6 |
| Good reaction time | 66.6 | poor precision / accuracy | 66.6 |
| rhythm | 66.6 | smooth combination of movements | 66.6 |
| fluency of movement / harmonious | 66.6 | | |
| fluid flow | 66.6 | poor movement efficiency | 66.6 |
| execute accurate movement | 66.6 | | |
| Within time limits | 66.6 | | |
| skilled movement sequence | 66.6 | | |
| learnt motor act | 66.6 | | |
| executed in a co-ordinated manner | 66.6 | | |
| less effort / efficient | 66.6 | | |
| initiates movement easily | 66.6 | | |
| organised movement | 66.6 | | |
| quality of motor act | 66.6 | | |
| acquired | 66.6 | | |
| correct movement patterns | 66.6 | | |

## 7.3.6 Results for Motor Performance Outcomes and Poor Motor Performance Outcomes

This cluster also emerged in this stage of the study, and while there was consensus in the clustering of these cards (more in the functional cards than the dysfunctional cards), each group again assigned a different label to the cluster. The labels were: “meaningful participation”, “occupational performance” and “outcomes” for the function cards and “general observations of poor movement”, “general - need further investigation (occupational function)” and “end products (skills, outcomes)” for the dysfunction cards.

**Table 7.6** Card sort results for motor performance outcomes and poor motor performance outcomes

| FUNCTION CARD SORT GROUPS | % | | DYSFUNCTION CARD SORT GROUPS | % |
|---|---|---|---|---|
| **funcional / purposeful / meaningful** | **100** | | **poor task completion** | **100** |
| **meeting set criteria** | **100** | | **poor movement as measured by teachers** | **100** |
| **age related** | **100** | | not the outcome expected | 66.6 |
| **development** | **100** | | minimal effectiveness | 66.6 |
| **fulfill childs occupational role (scholar) / functional** | **100** | | difficulty meeting the demands of an activity | 66.6 |
| **cope with demands of task** | **100** | | difficulty with functional tasks | 66.6 |
| **age appropriate** | **100** | | poor gross and fine motor acts | 66.6 |
| **own satisfaction** | **100** | | Tends to drop objects | 66.6 |
| **engage in activity / functional** | **100** | | difficulty achieving a goal directed action | 66.6 |
| successful | 66.6 | | Awkward | 66.6 |
| efficiently | 66.6 | | not meet movement criteria / standards | 66.6 |
| interact with the environment | 66.6 | | Clumsiness / accident prone | 66.6 |
| skilled movement | 66.6 | | increased effort | 66.6 |
| practiced tasks | 66.6 | | not muscular dysfunction | 66.6 |
| approach to tasks | 66.6 | | poor performance of movement skills / end products | 66.6 |
| activity | 66.6 | | poor performance of age appropriate motor tasks | 66.6 |
| in a task | 66.6 | | Pinnochio trying to run | 66.6 |
| for a specific task | 66.6 | | walking like pinnochio | 66.6 |
| uniquely human | 66.6 | | | |
| skilled | 66.6 | | | |

There was lower consensus in the cluster, with only two cards (4.5%) from the dysfunction card sort groups and 23.1% of the function cards being consensually placed in this cluster. The majority of the cards (48.7%) of function cards and 59.1% of dysfunction cards) placed in this cluster were discarded due to poor consensus (33.3%). There were 28.2% function cards and 36.4% dysfunction cards retained in this cluster with 66.6% agreement.

### 7.3.7 Results for Motor Skills and Poor Motor Skills

Strong consensus was evident in the function card sort groups regarding cards pertaining to motor skills, and these groups successfully subdivided “motor skills” into “hand function”, ‘fine motor skills” and “gross motor skills”. The dysfunction cards were not subdivided and represented only “poor fine motor skills”.

**Table 7.7** Card sort results for motor skills and poor motor skills

| FUNCTION CARD SORT GROUPS | % |
|---|---|
| **Hand Function** | |
| Diadokokinesis | 100 |
| Thumb-finger touching | 100 |
| Eye-hand | 100 |
| In-hand manipulation | 100 |
| Hand-hand | 100 |
| for fine activities and games | 66.6 |
| Manual dexterity | 66.6 |
| **Fine Motor Skills** | |
| Handwriting | 100 |
| Cutting on a straight line | 100 |
| Tracing skills | 100 |
| Tie a bow behind back | 100 |
| Eats with a knife and fork | 100 |
| Construction | 66.6 |
| smooth drawing | 66.6 |
| pencil control | 66.6 |
| **Gross Motor Skills** | |
| Bat and ball games | 100 |
| Pumping a swing to move | 100 |
| Playing hopscotch | 100 |
| Forward rolls | 100 |
| Jumping two feet together | 100 |
| Dynamic balance on a beam | 100 |
| Accurate target throwing | 66.6 |
| Gross motor | 66.6 |

| DYSFUNCTION CARD SORT GROUPS | % |
|---|---|
| **Poor Fine Motor Skills** | |
| Poor manual dexterity | 100 |
| Poor pencil control | 100 |
| Poor thumb-finger touching | 100 |
| Poor tracing skills | 100 |
| Shaky drawing | 100 |
| Poor in-hand manipulation | 100 |
| Untidy handwriting | 100 |
| Overshoot the outline in colouring in | 100 |
| poor hand function | 100 |
| Tight pencil grip | 100 |
| Increased pencil pressure | 100 |
| Crosses out often in writing | 66.6 |
| Intention Tremor | 66.6 |
| poor eye hand | 66.6 |
| Difficulty cutting on a straight line | 66.6 |
| poor combination of eye and hand | 66.6 |

The hand function sub-cluster was represented as follows:

- 41.7% of cards were 100% allocated to hand function
- 16.6% of cards were 66.6% allocated to hand function
- 41.7% of cards were discarded due to poor consensus (33.3%)

The fine motor skills sub-cluster was represented as follows:

- 38.5% of cards were 100% allocated to fine motor skills
- 23.0% of cards were 66.6% allocated to fine motor skills
- 38.5% of cards were discarded due to poor consensus (33.3%)

The gross motor skills sub-cluster was represented as follows:

- 54.5% of cards were 100% allocated to fine motor skills
- 18.2% of cards were 66.6% allocated to fine motor skills
- 27.3% of cards were discarded due to poor consensus (33.3%)

The poor fine motor skills sub-cluster was represented as follows:

- 40.7% of cards were 100% allocated to fine motor skills
- 18.6% of cards were 66.6% allocated to fine motor skills
- 40.7% of cards were discarded due to poor consensus (33.3%)

### 7.3.8 Clusters that emerged but were not consensually represented

The card sort groups that sorted function related cards had some clusters that were not consensually represented. Function group 3 created a cluster labelled "gross motor components" which contained cards such as "move hand, foot or eye in required way", "asymmetrical / different actions", "string movements together", and "eye-hand-foot". A cluster labelled "motor adaptation" by function group 1 contained cards such as "movement pattern", "correct / refine", "adapt a sequence", "perform a motor task", "learn movement" and "co-ordinate separate movements". These cards were sorted into other clusters by the other two function groups.

Two of the function groups created a cluster that related to the sensory base for movement (table 7.8). This trend however was not evident in the other function group, and the only dysfunction group to include it was group 3 which created a "poor proprioception" cluster that contained only one card, "poor pressure", which they felt was alone in its representation of poor proprioception.

**Table 7.8** Cards sorted by function group 2 and 3 into a "sensory foundation to movement" cluster

| **Proprioception / Sensory foundation to movement** | % |
|---|---|
| guided/controlled by sensory feedback | 66.6 |
| Force | 66.6 |
| Proprioception | 66.6 |
| body scheme | 66.6 |
| sufficient stretch | 66.6 |
| correct pressure | 66.6 |
| control of movement force | 33.3 |
| interact with the environment | 33.3 |
| motor engrams formation | 33.3 |
| appropriate sensory feedback/input | 33.3 |
| not look at the end product | 33.3 |
| require less concentration | 33.3 |
| correct force | 33.3 |
| judgement in movement sub-conscious | 33.3 |
| sub-conscious | 33.3 |

The dysfunction related card sort groups also had some isolated clusters. “Poor body scheme” was a cluster created by group 2. This cluster included cards such as “poor direction”, “tends to drop objects”, “awkward” and “difficulty using body scheme / poor developed”. These could possibly be considered to be an attempt to also represent the sensory foundation to movement that the two function groups had, but the cards included in this cluster where not consistent with those in the other groups representing the “sensory foundation to movement”.

Dysfunction group 1 was the only group sorting dysfunction related cards that created a “gross motor skills and outcomes” cluster. It included cards such as “poor direction”, “below average gross motor”, “poor performance of age appropriate motor tasks”, and “misses the target in throwing”.

### 7.3.9 Sub-clusters that emerged through subdividing the larger clusters

**Table 7.9** Sub-clusters that presented some agreement among card sort groups

| FUNCTION | % | | DYSFUNCTION | % |
|---|---|---|---|---|
| **Postural Control** | | - | **Poor Postural Control** | |
| Postural Tone | 66.6 | | Low Tone and stability | 33.3 |
| Fundamental Components | 33.3 | | Low Tone | 33.3 |
| **Stability (Trunk)** | **100** | | Poor postural control | 33.3 |
| Postural Adaptation | 33.3 | | Endurance | 33.3 |
| Balance | 66.6 | | Dynamic / Equilibrium | 33.3 |
| Dynamic Postural Control | 33.3 | | Dissociation | 33.3 |
| | | | Neuro-motor | 33.3 |
| | | | Body Scheme | 33.3 |
| | | | Outcomes of postural control | 33.3 |
| **Bilateral Integration and Sequencing** | | - | **Poor Bilateral Integration and Sequencing** | |
| Bilateral Components | 33.3 | | Bilateral co-ordination | 33.3 |
| Bilateral Integration | 66.6 | | Sequencing | 33.3 |
| Sequential Patterns | 33.3 | | Outcomes of BIS | 33.3 |
| Sequencing | 33.3 | | | |
| **Praxis** | | - | **Dyspraxia** | |
| Pre-planning | 33.3 | | **Ideational Difficulty (poor)** | **100** |
| Ideation | 66.6 | | Poor Feed-forward | 33.3 |
| Ideo-motor process | 33.3 | | Poor Feedback | 33.3 |
| Timing | 33.3 | | **Poor execution** | **100** |
| Feedback-feedforward | 33.3 | | Poor Planning | 33.3 |
| Execution | 33.3 | | Planning and Processing | 33.3 |
| | | | Outcomes of Dyspraxia | 33.3 |

While there was insufficient consistency as to the clustering of cards into sub-clusters (small brown envelopes) there was some evidence of consistency as to how the groups decided to divide the larger clusters. Table 7.9 shows that postural tone (or dysfunction of tone), stability and balance were three frequent divisions of postural control. The groups divided the “bilateral integration and sequencing” cluster into “bilateral integration / components / co-ordination” and “sequencing / sequential patterns”, with two dysfunction groups deciding not to sub-divide this cluster. Strong sub-clusters in the “praxis” - “dyspraxia” cluster were that of “ideation”, “feedback-feedforward” and “motor execution”. Table 7.7 demonstrates the high level of consistency in the sub-clusters of the function cards for “motor skills” – “poor motor skills” into three sub clusters: “hand function”, “fine motor skills” and “gross motor skills”.

## 7.4 DISCUSSION

### 7.4.1 Critique of the open card sort groups as a research method

Conducting open card sort groups was a novel and beneficial research method to select for this stage of the study. It provided an opportunity to counter any researcher bias in the selection of the motor component terms to be investigated in the study, as the groups had the freedom to create their own motor component terms through their emergent clusters of cards. The nature of the task also ensured that the group was kept focused on the group process and groups rarely deviated to topics outside of the context of the research. This was thus an efficient data collection strategy. Most card sort groups were conducted over a period of two to two and a half hours, except for function group 3 which took just over three hours.

Dysfunction group 3 was the only group to consist of five participants, and this impacted the group process. There were times when the group seemed to sub-divide into two participants discussing cards while three participants discussed other cards. The facilitation of this group required extensive reminders that card clustering was to be by whole group consensus. It is thus notable that open card sort groups function more effectively with four members.

The time of day that the groups are conducted may have an impact on the validity of the results. Function group 3 was conducted in the morning and this group was the longest in duration. Dysfunction group 2 was conducted from seven to nine in the evening, and this group only felt in necessary to sub-divide the "dyspraxia" cluster and no other clusters. It is possible that the evening open card sort groups were more susceptible to fatigue as they were after a full working day. Four of the six groups were conducted in the evening, though the other three started at six o'clock.

The number of cards to be sorted was a possible limitation to this method as it was difficult to assimilate all the cards, and most groups opted for a card by card approach. The participants were also aware that at times they would pick one word out of a phrase on a card and cluster the card based on the word and not the phrase as a whole. This was commented on bay participants in three of the open card sort groups.

### 7.4.2 Motor component clusters

This stage of the study provided the participants with the opportunity to create motor component clusters that were meaningful to the group. It is important that the earlier stages of the study are not discarded at this stage, as it would be convenient to simply use the participant clusters as the FUMT. Submitting to this would be inappropriate as there was still a level of inconsistency among the participant groups, which would leave gaps in the framework. The consistent motor component clusters give strength to the framework. There were six motor component clusters (with sub-clusters) that emerged with inter-group consistency during this stage of the study. They were:

- **Postural control – Poor postural control** (table 7.3 and 7.9)
    - Postural tone
    - Stability
    - Balance
- **Praxis – Dyspraxia** (table 7.2 and 7.9)
    - Ideation
    - Feed-forward and feedback

    - Motor execution
- **Bilateral Integration and Sequencing (BIS) – Poor Bilateral Integration and Sequencing (BIS)** (table 7.4 and 7.9)
    - Bilateral co-ordination (co-ordination is selected based on the results of stage 3)
    - Motor sequencing
- **Motor Control – Poor Motor Control** (table 7.5)
- **Motor Performance Outcomes – Poor Motor Performance Outcomes** (table 7.6)
- **Motor Skills – Poor Motor Skills** (table 7.7)
    - Hand function
    - Fine motor skills
    - Gross motor skills

Three of these clusters are consistent with the motor components of the previous stages of the study ("postural control – poor postural control", "praxis – dyspraxia" and "motor skills – poor motor skills"). The "integration", "co-ordination" and "sequencing" motor components investigated in the Delphi A and B have been combined in this stage to form the "BIS – poor BIS" cluster. Two new clusters to emerge at this stage of the study are "motor control – poor motor control" (table 7.5) and "motor performance outcomes – poor motor performance outcomes" (table 7.6).

The "postural control – poor postural control" cluster has a theory base in dynamic systems theory of motor control theory [35,36], neurodevelopmental therapy [35] and sensory integration [5,33,54,72], with the sub-clusters identified being common to all [35,54]. There was strong consensus among the card sort groups as to which cards clustered into the "postural control – poor postural control" cluster, despite the variation in location and postgraduate qualification.

Sensory integration theory seems to have had a strong influence in the emergence of the "praxis – dyspraxia" cluster and the BIS – poor BIS cluster. Ayres investigated developmental dyspraxia in children and identified two main forms of dyspraxia through factor analysis of the standardisation processes of the Sensory

Integration and Praxis Tests [5,12]. Participant's knowledge of Somatodyspraxia and BIS are the likely foundation for these two clusters.

"Motor control – poor motor control" was not a cluster investigated in previous stages of the study, but there was evidence of the need for such a cluster due to the apparent division of the "co-ordination" and "poor co-ordination" into semantic clusters related to "combining of movement" and "smooth control of movement" (see 6.4.6 p98). The "Motor control – poor motor control" cluster has a theory base in motor learning and motor control theories [36]. Motor control in occupational therapy is often considered the clinical observations of the quality of the movement, as can be seen by the nature of the cards that were sorted into this cluster, such as the fluidity, smoothness and efficiency of the movement.

The emergence of the "motor performance outcomes – poor motor performance outcomes" cluster (table 7.6) was entirely novel to this stage of the study. The cards sorted into this cluster pertained to the functional evaluation scales of movement rather than movement itself. "Age appropriate", "functional", "purposeful" and "poor task completion" are descriptors of the appropriateness of the movement task. The cards within the cluster are predominantly from the units of meaning derived from analysing the participants' definitions in the Delphi B, many of which were used to define "motor skills", or as indicators of the outcome of the motor component it was used to define. While the uniqueness of this cluster warrants caution for inclusion in the FUMT, as its hierarchical location will be difficult to establish, it is also reflective of the occupation aspect of motor performance in children. It is vital in the ability to set occupational therapy treatment goals and thus established a need for the FUMT (8.3.4 p133) to reflect occupational performance, and not have a ceiling at the level of motor skill.

Fundamental to the practice of occupational therapy with children is the assessment and treatment of their motor skills [17,35,50]. There was excellent consensus among all the card sort groups as to the nature of cards sorted into the "motor skills – poor motor skills", as well as to the sub-clusters of this cluster being "hand function", "fine motor skills" and "gross motor skills". There was some consensus difficulty (6.4.7 p99) in the Delphi B related to characteristics of movement that the literature strongly relates to motor skills. Strong consensus in this stage thus validated this cluster in the FUMT.

The sub-clusters (7.3.9 p120) that were identified by the card sort groups included under each cluster, assist in forming the hierarchical structure of the FUMT. These are not the same as the semantic clusters identified in the Delphi B and this the phases of the development of the FUMT will first consider these separately (8.3.1 p129 and 8.3.2 p131) and then in combination (8.3.4 p133).

### 7.4.3 Clusters that emerged but were not consensually represented

The clusters that emerged in the card sorts of one group and no others were representative of non-consensus and this was evaluated in relation to prior stages of the study. The "gross motor components" and "gross motor skills and outcomes" clusters that were created by individual groups could be associated with the "motor skills – poor motor skills" cluster, for the formation of the FUMT. These clusters could form parts of sub-clusters of motor skills, but would require further investigation to validate their inclusion. It is thus reasonable to exclude these clusters at this stage.

Two of the function related card sort groups created clusters related to "sensory foundation to movement", and one dysfunction group created a "poor body scheme cluster". This could be considered 50% consensus on the need for a cluster representing the involvement of sensory processing in movement. This is strongly represented in both sensory integration theory [5,33] and motor control theory [35,36]. The "sensory foundation to movement" requires further validation, but there is sufficient support for the inclusion of this cluster in the outline of the FUMT.

The clusters of "motor adaptation" and "poor proprioception" were isolated clusters, which have poor association to other clusters within the study. Although these clusters may seem to associate with the "motor control – poor motor control" (table 7.5) cluster or the "sensory base to movement" cluster (table 7.8), there were no cards in common with these. Poor consensus of these clusters warrants their exclusion from the FUMT.

## 7.5 CONCLUSION

The card sort methodology selected was a successful tool to implement towards the development of the FUMT. This method is considered efficient in ensuring the inclusion of the view of the target population in the development of a taxonomy [81]. Each card sort group represented a level of participant consensus as the groups were required to agree to card placement and cluster labels. Consensus among groups thus represents a higher level of consensus, thus providing strong evidentiary support for the clusters that emerged in this stage.

The participants of this stage were not bound to the motor components investigated in the Delphi A and B and were free to sort the data in a way that they found agreement on within each open card sort group. This facilitated the emergence of motor components (clusters) in the Delphi C, that were not previously investigated and discussed in the study.

Important validation for the need to include the Delphi C is in the results of this stage:

- There was high consensus regarding motor skills – poor motor skills (poor consensus in previous stages).
- “Motor control – poor motor control” emerged to account for the smoothness items associated to co-ordination in previous stages of the study.
- “Motor performance outcomes – poor motor performance outcomes” highlighted the need for an occupational performance aspect to the FUMT.
- “Sensory foundation to movement” emerged for inclusion in the FUMT.

The results of this stage were interpreted individually and then in conjunction with the results from the Delphi A and B of the study to develop the FUMT in chapter 8.

# CHAPTER 8 – DEVELOPMENT OF THE FRAMEWORK OF MOTOR TERMINOLOGY

## 8.1 INTRODUCTION

The previous stages of the study (chapters 5 to 7) investigated how South African occupational therapists use the motor terminology related to intervention with children who have LD and DD, based on the results of an audit of the literature (chapter 4). It is important to reflect that the six motor components investigated in Delphi A and B were those that were identified in the literature as being ambiguous and inconsistently used and not all motor terms were investigated. Delphi C used the results of the prior stages in an open card sort to give experts the freedom to generate their own motor components in the form on clusters of cards.

This chapter synthesises the results of the previous stages of the study with the literature to form a FUMT, for use specifically in the context of occupational therapy intervention with children who have LD and DD. It is not intended to be extrapolated into other paediatric occupational therapy contexts. It is an outline as it would require further validation prior to being considered a comprehensive FUMT. Validation would be through dissemination of the FUMT and trialling the FUMT in occupational therapy practice, then refining the FUMT through feedback from the occupational therapists trialling it.

## 8.2 PROCESS OF DEVELOPMENT OF THE FRAMEWORK OF MOTOR TERMINOLOGY

A framework has two main features, the first is a hierarchical structure (a taxonomy), and the second is clearly defined terminology [2,21,53]. This chapter (8.3.4) presents a schematic of relationships within the FUMT and definitions of terms that are consistent in the literature and the results of this study. Although the study did not specifically investigate a hierarchy of motor components, there was some evidence of this in the results. This evidence was carried though to the development of the FUMT, and supported by evidence in the literature.

The development of the FUMT was done in three phases to ensure that the results of all phases were synthesised and represented.

Phase 1 compiled a preliminary schematic from the results of the audit of the literature (stage 1), the Delphi A and B. The steps for this phase included:

- Identification and grouping of terms in the literature that were not ambiguous and were consistently used.
- Results of Delphi A and B were seen as reflected in Delphi B predominantly as the results of Delphi A were used to generate Delphi B.
- Tables (especially table 6.7) and figures of results of Delphi B and conclusions from Delphi A and B were reviewed over a one week period. The data was synthesised into a schematic by the researcher on three blinded occasions (i.e. the researcher did not view the prior schematics while developing each schematic). Although memory was involved this was not seen as a variable as the developmental and emergent nature of the research allows for such review.
- The three schematics were finally reviewed and the common elements formed the final phase 1 schematic.

Phase 2 compiled a preliminary schematic from the results of Delphi C in isolation. The steps for this phase included:

- Tables of results and conclusions of Delphi C were reviewed over a four day period. The data was synthesised into a schematic by the researcher on two blinded occasions.
- Both schematics were then reviewed and the common elements formed the final phase 2 schematic. It should be noted that the two schematics for this phase were consensual, limiting the need for a third blinded schematic.

The final phase (phase 3) synthesised phase 1 and 2 and revisited the first stage (audit of the literature) to form the final FUMT. The same process was used as prior phases over a one month period with three blinded schematics.

## 8.3 THE FRAMEWORK OF UNIFORM MOTOR TERMINOLOGY DEVELOPMENT PHASES

### 8.3.1 Phase 1: Hierarchical structure based on the Audit of the Literature, Delphi A and B

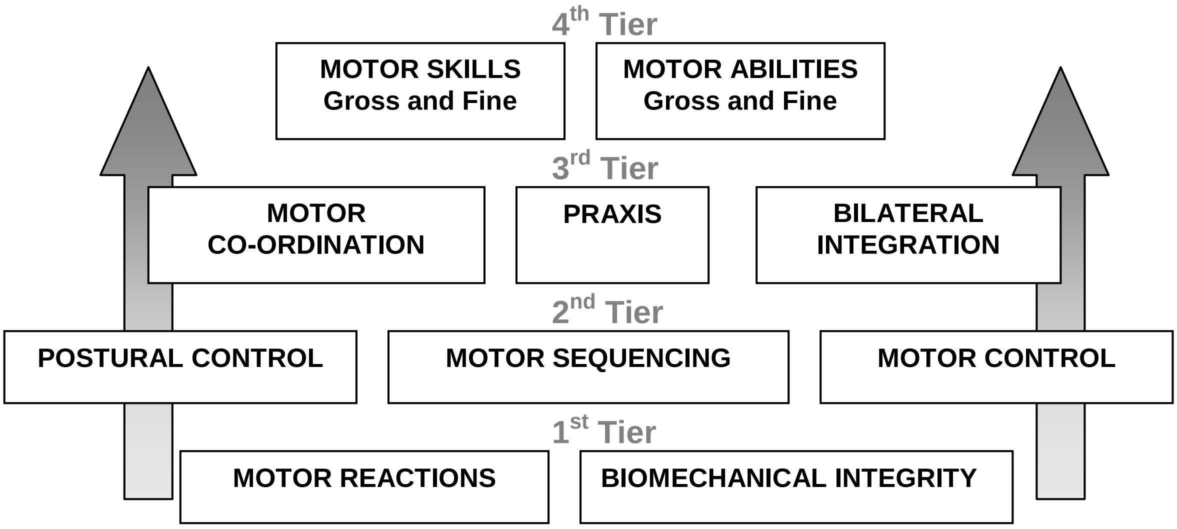



**Figure 8.1** Phase 1 Hierarchical Schematic of the FUMT

The hierarchical structure developed as phase 1 has retained most of the motor components that were investigated in the audit of the literature, Delphi A and B (stages 1 to 3), but split or replaced some of these in order to allow for the trends that emerged in the study. “Integration of movements” has been replaced with “bilateral integration” as this consistently emerged in the stage 3 of the study (6.4.4 p97). “Motor skills” has been divided into “motor abilities” and “motor skills” to accommodate the quality trend and the learning trend (6.4.7 p99). “Motor co-ordination” has been divided into “motor co-ordination” and “motor control” to accommodate the two constructs that persisted in the research (6.4.6 p98), and these were placed on different tiers as “motor control” can contribute to the quality of “motor co-ordination”. The first tier represents terminology that was consistent in the literature, and thus does not emerge from the results of the study, but is included from the audit of the literature in the first stage of the study.

**Table 8.1** Sub-components of each motor component

| | | |
|---|---|---|
| 1st Tier | Biomechanical Integrity | Muscle tone |
| | | Muscle strength |
| | | Joint range of motion |
| | | Endurance |
| | Motor Reactions | Stretch reflex |
| | | Gamma reflex loop |
| | | Golgi tendon reflex |
| | | Flexor reflex |
| | | Brainstem reactions |
| | | Righting reactions |
| | | Equilibrium reactions |
| | | Protective extension |
| 2nd Tier | Postural Control | Stability of trunk and girdles |
| | | Sustained postural alignment |
| | | Postural background adjustment |
| | | Weight-shift |
| | | Dissociation and rotation |
| | Motor Sequencing | Ordering of movement |
| | | Timing (projected action sequence) |
| | | Rhythm |
| | | Movement transitions |
| | Motor control | Regulation of movement force and pressure |
| | | Regulation of movement speed |
| | | Regulation of movement smoothness/ fluidity |
| | | Regulation of movement direction |
| 3rd Tier | Motor Co-ordination | Eye – hand synchrony (including Visual Motor Integration) |
| | | Hand – hand synchrony |
| | | Eye – hand - foot synchrony |
| | Praxis | Ideation (conceptualisation) |
| | | Motor planning |
| | | Motor engram formation |
| | | Motor learning |
| | Bilateral Integration | Symmetrical movement |
| | | Reciprocal movement |
| | | Asymmetrical movement |
| | | Midline crossing |
| | | Hand preference (also eye, foot, ear) |
| 4th Tier | Motor Abilities (Gross) | Balance |
| | Motor Abilities (fine) | In-hand manipulation |
| | | Manual dexterity |
| | | Grips |
| | | Pinches |
| | Motor Skills (gross) | Fundamental milestones (sit, stand, walk, run) |
| | | Ball skills |
| | | Cycling, driving, riding |
| | Motor skills (fine) | Cutting |
| | | Colouring in, drawing, handwriting |
| | | Typing |
| | | Stitching, knitting |

This hierarchical structure (figure 8.1) represents a grading of the complexity of the motor output, with the first tier representing the basic anatomical structures and basic physiological processes that are required for movement. The second tier represents refining and ordering of movement which is required as a base for meaningful interaction with the environment. The third tier represents an amalgamation or composition of the lower tiers through development in order to facilitate the attainment of mastery over the environment. The fourth tier represents that action that demonstrates mastery over the environment. All four tiers are required for the successful contribution of movement to the occupational performance of a child with LD or DD. Within each motor component of a tier are sub components that are supported by the lower tiers. Table 8.1 identifies these sub-components.

### 8.3.2 Phase 2: Hierarchical Structure Based Only on Delphi C

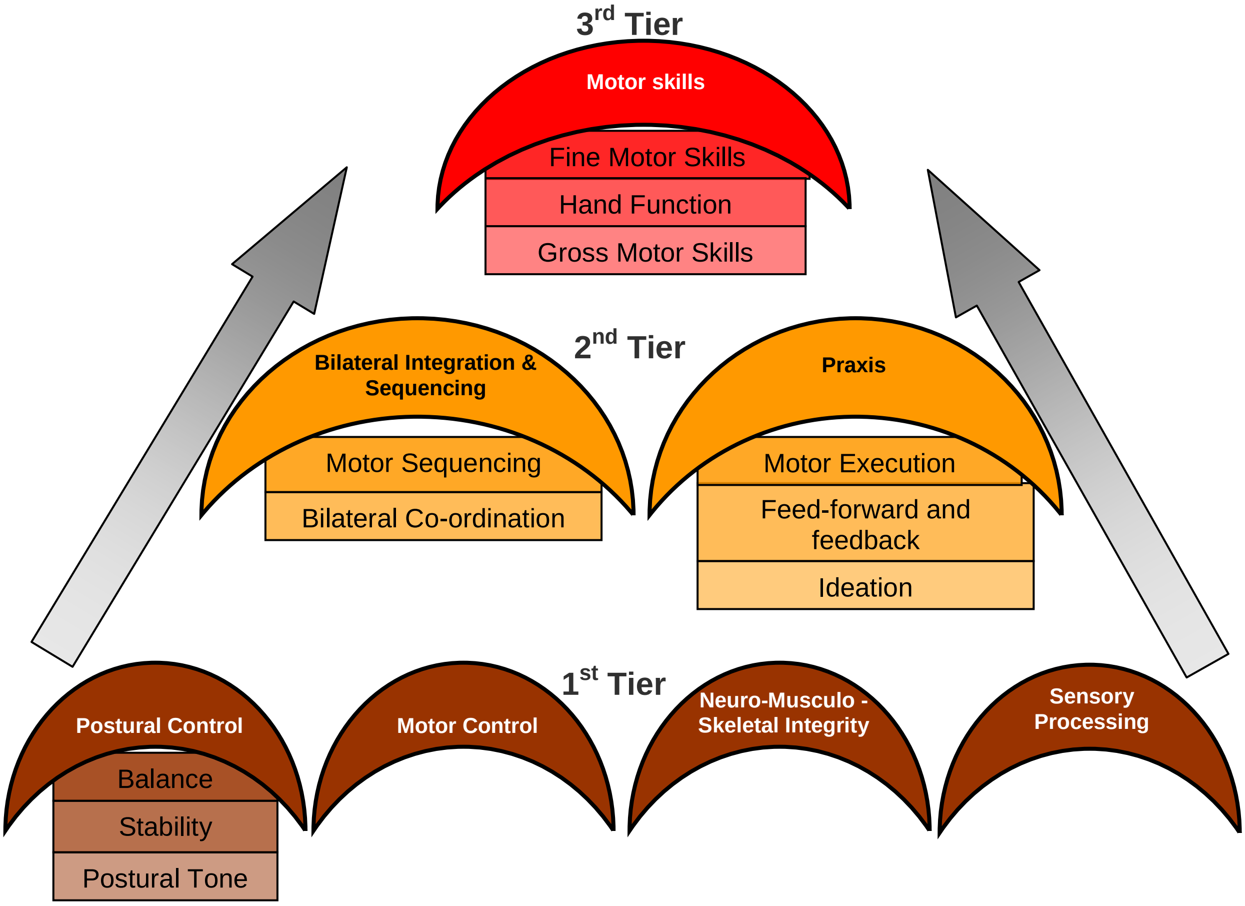



**Figure 8.2** Phase 2 Hierarchical Schematic of the FUMT

Phase 2 of the development of the FUMT paralleled phase 1 as both outlines were hierarchically structured, with motor skills representing the highest level of the structure. This three tiered schematic (figure 8.2) has a base tier of automatic processes and physical integrity of the body. The second tier represents processes that are more cognitively controlled to create complex movements, with the highest tier containing practiced and refined movements that allow for selective participation in daily living tasks.

The significant uniqueness of the second phase structure is the mini-hierarchy of function evident within each component, representing a relative dependence of sub-components on each other within a component. The components are represented as “umbrellas” which are divided into sub-components that together form the component. The component “motor performance outcomes” (7.3.6 p116) was omitted from the structure in this phase as it represents more the evaluative terms used to measure movement quality, rather than forming a type of movement.

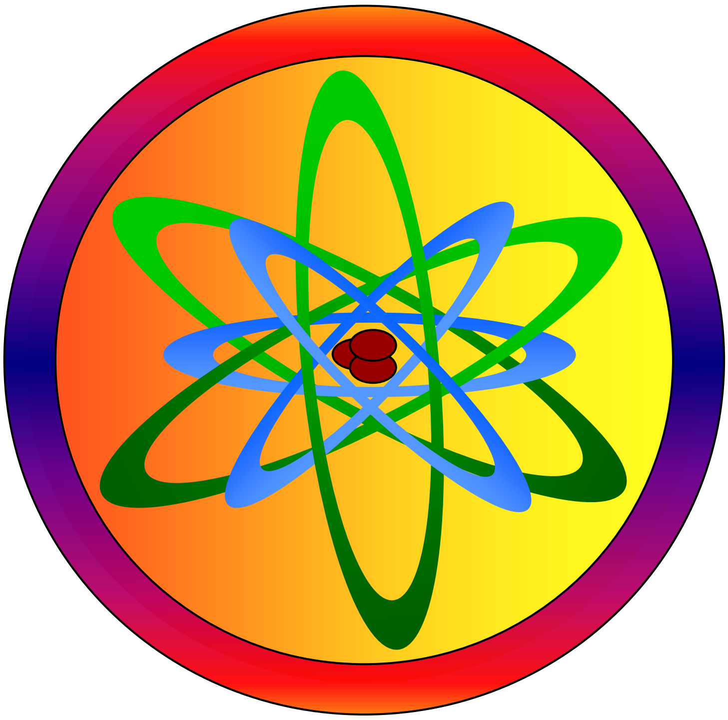
While either of the hierarchical structures could be used to formulate a FUMT for occupational therapy with children with LD and DD, there are limitations to each and synthesising them would be more comprehensive.

### 8.3.3 Critical review of the Phase 1 and Phase 2 schematics

The hierarchical structure presented in phase 1 schematic (figure 8.1) of the development of the outline of the framework of motor is a classic hierarchy, that can be likened to a brick wall. Each tier of the structure is dependent on the tiers below. The development of motor performance in children should not be over simplified to such a degree as this dilutes the relationships and inter-dependences between motor components and within the context of life and environment [34]. This simplified structure is further limited by the apparent separation between motor components, implying that that each is mutually independent of the other motor components and fails to reflect any overlap between aspects of each component.

The more dynamic structure presented in phase 2 (figure 8.2) is less rigid, allowing for some flexibility. The hierarchy of phase 2 is more pyramidal, implying some synthesis of motor performance at each tier for contribution to the higher tier. The mini-hierarchies within each motor component provides for the relationships within a motor component. This structure however also falls short of providing a full dynamic, flexible interpretation of motor performance in children with LD and DD. It does not provide for feedback from the environment on the quality of movement, and the “umbrella” motor components are stand alone within the hierarchy, implying that they have limited influence on and by other motor components.

#### 8.3.4 Phase 3: The final Framework of Uniform Motor Terminology



**From the core outwards**

- Neuro-sensory-musculo-skeletal integrity
- Movement control
- Complex movement
- Motor skills
- Occupational performance

**Figure 8.3** Schematic of the Framework of Uniform Motor Terminology

Three schematics were initially developed in this phase. The initial schematic to emerge was in the form of a mind map that branched outwards from a central core. Although this schematic was rejected in favour of the dynamic FUMT it is worthy of mention as the structure it provided contributed ensuring that the FUMT was comprehensive and the image of the central core sparked the conceptual idea for the atom-like orb.

The final schematic of the FUMT for use by occupational therapists practicing in the field of LD and DD developed in the third phase (figure 8.3) is not simply a hierarchy. The atom like orb represents the dynamic integration of structures and processes, clustered into systems (represented by a different colour in the schematic) that form the motor domain. Although some level of hierarchy is represented from the core of orb (**neuro-sensory-musculo-skeletal integrity**) to the crust (**occupational performance**), each motor system is also dynamically integrated with every other system and motor component within each system. The motor systems are dependent on feedback from each other to ensure successful motor performance. The schematic thus represents the dynamic interaction between the systems and the motor components.

The core is the fundamental structures and automatic processes of the body, the **neuro-sensory-musculo-skeletal integrity** system. Surrounding this core are three motor component orbits representing the **movement control** system. The orbits are suspended three dimensionally around the core, and are in constant flow, representing the continuous activation of these structures. The **movement control** system orbits are surrounded by a second layer of orbits, the **complex movement** system, which also comprises of three motor components. The three systems are suspended in the inner stratum which represents the **motor skills** system. The yellow to orange grading of the inner stratum represents the progression from gross motor skills to fine motor skills, and that there is not a clear line dividing the two motor components of this system. The inner stratum is also not a solid layer, but a zone in which the inner three systems are suspended, representing the reciprocal interaction that motor skills has on all the inner systems, and that it bridges the inner systems to the crust. The outermost layer of the schematic is the multi-coloured crust, which represents the **occupational performance** system. This system is multi-coloured as it is dependent on all four inner systems, in constantly changing proportions, to appropriately interact with the environment and society (the space surrounding the orb).

The **neuro-sensory-musculo-skeletal integrity** and the **occupational performance** systems were not the focus of this study, but the schematic has representation of these two systems as they complete the motor domain, and there was good consensus in the literature regarding the definitions and formation of these two systems.

This schematic (figure 8.3) is therefore more dynamic and accounts for more flexibility of the development of the motor domain. It addresses the limitations of the schematics from the previous two phases (figure 8.1 and 8.2).

**Table 8.2** Overview of the Framework of Uniform Motor Terminology

| SYSTEMS OF MOTOR FUNCTION | MOTOR COMPONENT | MOTOR COMPONENT DEFINITION | SUB-COMPONENTS REPRESENTED WITHIN THE MOTOR COMPONENT |
|---|---|---|---|
| **Neuro-sensory-musculo-skeletal integrity**<br><br>**These components of movement are the fundamental genetically and developmentally crafted systems, processes and structures in the body that are automatically available to contribute towards movement. They are susceptible to damage, disease, genetic limitation or abnormality. They are also enhanced to genetic affordance, and through use.** | Musculo-skeletal integrity | Musculo-skeletal integrity is intact and working nature of the fundamental bone, fascia, ligament, joint, and muscle structure of the body, without limitation, deformity, or injury. | ▪ Skeletal structure (intact bone, joint range of motion, ligament integrity, body weight/mass)<br>▪ Muscle structure (intact muscle bulk, muscle innervation, muscle strength/power, postural tone, muscle tone, muscular endurance) |
| | Neuro-motor reactions | Neuro-motor reactions are those sub-consciously generated movement responses that occur in response to an environmental stimulus that requires automatic body adjustment or position change in order to adapt to the needs of the environment or demands of the task. These reactions mature throughout the life span. | ▪ Infant reflexes (rooting reflex, grasp reflex, swallow)<br>▪ Muscle reflexes (stretch reflex, golgi tendon reflex)<br>▪ Spinal reactions (flexor withdrawal, extensor thrust, crossed extensor response)<br>▪ Brainstem reactions (positive support, negative support, asymmetric tonic neck reaction, symmetric tonic neck reaction, tonic labyrinthine reaction)<br>▪ Midbrain reactions (neck-on-body righting reaction, body-on-body righting reaction, body-on-neck righting reaction, flexion righting reaction, optical righting reaction, labyrinthine righting reaction, landau righting reaction)<br>▪ Cortical reactions (equilibrium reactions, protective extension) |
| | Sensory processing related to movement | Sensory processing related to movement is the reception and interpretation of the meaning of information from the environment and our movements in order to ensure meaningful movement responses to the changing demands of our actions on and within the environment. | ▪ Intra-reception (vestibular processing, proprioceptive processing)<br>▪ Exo-reception (Visual processing, tactile processing, auditory processing, olfactory processing, gustatory processing) external<br>▪ Inter-reception (Sensory integration, multi-sensory discrimination) |

| | | | |
|---|---|---|---|
| **Movement control**<br><br>**Movement control is the precision (regulation and refinement [5]) of the motor interaction of the body with the environment, which is partly sub-consciously managed and partly consciously managed.** | Postural control | Postural control is the use of the neuro-sensory-musculo-skeletal integrity to hold a position, and provide a stable base from which to generate movements of the limbs or change position from one stance to another. | ▪ Postural stability (central/trunk stability, pelvic girdle stability, shoulder girdle stability, co-contraction, postural alignment)<br>▪ Dynamic postural adaptation (weight-bearing, weight-shift, rotation/dissociation, postural background movements, balance) |
| | Motor control | Motor control is the use of the neuro-sensory-musculo-skeletal integrity to generate precise and efficient movements. | ▪ Selective control of movement (isolation of movements: DDK, TFT, freedom from mass patterns; stability-mobility dissociation)<br>▪ Grading of movement (smoothness, force, speed, timing, accuracy)<br>▪ Motor synchrony (eye-hand synchrony, hand-hand synchrony, eye-hand-foot synchrony) |
| | Fine dexterous control | Fine dexterous control is the use of the neuro-sensory-musculo-skeletal integrity, postural control and motor control to generate precise and efficient movements specifically of the upper limbs for tool use. | ▪ Power grasps (power, cylindrical, spherical, hook, disc, chuck)<br>▪ Precision pinches (lateral, tip, tripod)<br>▪ Reach (near reach, far reach)<br>▪ In-hand manipulation (finger-to-palm translation, palm-to-finger translation, object shift, simple object rotation, complex object rotation) |
| **Complex movement**<br><br>**Complex movements are cognitively managed actions for the benefit of successful and efficient interaction with the changing demands of the environment.** | Bilateral integration and sequencing | Bilateral integration and sequencing is the ability to use both sides of the body simultaneously to perform a specific sequence of actions. | ▪ Bilateral co-ordination (symmetrical bilateral co-ordination, reciprocal bilateral co-ordination, asymmetrical bilateral co-ordination, midline crossing, hand preference)<br>▪ Motor sequencing (simple pattern, complex pattern, pattern repetition, projected action sequence) |
| | Motor learning | Motor learning is the capacity of individual to practice a task, improving with each attempt in order for the movements to become more automatically controlled, and require less | ▪ Movement practice, acquisition and modification<br>▪ Motor engram formation<br>▪ Movement memory |

| | | | |
|---|---|---|---|
| | | conscious attention to perform. | |
| | Praxis | Praxis is the ability to adapt already learnt movements to new and novel experiences for successful interaction, by conceptualising and planning a new movement response to the environmental demand. | ▪ Ideation (movement visualisation, movement brainstorming, movement problem solving)<br>▪ Ideomotor process (feed-forward, task action order, feedback) |
| **Motor skills**<br><br>**Motor skills are the ability to perform specific learnt actions with confidence of success based on previous experience of successful completion of the action. Motor skills require conscious attention to the accuracy and success of the task involving tool and material use rather than the ability to perform the task.** | Gross motor skills | Gross motor skills are the ability to perform specific learnt actions involving whole body movement | ▪ Fundamental motor skills (stand, crawl, walk, run, jump)<br>▪ Riding skills (bike riding, skateboarding, horse riding, motor bike riding, driving)<br>▪ Water skills (swimming, diving)<br>▪ Ball skills (throw, catch, bounce, target throw, kick, goal kick)<br>▪ Balance skills (static, dynamic, raised surface)<br>▪ Gardening skills (mowing, edge trimming, hole digging)<br>▪ Dancing skills (pirouette, arabesque, leap) |
| | Fine motor skills | Fine motor skills are the ability to perform specific learnt actions specifically of the distal and oral body parts involving tool and materials usage. | ▪ Pre-writing skills (tracing, colouring, painting, drawing, erasing)<br>▪ Writing skills (letter formation, letter spacing, letter sizing, typing)<br>▪ Craft skills (cutting, pasting, sewing, knitting, baking)<br>▪ Gardening skills (digging, planting, pruning, sowing)<br>▪ Domestic skills (washing, ironing, cooking, cleaning)<br>▪ Oral motor skills (sucking, blowing, chewing, swallowing)<br>▪ Dressing skills (buttoning, zips, tying laces) |

| | | | |
|---|---|---|---|
| **Occupational performance**<br><br>**Occupational performance is the activities that individuals participate in throughout the day to fulfil personal, familial, societal and cultural responsibilities. In the context of the FUMT occupational performance occurs through the integrated use of neuro-sensory-musculo-skeletal integrity, movement control, complex movements and motor skills.**<br><br>**In the FUMT only those occupational performance activities that require obvious motor function have been illustrated and there are many more examples of each.** | Work | Work is the performance of activities for the purpose of education, contributing to society, and employment [2,19]. | ▪ Academic performance (writing dictation, creative writing, copying maths equations off the board, answering examinations, art projects, physical education lesson performance)<br>▪ Paid employment (shopping bag packer, till operator, shelf packer, paper delivery) |
| | Leisure | Leisure is the performance of activities through free will that are for the purpose of amusement, entertainment, relaxation and socialisation, at times when work and personal management demands are not pressing [2,19]. | ▪ Sport performance (netball, soccer, golf, hockey, motocross racing, show jumping, cross country racing, team swimming, gymnastics, ballet, karate)<br>▪ Craft performance (scrap-booking, art painting, pottery, mat weaving, dress making)<br>▪ Recreational games (monopoly, card games, chess, puzzle building)<br>▪ Play (imitative play, fantasy play, explorative play, role play, games) |
| | Personal management | Personal management is the performance of activities that are for self maintenance purposes. These activities are for the activities of caring for the individual's body, personal living space, possessions and family [2,19]. | ▪ Toileting (potty training, transferring on and off toilet, wiping)<br>▪ Dressing (putting on clothing, selecting appropriate clothing, putting on school uniform)<br>▪ Eating (eating with a spoon, knife and fork, drinking from a cup, drinking)<br>▪ Hygiene (brushing teeth, brushing hair, washing body and hair, using deodorant)<br>▪ Refined self care (hair styling, putting on make-up, accessorising)<br>▪ Home maintenance (washing and ironing clothes, making bed, cooking meals, cleaning the home, shopping, maintaining the garden, transportation) |

Table 8.2 defines each system of motor function, identifies and defines each motor component and presents the sub-components (motor qualities) that are represented within each motor component. To illustrate the FUMT the common school task required of a grade 2 child is completing a dictation test. The motor performance of this task is analysed in table 8.3.

**Table 8.3** Task of writing dictation illustrated using the FUMT.

| | | |
|---|---|---|
| **Neuro-sensory-musculo-skeletal integrity.** | Musculo-skeletal integrity | The child requires active range of motion in all finger joints, the wrist, elbow and shoulder. Muscle strength in the finger flexors and extensors should be at least an oxford grade 4. |
| | Neuro-motor reactions | Optical and labyrinthine righting reactions maintain the upright sitting position at the desk. |
| | Sensory processing related to movement | Proprioceptive and tactile processing in the hand assist in monitoring grip on the pencil and pressure exerted in the pencil tip. Visual, tactile, proprioceptive integration are needed to monitor the quality and correctness of the handwriting |
| **Movement control** | Postural control | Shoulder girdle stability is required for provision of a stable frame from which to general arm movements. Co-contraction at the elbow and wrist joints facilitates finger movements. Upright sitting alignment facilitates motor control. |
| | Motor control | Isolated finger movements allows for a dynamic pencil grasp. Smooth, well timed pencil movement with adequate force allows for neat handwriting. Adequate speed of writing is required to ensure that all of the dictation words are written. |
| | Fine dexterous control | A tripod pinch is used to hold the pencil. Some shift could be used to position where the pencil is held, and this may be done during the task to reposition the pinch. |
| **Complex movement** | Bilateral integration and sequencing | Hand preference is required for development of handwriting skills, and the non-preferred hand should stabilise the paper that the dictation is written onto. |
| | Motor learning | The child would have applied motor learning to the acquisition of ability to form each letter through practice and repetition. |
| | Praxis | If the dictation words are unfamiliar, the child may have to use other strategies to decide on the letters to write (ideation), and then sound them out afterwards to check that these are as accurate as the child is capable (feedback). |
| **Motor skills** | Gross motor skills | N/A |
| | Fine motor skills | Letter formation, letter spacing, and letter sizing are all required in order to transcribe the dictation words. |
| **occupational performance** | Work | Performing the dictation task within the time provided by the teacher with and acceptable level of neatness and accuracy. |
| | Leisure | N/A |
| | Personal management | N/A |

## 8.4 DISCUSSION OF THE FRAMEWORK OF UNIFORM MOTOR TERMINOLOGY

This chapter aimed to develop the FUMT, with a schematic representing the relationships within the FUMT. The phases of the development of the FUMT are aligned with the stages of the study, providing evidence to substantiate the need for all the stages of the study.

### 8.4.1 Rationale for the name

The word "framework" was specifically chosen as it was the term used by the American Occupational Therapy Association in their most recent attempt at developing a uniform terminology document for the profession of occupational therapy [2]. A framework is more than simply a terminology list, or a hierarchical taxonomy [2,21,53]. It is the baseline or foundation on which to build profession specific theory [21], and provides a structure for analysing information within a context, accounting for the influence of the theories used in practice. A framework is also distinguished from a "frame of reference" which according to Dunbar

> "*consists of four primary aspects, including a theoretical base, function-dysfunction continuums, descriptions of behaviours that are indicative of function and dysfunction, and postulates regarding change*" [17] p4.

The product of this study does not speak to any particular theory base or treatment frame of reference, though the clear influence of the theory of Sensory Integration is evident, it provides for infiltration into most current theories and frames of reference in use by occupational therapists practicing in the field of LD and DD. The FUMT is thus not a theory nor a frame of reference in its own right as it does not explain relationships of components, nor does it guide therapeutic intervention, it merely states the boundaries of each component [17]. The FUMT is also not a model as it does not represent method of practice, the philosophy, ethics, nor the tools of practice within this domain of motor performance in children with LD and DD [17]. The term "framework" is therefore a suitable description for the nature of the FUMT.

### 8.4.2 Review of the Framework of Uniform Motor Terminology

The motor components investigated in the study were those that were noted to be ambiguous and inconsistently used, both in the literature and in clinical practice of occupational therapy with children who have LD and DD. The development of the FUMT has attempted to synthesise the motor components investigated in the study with motor components that are consistently and precisely used. The **Neuro-sensory-musculo-skeletal integrity** and the **occupational performance** systems of the FUMT were drawn predominantly from the literature, though the influence of the study on the configuration of these systems is evident. The **movement control** system, the **complex movement** system and the **motor skills** system were developed from the results of this study as a whole.

**Neuro-sensory-musculo-skeletal integrity** is the inner core of the FUMT. It comprises of three motor components that are fundamental to motor performance of any kind. These three motor components are: “Musculo-skeletal integrity”, “Neuro-motor reactions” and “Sensory processing related to movement”. As noted in table 8.2 this system forms the physical structure of the body, and the automatic processes that occur though the reflexive processes of the body.

In the Framework [2] the **Neuro-sensory-musculo-skeletal integrity** system would fall under the “body function categories”, and interestingly the results of this study align this system broadly with the two categories under “body function categories”; the “sensory functions and pain” and “Neuromusculoskeletal and movement related functions”. Like in the Framework [2] this system is hierarchically the lowest, or most central to the ability to perform motor actions, and thus its placement at the core of the schematic is justified. Threat to any of the sub-components of the **neuro-sensory-musculo-skeletal integrity** of the body will impact on all the systems, but higher systems may develop strategies for compensating for permanent damage at this level.

The **movement control** system comprises of “postural control”, “motor control” and “fine dextrous control”. This system’s main focus is the quality, precision, refinement, regulation and efficiency of movement. Neuro-anatomically this system is a product of cerebella and basal ganglia involvement in movement [38]. Many texts [5,35,36,38] consider "motor control" to be far broader than that implied in this study, implying that it is the process of generating and developing all movement. In the same texts however, motor control is largely defined as the "*regulation and refinement of movement*" [5] p88, thus providing consistency with this study.

Motor control theory emphasises the role of feedback and feed forward in refining movement [5,36,38]. The FUMT schematic allows for this interaction in that there is a direct relationship between all the systems, specifically the **movement control** and **motor skills** systems. It facilitates the opportunity for feedback during motor skill participation to influence the refinement of the movement (**movement control**). While practice assists in the refinement of movement, humans have inherent movement control which optimises performance in unlearnt tasks [36,38].

"Bilateral integration and sequencing", "motor learning" and "praxis" are the three motor components that form the **complex movement** system. The strong influence of the theory of sensory integration is evident in this system, with two of the three motor components stemming directly from this theory [5,6,17]. Motor learning on the other hand has its base in psychology [34,36] (neuro-psychology and educational), but does dovetail well into this system. The **complex movement** system brings cognition into movement, representing ideated, goal directed intentional movement, that adapts with the changing demands of the environment and the person's needs.

The **motor skills** system is directed towards specific activity actions that are practiced and learnt. The division of this system into "gross motor skills" and "fine motor skills" is consistent with the literature [34,36] and the results of the study (7.3.7 p117). It is important to differentiate **motor skills** from the motor aspects of the **occupational performance** system. While a child may be able to ride a bicycle (**motor skill**), he may have difficulty riding his bicycle in the park with friends (**occupational performance**) due to low self confidence, inability to negotiate obstacles in the path or various other influencing factors. **Motor skills** are used in daily life to contribute towards our **occupational performance**.

The Model of Human Occupation [82] (MOHO) formed the basis for the **occupational performance** system in this study, as it is well recognised and was incorporated into the Framework [2].

### 8.4.3 Validity

The FUMT was developed through three phases, based on four stages of research. This detailed process validates the content of the FUMT. While the opinion of the researcher is inherently in the creative process of developing the schematic, the foundation information lies firmly in the research process and the literature. Researcher bias is thus not a limiting factor in this stage, as it was controlled in previous stages.

## 8.5 CONCLUSION

This chapter describes the process of developing the FUMT by synthesising the stages of the study with the literature. The FUMT is both:

- **A taxonomy** of motor terminology related to occupational therapy intervention with children with LD and DD and
- **A structure** for analysing movement in children with LD and DD.

It was developed through researching the opinions of occupational therapists practicing in the field of LD and DD. The FUMT reflects the opinions and common practice of clinical occupational therapists and is not restricted to any single theory base, but rather has combined practice and theory within its structure. While any one participating occupational therapist may disagree with some aspects of the FUMT, the common trends of the occupational therapists sampled are reflected in the FUMT.

# CHAPTER 9 – CONCLUSION

## 9.1 INTRODUCTION

This study has produced a FUMT for use by occupational therapists treating children with LD and DD, using a methodology that synthesised the opinions of and current practice terms used by these occupational therapists. While some occupational therapists may use the terms differently, and there may still be some deviation from the literature the FUMT represents an analysis of the opinions of South African occupational therapists practicing in the field of LD and DD.

## 9.2 REVIEW OF THE STUDY

There is ambiguity and inconsistency of motor term use in the literature on occupational therapy intervention with children who have LD and DD. Occupational therapists are not vigilant in their consistency of term use, possibly due to the need to communicate with professionals and the layman. This problem plagues the profession, and has a negative impact on occupational therapy research, reporting on intervention and in communication within the profession. The purpose of this study was to investigate the use of motor terminology by occupational therapists practicing in the field of LD and DD and develop a FUMT.

The study was conducted using a five staged mixed methods approach. Occupational therapists practicing in the field of LD and DD were sampled in this study, with the second stage sampling all levels of experience within the field, and a progressive increase in expertise of the sample through the third and fourth stages. The first and fifth stage did not require sampling.

The first stage (Chapter 4 p29) of the study was an audit of the literature related to motor performance in children with LD and DD. This stage yielded six motor component terms that were ambiguous or inconsistently used. These terms were then investigated in the second stage (Delphi A) of the study (chapter 5 p43), which asked paediatric occupational therapists to assign a list of characteristics of movement to each of the terms. The results highlighted the inconsistency and varied opinion of occupational therapists. The lack of above 50% association of characteristics of movement to the “poor motor skills” component was not detrimental to the study, as this motor component was well represented in the Delphi C (7.3.7 p117) The planned Delphi Technique proved imperative for gaining some clarity of term use.

The Delphi B (third stage - Chapter 6 p64) was thus the formation of a survey which synthesised the results of the second stage into nine point Likert scales, and requested definitions of each term in the occupational therapists own words. This stage thus used both quantitative and qualitative data collection and analysis. The results indicated that there continued to be inconsistency and overlap between motor component terms but trends did emerge. The motor components of “Praxis” and “Postural control” showed better consistency than the other motor components.

The fourth stage (chapter 7 p102) attempted to force consensus through the use of card sort groups (Delphi C). Six expert card sort groups were held in four major cities across South Africa. Participants sorted cards into meaningful clusters, sub-divided clusters where appropriate and provided labels for each cluster and sub-cluster. This provided quantitative data for analysis. The results of this stage configured the motor components differently to the initial motor component terms investigated. While this provided data towards the structure of the FUMT, and allowed the occupational therapists to configure the information in a way that made sense to them, they did not directly address the six terms being investigated in the study. It was therefore important to combine the results of stages three and four in the development of the FUMT.

The results of stage four made a significant contribution towards the FUMT. Strong consensus in the motor components: postural control, praxis, bilateral integration and sequencing, motor control and motor skills, supported their incorporation into the FUMT. The “motor performance” component was attributed to the occupational performance system of the FUMT.

The FUMT was developed during the fifth stage of the study (chapter 8 p127) through a three phase process. The FUMT is represented by a schematic in order to facilitate ease of interpretation, as well as a taxonomy of motor terminology.

## 9.3 VALIDITY AND RELIABILITY

The use of mixed methods research in attempting to gain consensus of participants is successful due to the triangulation of information during the data collection processes [62]. This study used triangulation and a sequential research method to strengthen the validity of the study. Participants were revisited twice (depending on their level of expertise), this providing opportunity for participants to revise their opinions, providing a more stable data saturation, and higher level of consensus.

A strength of the Delphi Technique is that there is very limited participant pollution, or influence of one participant over another [62]. This was especially evident during the first and second stages of this study. In the third stage participant peer pressure could be an influencing factor, but this was controlled by the researcher ensuring participation of all group members in the assigning of cards to sets. The reliability of this study method is thus appropriate.

Subject fatigue may be a reliability factor [65] in the surveys due to the length of the surveys. It was also a possible factor in the first open card sort group, as this group was held in the evening, and two participants were subjected to an hour of travelling time to attend the group. If the group had been held earlier in the day, the results could possibly have been different, however, the group was conducted efficiently to completion.

## 9.4 CRITIQUE OF THE FRAMEWORK OF UNIFORM MOTOR TERMINOLOGY

Most taxonomies and frameworks are developed through professional associations' formation of specific task groups, as was the case with the Framework [2] and the ICF [46]. This method has come under scrutiny by Nelson [21] who sited political processes within a committee and poor buy-in by the occupational therapy population as a limitation. Nelson further implored the scholarly population to research terminology. This study has specifically targeted the occupational therapy population who would use the FUMT to participate in its development. It has used a research base that is not subjected to political bias, and is more representative of common practice. Nelson [21] criticised the Framework for including terminology that is not commonly cited in the literature, which is evident in its very limited reference list [2]. The FUMT has a strong base in the literature pertaining to LD and DD, primarily occupational therapy literature, but also includes terms that are common to psychology and medical literature.

The most prominent limitation of the FUMT in the current state is the lack of critical review by the experts that have contributed to its formation, and other experts in the field of LD and DD, be they occupational therapists, or other professionals. A further limitation is that the FUMT has not been disseminated to the population for which hit has been developed. These factors are both sited by Borst and Nelson [20] as vital in the production of any uniform terminology document. Continued research on the FUMT and a dissemination plan will be implemented as further stages of this study.

The FUMT was designed for, and developed through the research into the field of LD and DD within occupational therapy. It is therefore in no way intended to be extrapolated to the general practice of occupational therapy. While there may be potential for such extrapolation, specific research would need to be conducted by experts in other fields of occupational therapy, in order of this to be successful in those contexts. This is not planned within the future process of the current study.

The FUMT has not been designed for implementation in any one specific frame of reference. While the strong influence of Sensory Integration is evident in the FUMT, it is also in accordance with Developmental, Neurodevelopmental, Motor Learning, Motor Control, and Biomechanical frames of reference, when these are applied to intervention with children who have LD and DD. The FUMT also used terms commonly included in standardised assessments used by occupational therapists to evaluate their client’s motor performance. This is a strength of the FUMT.

## 9.5 CONTRIBUTION TO OCCUPATIONAL THERAPY

The FUMT will provide occupational therapists with a framework of motor terminology (table 8.2 p134) for use in the field of LD and DD. The benefits of this are:

- Consistent terms in reporting on LD and DD occupational therapy client evaluation and progress to the layman.
- Consistent terms for analysing and interpreting information gained through client evaluation for peer review, discussion and client hand-over within occupational therapy.

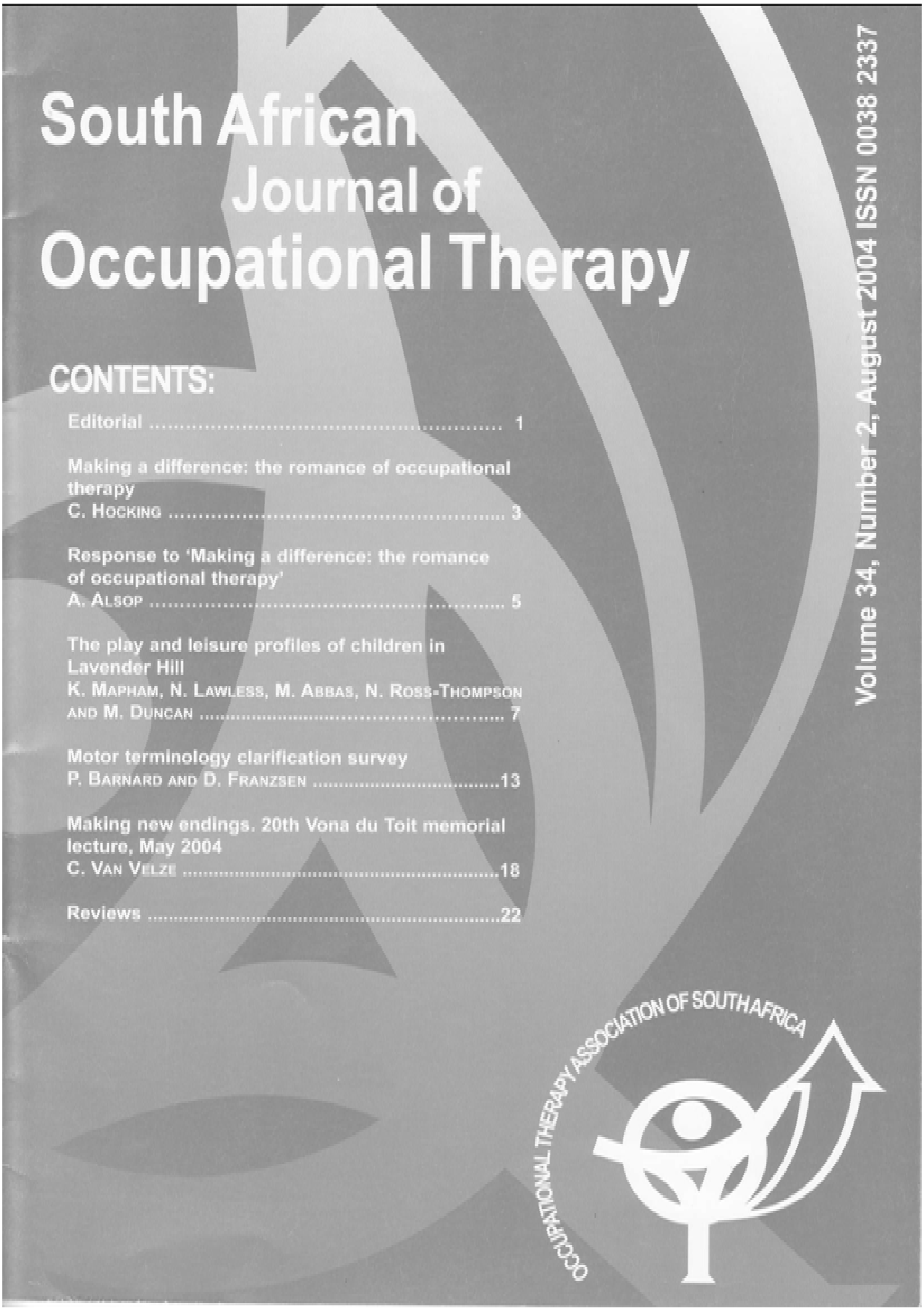
The FUMT will further provide a structure for presenting motor performance information, as illustrated in table 8.3 (p139). This will benefit occupational therapists in the following ways:

- Provide consistent constructs for researching motor performance in occupational therapy related to LD and DD, allowing for strong comparative research and meta-analysis. This is urgently needed within the profession in the development of best practice evidence.
- Provide a structure for use in training occupational therapists, which is clear and concise and thus will facilitate optimal student learning.

## 9.6 CLOSING COMMENT

This study has developed a FUMT for occupational therapists practicing in the field of LD and DD. The FUMT has been constructed through a research process, and is not the opinion of the researcher. This is only the initial stages of the study, as the FUMT still needs to be subjected to the scrutiny of those occupational therapists who are expert in the field of LD and DD. Finally the FUMT should be applied to clinical practice and further researched and revised before it can be deemed a comprehensive framework.

## APPENDIX A Article Published on this Study



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# Motor terminology clarification survey

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**Abstract**

A review of the literature yielded confusion regarding the use of terminology related to motor performance in children. Terms such as "praxis", "motor planning" and "co-ordination" were used interchangeably and poor consistency was evident in the use of other terms. The study investigated the use of terms by South African paediatric occupational therapists. The terminology investigated was: postural control, praxis, co-ordination, integration of movement, sequencing of movement and motor skills as well as each component represented in dysfunction form. The 68 surveys returned showed a high discrepancy of terminology usage among the therapists, with a resulting frequency of 50 percent representation of a phrase in each component being selected. The phrases that did reach >50 percent frequency serve to develop a clearer understanding of the view that therapists have of each term and thus form a basis for defining motor terminology.

**Key Words:** Motor terminology, learning disabilities, motor performance, assessment, paediatric

## Introduction

This study forms the initial phase of developing a South African assessment of motor performance in children aged five years to nine years 11 months.

Occupational therapists (OTs) who specialise in treating children with learning difficulties use a variety of motor assessments in order to determine the motor problems that contribute to a child's learning difficulties. These assessments are usually standardised on a normal population for a specific age range, but some assessments are non-standardised clinical observations.

Poor motor performance may contribute to a child's difficulties in school, as day-to-day academic tasks are often motor dependent. On a gross motor level a child should be able to participate in sporting and playground activities in order to socialise effectively with peers. A child further requires an upright sitting posture to maintain adequate attention to lessons and to perform fine motor tasks skilfully.[1] On a fine motor level a child is required to draw, write, cut out and paste in order to present academic work. Thus, difficulties in motor performance or sensorimotor delays can significantly influence a child's learning experiences.[1,2,3]

There are a number of motor performance tests available to OTs practising in this field. The most commonly utilised in South Africa appears to be the Movement Assessment Battery for Children,[2] and the Bruininks-Oseretsky Test of Motor Proficiency.[4] These assessments, although effective, are not standardised on a South African population, and are not designed to cope efficiently with the cultural diversity that our population presents. It would thus be beneficial to develop an assessment of motor performance that is appropriate to the needs of the South African population and is developed with local environmental and social issues in mind.

On reviewing the literature in the initiation phase of this task it was seen that there is great overlap and poor consistency in the use of terms related to motor performance in children with learning disabilities. The purpose of this part of the study aimed to determine how South African OTs use the terminology related to motor performance of children with learning difficulties. This will ensure appropriate use of terminology in the motor assessment that is to be developed. This survey will form the preparation stage for a Delphi Technique[5] in gaining consensus on term usage among South Africa paediatric OTs.

## Literature review

In South Africa, approximately 40 percent of primary school children are referred for special educational assistance, be it for a diagnosed disability or for more temporary assistance in terms of psychological, speech, occupational or remedial therapy.[6] This percentage (although seemingly excessive) is made up of a variety of difficulties, such as attention deficit disorder and developmental co-ordination disorder. Both these disorders significantly affect a child's occupational performance in their scholastic, domestic and social environments.[7,8] A child presenting with these disorders often suffers with a form of motor performance delay, which impacts on his/her occupational performance,[7,8] such as tying shoelaces in the task of dressing. These children are referred to occupational therapy for treatment.

There is a tendency for OTs specialising in the field of paediatrics to use motor-related terms interchangeably. Motor performance is referred to as motor behaviour,[1,9] co-ordination and skill,[10] motor proficiency[4] or movement.[1,2,9] The term co-ordination is used to refer to praxis in some texts,[11] but is specifically distinguished from praxis in other texts.[12,13] "Developmental co-ordination disorder", as used in the DSM IV, is also considered to be "developmental dyspraxia",[8,13,14] which is the term preferred by South African OTs, "clumsy child syndrome",[8,14] or in the ICD-10: "specific developmental disorder of motor function".[13] Thus in reviewing the literature it is often necessary to attempt to define these terms based on the context of each study or text.

However, the literature does seem to agree on dividing motor performance into fine motor and gross motor components.[1,2,4,7,10] From this division there appear to be factors or components of performance which may influence a child's functioning in gross or fine motor activity. Of the named components, the most frequently used appear to be praxis, posture, integration, sequencing, co-ordination, motor skills and bilateral limb use.[1,2,4,9,10,12,13] These terms (except bilateral limb use) were thus selected as the components to be investigated. "Bilateral limb use" was excluded as in many texts it was reported in conjunction with either "integration of movement" or "co-ordination".

## Research methodology

The population for this study was qualified OTs registered with the Health Professions Council of South Africa practising in the field of paediatrics and treating children with learning difficulties.

A non-experimental research design was used.[15] A survey questionnaire was developed through reviewing the literature to identify terms related to the components selected for the research. Ninety phrases that depict characteristics of movement and motor performance were selected for inclusion in the questionnaire. The questionnaire was designed on two pages using a numeric code for each phrase to ensure ease of completion.

This survey questionnaire was sent to 1 200 OTs, who were asked to place each phrase under one or more of the following component headings: "praxis", "dyspraxia", "postural control", "poor postural control", "integration of movement", "poor integration of movement", "sequencing of movements", "poor sequencing of movement", "co-ordination", "unco-ordinated movements", "motor skill" and "unskilled motor acts". This produced nominal data for analysis.[15]

The survey was posted to the 1 200 OTs through the use of the Occupational Therapy Association of South Africa's (OTASA's) all-member mailing, and e-mailed to the target population. This method of distribution was selected as it was cost-effective and many of the therapists working with children who have learning difficulties are private practitioners, and are listed on the private practice register of OTASA. As a result, therapists practising in all areas of occupational therapy received the survey. The survey requested that only paediatric OTs complete and return the survey. Five hundred and sixty-one OTASA members were practising in the target field, according to the OTASA database.

Sixty-eight surveys were returned from paediatric OTs practising in the field of learning disabilities in South Africa. The return rate was thus 12,12 percent. This low return rate might be due to the time and thought that was needed in completing a questionnaire of this nature. The respondents ranged from having six months to over 30 years of clinical experience.

The data was analysed using descriptive statistics, in terms of percentage representation of a phrase in each component. The researcher had anticipated using a frequency of >80 percent as a cut-off for selecting a phrase to represent a component, but as very few phrases reached this cut-off it was reduced to a frequency of >50 percent.

## Results and discussion

### *Consistency of term usage*

Many phrases were represented in all the components, indicating that different therapists thought that the phrase was applicable to each component. A good example of this in figure 1 is "smoothness of movement", which had between 27 percent and 68 percent frequency of representation in all the components.

Phrases pertaining to postural control and aspects of praxis (figure 1), however, indicated high frequency in the use of the terms motor planning (praxis) and co-contraction (postural control) as can be seen by one marker being distinctly higher on the graph than the other markings for that phrase.

Figure 2 shows a similar trend for the use of phrases to represent several components of dysfunction. In the dysfunction components, however, a slightly greater selectiveness was noted, as there is a wider percentage range of each term across the components.

This illustrates the necessity of using a cut-off point for the percentage of therapists using a term for a component and encouraging therapists to be precise in their use of terminology.

### *Function*

The six areas of motor function that were investigated were: "praxis", "postural control", "integration of movement", "sequencing of movements", "co-ordination", and "motor skill". Table I represents the phrases used by therapists to describe movement that reached a >50 percent frequency in each component and the percentage of representation (in descending order) that the phrase had within the component.

The research showed there was strong consensus in the use of terms associated with praxis and postural control. For praxis there was over 80 percent frequency of the phrases: "goal directed action", "motor planning", "copying a movement", "conceptualising a movement" and "imitation of movements". These phrases are thus likely to be appropriate in the development of the definition and movement factors associated with

**Figure 1**
**Frequency of phrases across function components**

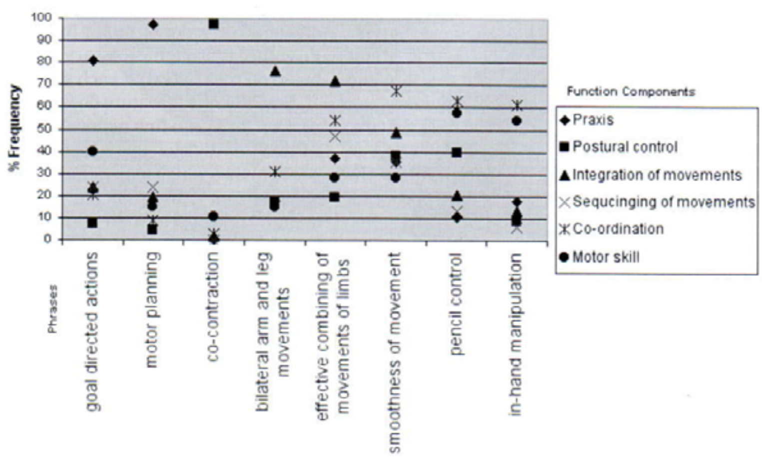
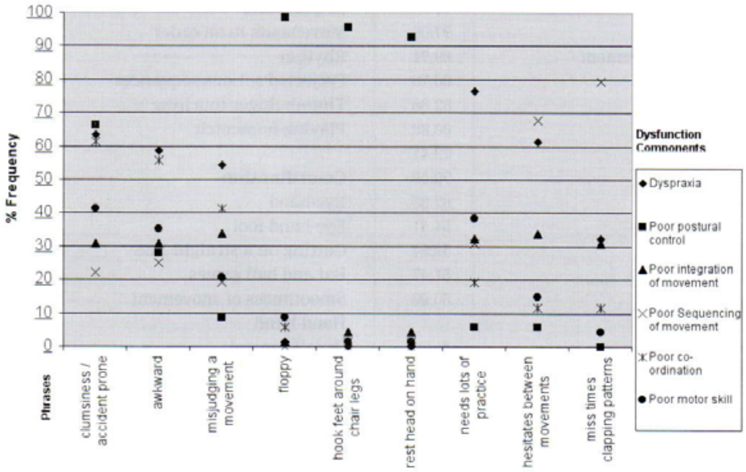


**Figure 2**
**Frequency of phrases across dysfunction components**




praxis. It is interesting to note that phrases such as "body scheme" and "motor engram formation" showed much lower representation even though these are deemed to be strong contributing functions to praxis in many sources, primarily in the theory of sensory integration.[16, 17] This is possibly due to the varied experience level of the participants, as 29 of the respondents were not sensory integration trained.

Postural control was associated with a small number of phrases all of which reached high (above 75 percent) representation. This indicates a strong consensus that these terms represent this component.

Even with the cut-off of 50 percent there were a number of phrases that were associated with more than one component, indicating either poor consensus or interchangeable terms. Integration of movement and co-ordination emerged to have the common phrase: "effective combining of limb movements" reaching the cut-off, but the phrase received higher representation in integration of movement than in co-ordination. This will be further investigated in the next phase of the Delphi Technique. Phrases that imply combining movements of the limbs such as "hand-hand" and "eye-hand-foot" reached the cut off in co-ordination and yet did not reach the cut off in integration of movement. This illustrates the possible carelessness of term usage among therapists practising in paediatrics, as the term "hand-hand" is often said in conjunction with the word co-ordination as in "hand-hand co-ordination". It is thus likely that the therapists are used to saying it as such and thus do not think through the actual meaning or implication of the phrase.

All the phrases that reached the cut off of >50 percent frequency in the motor skills component also reached the cut off in co-ordination (but not vice verse), implying that some therapists may use these terms interchangeably. It is surprising that there was not such overlap between motor skills and the other components as the term "motor skill" in much of the literature is considered to be a learnt and practised motor act requiring the adequate functioning of the other components,[16, 18] and thus could readily be associated with all of the phrases.

***Dysfunction:*** The same six components were investigated from the perspective of dysfunction (Table II).

The component "poor postural control" again displayed high consensus among therapists, 13 of the phrases reached >75 percent frequency . Postural control can thus be clearly differentiated from other motor performance terms. It has been shown that postural control is associated with co-contraction, stability, dynamic balance and weight shift, and indicators of dysfunction of postural control include resting of head on hand, hooking feet around the legs of the chair, fatigues easily, poor equilibrium reactions, fixation, tight pencil grip, low tone, increased pencil pressure and W-sitting on the floor.

Dysfunction of co-ordination seemed to relate to phrases that describe the smoothness and control of a movement, and was discrete from poor sequencing of movement that was characterised by phrases describing timing and ordering of movement. As the phrases related to the function components of co-ordination and sequencing overlapped there is a need to explore both the function and the dysfunction aspects of each term.

However, in terms of dysfunction there appears to be poor consensus in the use of the terms dyspraxia, poor sequencing of movement and poor co-ordination as there were several phrases represented in all three of these components.

Poor consensus was also reached for integration of movement and motor skills. Only one phrase reached the cut-off for integration of movement, which was "poor stabilising use of non-dominant hand", and no phrases reached the cut-off for poor motor skills. This may be due to the design of the questionnaire, which stated more phrases in the function-orientated manner than in a dysfunction-orientated manner (for example, "handwriting" versus "untidy handwriting").

## Conclusion

South African paediatric OTs practising in the field of learning difficulties have a strong tendency to use the terms "praxis", "dyspraxia", "postural control" and "poor postural control" consistently. This can be seen when considering the

**Table I**
**>50 percent frequency of phrases in the function components**

| | | | |
|---|---|---|---|
| **Praxis** | % | **Sequencing** | % |
| Motor planning | 97.06 | Movements in an order | 85.29 |
| Conceptualisation of a movement | 89.71 | Rhythm | 76.47 |
| Copying a movement | 86.76 | Projected actions sequences | 67.65 |
| Imitation of movements | 82.35 | Thumb-finger touching | 66.18 |
| Goal directed actions | 80.88 | Playing hopscotch | 60.29 |
| Construction | 79.41 | | |
| Tie a bow behind back | 70.59 | **Co-ordination** | % |
| Initiates movement easily | 67.65 | Eye-hand | 89.71 |
| Motor engrams formation | 54.41 | Eye-hand-foot | 85.29 |
| Playing hopscotch | 52.94 | Cutting on a straight line | 73.53 |
| Pumping a swing to move | 51.47 | Bat and ball games | 69.12 |
| Body scheme | 50.00 | Smoothness of movement | 67.65 |
| | | Hand-hand | 66.18 |
| **Postural Control** | % | Pencil control | 63.24 |
| Co-contraction | 97.06 | Manual dexterity | 61.46 |
| Stability | 97.06 | In-hand manipulation | 61.46 |
| Dynamic balance on beam | 79.41 | Handwriting | 57.35 |
| Weight shift | 79.41 | Effective combining of movements of limbs | 54.41 |
| | | Thumb-finger touching | 52.94 |
| **Integration** | % | Gross motor | 51.47 |
| Symmetrical movement | 79.41 | | |
| Bilateral arm and leg movements | 76.47 | **Motor Skill** | % |
| Midline crossing | 75.00 | Bat and ball games | 69.12 |
| Effective combining of movements of limbs | 72.06 | Manual dexterity | 60.29 |
| Eats with a knife and fork | 60.29 | Pencil control | 57.35 |
| Reciprocal movements | 58.82 | In-hand manipulation | 54.41 |
| Jumping two feet together | 55.88 | Handwriting | 54.41 |
| Playing hopscotch | 55.88 | Cutting on a straight line | 52.94 |
| Forward rolls | 50.00 | Forward rolls | 52.94 |

phrases above the cut-off, as well as when comparing the associated phrases across the other components.

Due to the low frequency representation of phrases in the other components, the cut-off was lowered in order to include enough phrases for the next phase of the Delphi Technique. This indicates that the terms "integration of movement", "poor integration of movement", "sequencing of movements", "poor sequencing of movement", "co-ordination", "unco-ordinated movements", "motor skill" and "unskilled motor acts" have less consensus, and thus require further investigation.

This research did not undertake to determine why this is so, as the intention was to determine how therapists use the terms. Possible reasons may be that therapists are required to utilise generic terms when explaining the conditions to their clients or client caregivers, and that poor consistency within current literature exacerbates the problem.

The apparent "looseness" of term usage has significant impact on the professional standing of OTs. While communicating within a multidisciplinary team it is important that the nature of a client's difficulties is effectively and consistently communicated. Clients that seek second opinions should receive consistent information in order to build the profession's reputation among consumers. The professional development of clinical OTs can also be influenced due to misconceptions and misunderstandings born out of poor consistency of term usage.

This study forms the preparation phase to select terms that will be subject to a Delphi Technique to develop consensus in the use of motor terminology. The results of the Delphi techniques will be used in developing a South African assessment of motor performance in children aged five years to years years 11 months. The results of this phase will be presented to a group of experienced paediatric OTs working with children who have learning difficulties. They will be required to rate the strength of a phrase within a component, define each component, indicate the pertinence of each component, and give their opinion on the aspects of the components that overlap. This phase will then be analysed and presented to a focus group for final consensus. The results of the study also aim to form a framework of motor terminology for use among South African paediatric OTs who work with children who have learning difficulties.

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**Table II**
**>50 percent frequency of phrases in the dysfunction components**

| **Dyspraxia** | % | **Poor Postural Control** | % |
|---|---|---|---|
| Slow to learn a motor skill | 86.76 | Floppy | 98.53 |
| Trial and error approach to tasks performance | 83.82 | Hook feet around chair legs | 95.59 |
| Needs lots of practice | 76.47 | Fatigues easily | 94.12 |
| Poor anticipation of motor responses | 73.53 | Rest head on hand | 92.65 |
| Puts on shirt before vest | 70.59 | Low tone | 92.65 |
| Uses splinter skills | 64.71 | Neck hyperextension in sitting | 92.65 |
| Crossing out often in writing | 63.24 | Fixation | 91.18 |
| Clumsiness / accident prone | 63.24 | W-sitting on the floor | 91.18 |
| Hesitates between movements | 61.46 | Excessive body adjustments in sitting | 89.71 |
| Awkward | 58.82 | Poor equilibrium reactions | 86.76 |
| Lack of timing in action | 58.82 | Increased pencil pressure | 80.88 |
| Delayed reaction time | 55.88 | Anterior pelvic tilt | 79.41 |
| Misjudging a movement | 54.41 | Flexed sitting | 76.47 |
| | | Clumsiness / accident prone | 66.18 |
| **Poor Co-ordination** | | Exaggerated movements | 57.35 |
| Over-shoot the outline in colouring in | 89.71 | Poor control of movement force | 55.88 |
| Poor tracing skills | 69.12 | | |
| Shaky drawing | 69.12 | **Poor Sequencing of Movement** | |
| Misses the target in throwing | 69.12 | Miss times clapping patterns | 79.41 |
| Clumsiness / accident prone | 61.46 | Hesitates between movements | 67.65 |
| Poor movement accuracy | 60.29 | Puts on shirt before vest | 55.88 |
| Awkward | 55.88 | Dysdiadokokinesis | 55.88 |
| Intention tremor | 52.94 | Lack of timing in action | 54.47 |
| Tends to drop objects | 51.47 | Looses place in a task | 52.94 |
| | | | |
| **Poor Integration of movements** | | **Poor Motor Skills** | |
| Poor stabilising use of non-dominant hand | 69.12 | *None* | |


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# APPENDIX B Ethical Clearance Certificate

**UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG**

Division of the Deputy Registrar (Research)

**COMMITTEE FOR RESEARCH ON HUMAN SUBJECTS (MEDICAL)**
Ref: R14/49 Barnard

**CLEARANCE CERTIFICATE** **PROTOCOL NUMBER** M01-06-04

**PROJECT** Development of A Standard Assessment Of Motor Performance In 5 To 9 Year Old South African Children

**INVESTIGATORS** Miss P Barnard

**DEPARTMENT** School of Therapeutic Sci, Johannesburg Hospital

**DATE CONSIDERED** 01-06-15

**DECISION OF THE COMMITTEE** *

Approved unconditionally

**DATE** 01-06-27 **CHAIRMAN**.................................................(Professor P E Cleaton-Jones)

* Guidelines for written "informed consent" attached where applicable.

c c Supervisor: Prof M Concha
Dept of School of Therapeutic Sci, Johannesburg Hospital

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**DECLARATION OF INVESTIGATOR(S)**

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10001, 10th Floor, Senate House, University.

I/we fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

# APPENDIX C1 Delphi A: Term Clarification Survey

Department of Occupational Therapy

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

7 York Road, Parktown, 2193 South Africa • Telegrams 'Witsmed' • Telephone (011) 717-3701 • Fax 717-3709

Dear Paediatric occupational therapist

My name is Paula Barnard. I am a sensory integration trained occupational therapist, and am currently lecturing in paediatric occupational therapy at the University of the Witwatersrand.

I am developing a model of motor component characteristics, specifically of the following components: praxis, postural control, integration of movements, sequencing of movements, co-ordination and motor skill. This model is focussing on the motor output and is excluding the effects of sensory input. It aims to consider development of motor performance and will thus not consider disorders related to upper motor neuron lesions. This model is to form the basis for the development of a motor assessment for South African children.

Please complete the survey if you are practising in the paediatric field.

Participation in this survey is voluntary and you will in no way be negatively influenced if you choose not to participate. The survey is anonymous and consent to participation is indicated by your completion and return of this survey questionnaire to me at the above details. Please endeavour to return the survey within two weeks of receiving it. Should you wish to receive this survey via email please contact me on: barnardpm@therapy.wits.ac.za

Please include your address if you would be willing to participate in further stages of this study. This would involve follow up questionnaires, possible observation of the test items for evaluation of the items, and finally possible referral of current clients for assessment on the battery.

Thank you for taking the time to read this letter and your participation is greatly appreciated.

Yours truly,

PBarnard

Paula Barnard
BSc (OT) Wits

**TERM CLARIFICATION SURVEY**

| Ref. No. |
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**PERSONAL DETAILS (OPTIONAL if willing to participate in the follow up stages of the study)**
Postal Address: ______________________________________________
______________________________________________________________

**BIOGRAPHICAL DETAILS**

Please complete this section as it allows the researcher to understand your responses in terms of your experience. Please feel free to indicate more than one answer to a question

What are your current areas of paediatric practice?

- ☐ Perception
- ☐ Developmental delay
- ☐ Neurodevelopment
- ☐ Sensory integration
- ☐ Physical (burns, orthopaedics)
- ☐ Other ______________________________

In what type of facilities are you currently working?

- ☐ Private practice
- ☐ Remedial school
- ☐ Special education school
- ☐ Hospital
- ☐ Other ______________________________

In which province do you practice? ______________________________

How many years have you been working in Paediatrics? ____________________

Postgraduate qualifications

- ☐ None
- ☐ NDT
- ☐ Sensory Integration
- ☐ Advanced Diploma in ______________________________
- ☐ MSc. (OT) in ______________________________
- ☐ Other ______________________________

I indicate my agreement to participate in this anonymous survey by completing the survey questionnaire.

Thank you for participating in this study!!

In completing this questionnaire, please use your own interpretation and understanding of these terms. This study wishes to look a current practice terminology use and not at the literature. Please do not consult the literature in completing this questionnaire. There are no correct or incorrect answers!!

The following table is a list of characteristics of movement. Please place the number allocated to each characteristic under **one or more** of the headings on the next page. This is to indicate which characteristics of movement ***you feel*** are strong indicators of function or dysfunction. Please note that all the left side headings are function based and the right side headings are dysfunction based.

| | | |
|---|---|---|
| 1. smoothness of movement | 31. playing hopscotch | 61. prefers to sketch rather than draw a solid line |
| 2. poor stabilising use of non-dominant hand | 32. hand-hand | 62. lack of timing in action |
| 3. clumsinees / accident prone | 33. co-contraction | 63. cutting on a straight line |
| 4. hesitates between movements | 34. excessive body adjustments in sitting | 64. bat and ball games |
| 5. goal directed actions | 35. crossing out often in writing | 65. exaggerated movements |
| 6. needs lots of practice | 36. trial and error approach to tasks performance | 66.shaky drawing |
| 7. rest head on hand | 37. tends to do things too fast | 67. involuntary movements |
| 8. awkward | 38. fixation | 68. delayed reaction time |
| 9. over-shoot the outline in colouring in | 39. tight pencil grip | 69. reciprocal movements |
| 10. hook feet around chair legs | 40. eye-hand-foot | 70. poor control of movement force |
| 11. effective combining of movements of limbs | 41. copying a movement | 71. neck hyperextension in sitting |
| 12. manual dexterity | 42. looses place in a task | 72. increased pencil pressure |
| 13. repeated motor acts | 43. symmetrical movement | 73. anterior pelvic tilt |
| 14. misjudging a movement | 44. gross motor | 74. automatic movement |
| 15. in-hand manipulation | 45. dissociation of arm movements | 75. poor movement accuracy |
| 16. motor planning | 46. slow to learn a motor skill | 76. tends to drop objects |
| 17. floppy | 47. motor engrams formation | 77. forward rolls |
| 18. pencil control | 48. puts on shirt before vest | 78. jumping two feet together |
| 19. rhythm | 49. eats with a knife and fork | 79. flexed sitting |
| 20. uses splinter skills | 50. dysdiadokokinesis | 80. brainstem reflex integration |
| 21. bilateral arm and leg movements | 51. stability | 81. W-sitting on the floor |
| 22. fatigues easily | 52. poor anticipation of motor responses | 82. construction |
| 23. poor equilibrium reactions | 53. initiates movement easily | 83. dynamic balance on beam |
| 24. imitation of movements | 54. quality of motor act | 84. development of preferred hand |
| 25. intention tremor | 55. movements in an order | 85. weight shift |
| 26. thumb-finger touching | 56. poor tracing skills | 86. over use of tactile feedback |
| 27. miss times clapping patterns | 57. finger isolation | 87. body scheme |
| 28. eye-hand | 58. handwriting | 88. pumping a swing to move |
| 29. projected actions sequences | 59. low tone | 89. tie a bow behind back |
| 30. midline crossing | 60. conceptualisation of a movement | 90. misses the target in throwing |

**PRAXIS**

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**POSTURAL CONTROL**

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**INTEGRATION OF MOVEMENTS**

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**SEQUENCING OF MOVEMENTS**

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**CO-ORDINATED MOVEMENT**

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**MOTOR SKILL**

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**DYSPRAXIA**

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**POOR POSTURAL CONTROL**

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**POOR INTEGRATION OF MOVEMENTS**

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**POOR SEQUENCING OF MOVEMENTS**

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**UNCO-ORDINATED MOVEMENT**

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**UNSKILLED MOTOR ACTS**

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**Please answer the following questions (optional)**

1. Which type of movement difficulty do you most frequently treat:
   - ☐ Dyspraxia
   - ☐ Poor postural control
   - ☐ Poor integration of movements
   - ☐ Poor sequencing of movements
   - ☐ Uncoordinated movement
   - ☐ Unskilled motor acts
   - ☐ Other: ______________________________

2. Are there any types of movement difficulty, which you feel is not covered by the above list? (Please identify and describe)

   ______________________________
   ______________________________
   ______________________________

3. Please add any comments which you feel are relevant to the study

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Thank you!

# APPENDIX C2 Results of Delphi A Survey Responses (%)

| Function | praxis | post cont | integ | sequcing | coord | motor skill |
|---|---|---|---|---|---|---|
| 1. smoothness of movement | 35.29 | 38.24 | 48.53 | 35.29 | 67.65 | 27.94 |
| 2. poor stabilising use of non-dominant hand | 0 | 2.94 | 2.94 | 0 | 1.47 | 1.47 |
| 3. clumsiness / accident prone | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 |
| 4. hesitates between movements | 1.47 | 0 | 0 | 0 | 0 | 0 |
| 5. goal directed actions | 80.88 | 7.35 | 23.53 | 23.53 | 20.59 | 39.71 |
| 6. needs lots of practice | 1.47 | 0 | 0 | 1.47 | 1.47 | 4.41 |
| 7. rest head on hand | 0 | 4.41 | 0 | 0 | 0 | 1.47 |
| 8. awkward | 0 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 |
| 9. over-shoot the outline in colouring in | 0 | 0 | 0 | 0 | 1.47 | 1.47 |
| 10. hook feet around chair legs | 1.47 | 2.94 | 0 | 0 | 0 | 1.47 |
| 11. effective combining of movements of limbs | 36.76 | 19.12 | 72.06 | 47.06 | 54.41 | 27.94 |
| 12. manual dexterity | 25 | 10.29 | 27.94 | 11.76 | 61.46 | 60.29 |
| 13. repeated motor acts | 14.71 | 4.41 | 11.76 | 41.18 | 8.82 | 17.65 |
| 14. misjudging a movement | 4.41 | 0 | 0 | 0 | 2.94 | 2.94 |
| 15. in-hand manipulation | 17.65 | 8.82 | 13.24 | 5.88 | 61.46 | 54.41 |
| 16. motor planning | 97.06 | 4.41 | 19.12 | 23.53 | 8.82 | 14.71 |
| 17. floppy | 0 | 4.41 | 0 | 0 | 0 | 1.47 |
| 18. pencil control | 10.29 | 39.71 | 20.59 | 13.24 | 63.24 | 57.35 |
| 19. rhythm | 39.71 | 2.94 | 39.71 | 76.47 | 22.06 | 10.29 |
| 20. uses splinter skills | 4.41 | 2.94 | 0 | 0 | 0 | 2.94 |
| 21. bilateral arm and leg movements | 17.65 | 17.65 | 76.47 | 30.88 | 30.88 | 14.71 |
| 22. fatigues easily | 0 | 2.94 | 0 | 0 | 0 | 0 |
| 23. poor equilibrium reactions | 0 | 1.47 | 0 | 0 | 0 | 1.47 |
| 24. imitation of movements | 82.35 | 2.94 | 10.29 | 22.06 | 1.47 | 8.82 |
| 25. intention tremor | 2.94 | 0 | 1.47 | 1.47 | 5.88 | 1.47 |
| 26. thumb-finger touching | 48.53 | 8.82 | 32.35 | 66.18 | 52.94 | 17.65 |
| 27. miss times clapping patterns | 7.35 | 2.94 | 4.41 | 8.82 | 5.88 | 1.47 |
| 28. eye-hand | 11.76 | 7.35 | 13.24 | 2.94 | 89.71 | 20.59 |
| 29. projected actions sequences | 41.18 | 2.94 | 20.59 | 67.65 | 7.35 | 5.88 |
| 30. midline crossing | 7.35 | 35.29 | 75 | 1.47 | 10.29 | 23.53 |
| 31. playing hopscotch | 52.94 | 30.88 | 55.88 | 60.29 | 22.06 | 47.06 |
| 32. hand-hand | 5.88 | 4.41 | 32.35 | 13.24 | 66.18 | 19.12 |
| 33. co-contraction | 0 | 97.06 | 1.47 | 0 | 2.94 | 10.29 |
| 34. excessive body adjustments in sitting | 0 | 5.88 | 2.94 | 0 | 0 | 1.47 |
| 35. crossing out often in writing | 1.47 | 0 | 0 | 0 | 0 | 0 |
| 36. trial and error approach to tasks performance | 1.47 | 0 | 0 | 0 | 0 | 0 |
| 37. tends to do things too fast | 0 | 1.47 | 0 | 1.47 | 1.47 | 1.47 |
| 38. fixation | 0 | 1.47 | 0 | 0 | 0 | 0 |
| 39. tight pencil grip | 0 | 1.47 | 0 | 0 | 0 | 0 |
| 40. eye-hand-foot | 7.35 | 2.94 | 25 | 16.18 | 85.29 | 33.82 |
| 41. copying a movement | 86.76 | 2.94 | 25 | 33.82 | 7.35 | 14.71 |
| 42. looses place in a task | 0 | 2.94 | 1.47 | 2.94 | 0 | 0 |
| 43. symmetrical movement | 8.82 | 17.65 | 79.41 | 17.65 | 23.53 | 23.53 |
| 44. gross motor | 22.06 | 27.94 | 23.53 | 19.12 | 51.47 | 79.41 |
| 45. dissociation of arm movements | 5.88 | 44.12 | 44.12 | 7.35 | 19.12 | 16.18 |
| 46. slow to learn a motor skill | 2.94 | 0 | 1.47 | 1.47 | 0 | 1.47 |
| 47. motor engrams formation | 54.41 | 2.94 | 17.65 | 10.29 | 4.41 | 25 |
| 48. puts on shirt before vest | 4.41 | 1.47 | 0 | 2.94 | 0 | 0 |
| 49. eats with a knife and fork | 36.76 | 4.41 | 60.29 | 20.59 | 44.12 | 38.24 |
| 50. dysdiadokokinesis | 5.88 | 5.88 | 2.94 | 10.29 | 10.29 | 2.94 |
| 51. stability | 0 | 97.06 | 1.47 | 0 | 1.47 | 4.41 |
| 52. poor anticipation of motor responses | 4.41 | 0 | 1.47 | 1.47 | 0 | 0 |
| 53. initiates movement easily | 67.65 | 16.18 | 23.53 | 20.59 | 13.24 | 23.53 |
| 54. quality of motor act | 33.82 | 30.88 | 20.59 | 8.82 | 38.24 | 50 |
| 55. movements in an order | 27.94 | 0 | 7.35 | 85.29 | 1.47 | 2.94 |
| 56. poor tracing skills | 4.41 | 1.47 | 0 | 1.47 | 1.47 | 2.94 |
| 57. finger isolation | 26.47 | 10.29 | 23.53 | 13.24 | 42.65 | 22.06 |
| 58. handwriting | 39.71 | 39.71 | 33.825 | 36.76 | 57.35 | 54.41 |
| 59. low tone | 1.47 | 8.82 | 0 | 0 | 0 | 0 |
| 60. conceptualisation of a movement | 89.71 | 0 | 5.88 | 2.94 | 2.94 | 5.88 |
| 61. prefers to sketch rather than draw a solid line | 2.94 | 1.47 | 4.41 | 1.47 | 1.47 | 4.41 |
| 62. lack of timing in action | 1.47 | 0 | 1.47 | 1.47 | 0 | 0 |
| 63. cutting on a straight line | 29.41 | 13.24 | 39.71 | 17.65 | 73.53 | 52.94 |
| 64. bat and ball games | 33.82 | 14.71 | 38.24 | 25 | 69.12 | 69.12 |
| 65. exaggerated movements | 1.47 | 1.47 | 0 | 0 | 1.47 | 0 |
| 66.shaky drawing | 1.47 | 0 | 0 | 0 | 0 | 1.47 |
| 67. involuntary movements | 0 | 0 | 0 | 0 | 4.41 | 1.47 |
| 68. delayed reaction time | 0 | 0 | 0 | 0 | 0 | 1.47 |
| 69. reciprocal movements | 10.29 | 4.41 | 58.82 | 41.18 | 19.12 | 11.76 |
| 70. poor control of movement force | 0 | 1.47 | 1.47 | 0 | 1.47 | 0 |
| 71. neck hyperextension in sitting | 0 | 2.94 | 0 | 0 | 0 | 0 |
| 72. increased pencil pressure | 0 | 1.47 | 0 | 0 | 0 | 0 |
| 73. anterior pelvic tilt | 0 | 16.18 | 0 | 0 | 0 | 0 |
| 74. automatic movement | 25 | 19.12 | 35.29 | 8.82 | 10.29 | 26.47 |
| 75. poor movement accuracy | 0 | 0 | 0 | 1.47 | 0 | 1.47 |
| 76. tends to drop objects | 0 | 0 | 0 | 0 | 1.47 | 0 |
| 77. forward rolls | 35.29 | 26.47 | 50 | 41.18 | 13.24 | 52.94 |
| 78. jumping two feet together | 23.53 | 20.59 | 55.88 | 32.35 | 25 | 39.71 |
| 79. flexed sitting | 2.94 | 10.29 | 1.47 | 0 | 0 | 1.47 |
| 80. brainstem reflex integration | 5.88 | 45.59 | 48.53 | 0 | 0 | 10.29 |
| 81. W-sitting on the floor | 0 | 0 | 0 | 0 | 0 | 0 |
| 82. construction | 79.41 | 0 | 8.82 | 14.71 | 23.53 | 26.47 |
| 83. dynamic balance on beam | 11.76 | 79.41 | 29.41 | 11.76 | 17.65 | 44.12 |
| 84. development of preferred hand | 5.88 | 11.76 | 45.59 | 2.94 | 23.53 | 36.76 |
| 85. weight shift | 0 | 79.41 | 23.53 | 1.47 | 2.94 | 7.35 |
| 86. over use of tactile feedback | 1.47 | 0 | 1.47 | 0 | 0 | 0 |
| 87. body scheme | 50 | 23.53 | 27.94 | 10.29 | 10.29 | 22.06 |
| 88. pumping a swing to move | 51.47 | 19.12 | 35.29 | 42.65 | 10.29 | 30.88 |
| 89. tie a bow behind back | 70.59 | 7.35 | 36.76 | 38.24 | 27.94 | 33.82 |
| 90. misses the target in throwing | 2.94 | 1.47 | 1.47 | 2.94 | 5.88 | 2.94 |

**Dysfunction**

| | Dyspraxia | Poor PC | Integrat | Seqcing | Coord | Motor skill |
|---|---|---|---|---|---|---|
| 1. smoothness of movement | 2.94 | 5.88 | 1.47 | 1.47 | 1.47 | 1.47 |
| 2. poor stabilising use of non-dominant hand | 11.76 | 25 | 69.12 | 1.47 | 13.24 | 20.59 |
| 3. clumsiness / accident prone | 63.24 | 66.18 | 30.88 | 22.06 | 61.46 | 41.18 |
| 4. hesitates between movements | 61.46 | 5.88 | 33.82 | 67.65 | 11.76 | 14.71 |
| 5. goal directed actions | 1.47 | 0 | 0 | 0 | 0 | 1.47 |
| 6. needs lots of practice | 76.47 | 5.88 | 32.35 | 30.88 | 19.12 | 38.24 |
| 7. rest head on hand | 0 | 92.65 | 4.41 | 0 | 1.47 | 1.47 |
| 8. awkward | 58.82 | 27.94 | 30.88 | 25 | 55.88 | 35.29 |
| 9. over-shoot the outline in colouring in | 20.59 | 25 | 19.12 | 5.88 | 89.71 | 48.53 |
| 10. hook feet around chair legs | 0 | 95.59 | 4.41 | 0 | 1.47 | 1.47 |
| 11. effective combining of movements of limbs | 4.41 | 0 | 5.88 | 4.41 | 1.47 | 1.47 |
| 12. manual dexterity | 1.47 | 0 | 1.47 | 0 | 1.47 | 0 |
| 13. repeated motor acts | 16.18 | 0 | 4.41 | 17.65 | 1.47 | 10.29 |
| 14. misjudging a movement | 54.41 | 8.82 | 33.82 | 19.12 | 41.18 | 20.59 |
| 15. in-hand manipulation | 0 | 1.47 | 2.94 | 1.47 | 8.82 | 2.94 |
| 16. motor planning | 4.41 | 0 | 0 | 1.47 | 0 | 0 |
| 17. floppy | 1.47 | 98.53 | 1.47 | 0 | 5.88 | 8.82 |
| 18. pencil control | 1.47 | 1.47 | 0 | 0 | 2.94 | 2.94 |
| 19. rhythm | 2.94 | 0 | 1.47 | 4.41 | 0 | 1.47 |
| 20. uses splinter skills | 64.71 | 7.35 | 30.88 | 11.76 | 19.12 | 29.41 |
| 21. bilateral arm and leg movements | 1.47 | 0 | 1.47 | 1.47 | 1.47 | 0 |
| 22. fatigues easily | 2.94 | 94.12 | 4.41 | 0 | 4.41 | 10.29 |
| 23. poor equilibrium reactions | 2.94 | 86.76 | 29.41 | 1.47 | 8.82 | 23.53 |
| 24. imitation of movements | 7.35 | 0 | 1.47 | 2.94 | 0 | 1.47 |
| 25. intention tremor | 4.41 | 26.47 | 11.76 | 2.94 | 52.94 | 19.12 |
| 26. thumb-finger touching | 2.94 | 0 | 1.47 | 1.47 | 2.94 | 1.47 |
| 27. miss times clapping patterns | 32.35 | 0 | 30.88 | 79.41 | 11.76 | 4.41 |
| 28. eye-hand | 0 | 0 | 0 | 0 | 2.94 | 0 |
| 29. projected actions sequences | 2.94 | 0 | 2.94 | 2.94 | 0 | 0 |
| 30. midline crossing | 0 | 2.94 | 1.47 | 0 | 1.47 | 0 |
| 31. playing hopscotch | 1.47 | 0 | 0 | 1.47 | 1.47 | 1.47 |
| 32. hand-hand | 0 | 0 | 0 | 1.47 | 2.94 | 1.47 |
| 33. co-contraction | 0 | 2.94 | 0 | 0 | 0 | 0 |
| 34. excessive body adjustments in sitting | 0 | 89.71 | 13.24 | 1.47 | 1.47 | 8.82 |
| 35. crossing out often in writing | 63.24 | 4.41 | 7.35 | 20.59 | 30.88 | 22.06 |
| 36. trial and error approach to tasks performance | 83.82 | 0 | 16.18 | 11.76 | 5.88 | 19.12 |
| 37. tends to do things too fast | 19.12 | 45.59 | 30.88 | 14.71 | 25 | 29.41 |
| 38. fixation | 0 | 91.18 | 4.41 | 2.94 | 10.29 | 8.82 |
| 39. tight pencil grip | 8.82 | 80.88 | 5.88 | 1.47 | 29.41 | 26.47 |
| 40. eye-hand-foot | 1.47 | 1.47 | 4.41 | 2.94 | 2.94 | 1.47 |
| 41. copying a movement | 2.94 | 0 | 1.47 | 1.47 | 0 | 1.47 |
| 42. looses place in a task | 25 | 2.94 | 17.65 | 52.94 | 5.88 | 2.94 |
| 43. symmetrical movement | 0 | 0 | 0 | 1.47 | 1.47 | 1.47 |
| 44. gross motor | 1.47 | 1.47 | 0 | 0 | 1.47 | 1.47 |
| 45. dissociation of arm movements | 1.47 | 2.94 | 5.88 | 0 | 0 | 0 |
| 46. slow to learn a motor skill | 86.76 | 7.35 | 30.88 | 26.47 | 13.24 | 25 |
| 47. motor engrams formation | 1.47 | 0 | 0 | 1.47 | 0 | 0 |
| 48. puts on shirt before vest | 70.59 | 0 | 0 | 55.88 | 0 | 1.47 |
| 49. eats with a knife and fork | 1.47 | 0 | 0 | 1.47 | 1.47 | 1.47 |
| 50. dysdiadokokinesis | 45.59 | 17.65 | 44.12 | 55.88 | 32.35 | 16.18 |
| 51. stability | 0 | 2.94 | 0 | 0 | 0 | 0 |
| 52. poor anticipation of motor responses | 73.53 | 5.88 | 27.94 | 30.88 | 8.82 | 13.24 |
| 53. initiates movement easily | 0 | 0 | 1.47 | 1.47 | 1.47 | 1.47 |
| 54. quality of motor act | 2.94 | 0 | 0 | 0 | 1.47 | 1.47 |
| 55. movements in an order | 1.47 | 0 | 0 | 1.47 | 0 | 0 |
| 56. poor tracing skills | 32.35 | 13.24 | 11.76 | 10.27 | 69.12 | 36.76 |
| 57. finger isolation | 1.47 | 0 | 1.47 | 0 | 0 | 0 |
| 58. handwriting | 2.94 | 1.47 | 1.47 | 1.47 | 2.94 | 2.94 |
| 59. low tone | 0 | 92.65 | 2.94 | 0 | 11.76 | 14.71 |
| 60. conceptualisation of a movement | 4.41 | 0 | 0 | 1.47 | 0 | 0.47 |
| 61. prefers to sketch rather than draw a solid line | 16.18 | 19.12 | 13.24 | 5.88 | 39.71 | 22.06 |
| 62. lack of timing in action | 58.82 | 2.94 | 29.41 | 54.47 | 20.59 | 8.82 |
| 63. cutting on a straight line | 1.47 | 0 | 1.47 | 0 | 2.94 | 1.47 |
| 64. bat and ball games | 0 | 0 | 1.47 | 0 | 1.47 | 1.47 |
| 65. exaggerated movements | 25 | 57.35 | 30.88 | 8.82 | 33.82 | 23.53 |
| 66.shaky drawing | 13.24 | 41.18 | 10.29 | 1.47 | 69.12 | 25 |
| 67. involuntary movements | 8.82 | 32.35 | 26.47 | 1.47 | 33.82 | 13.24 |
| 68. delayed reaction time | 55.88 | 8.82 | 27.94 | 32.35 | 17.65 | 17.65 |
| 69. reciprocal movements | 1.47 | 0 | 1.47 | 1.47 | 0 | 2.94 |
| 70. poor control of movement force | 30.88 | 55.88 | 29.41 | 4.41 | 22.06 | 16.18 |
| 71. neck hyperextension in sitting | 0 | 92.65 | 5.88 | 0 | 2.94 | 4.41 |
| 72. increased pencil pressure | 5.88 | 80.88 | 11.76 | 0 | 30.88 | 14.71 |
| 73. anterior pelvic tilt | 0 | 79.41 | 2.94 | 0 | 0 | 1.47 |
| 74. automatic movement | 0 | 2.94 | 5.88 | 0 | 2.94 | 2.94 |
| 75. poor movement accuracy | 35.29 | 20.59 | 33.82 | 17.65 | 60.29 | 39.71 |
| 76. tends to drop objects | 16.18 | 33.82 | 16.18 | 2.94 | 51.47 | 32.35 |
| 77. forward rolls | 1.47 | 0 | 1.47 | 1.47 | 1.47 | 1.47 |
| 78. jumping two feet together | 0 | 1.47 | 1.47 | 1.47 | 0 | 0 |
| 79. flexed sitting | 0 | 76.47 | 2.94 | 0 | 0 | 2.94 |
| 80. brainstem reflex integration | 0 | 4.41 | 1.47 | 0 | 1.47 | 2.94 |
| 81. W-sitting on the floor | 0 | 91.18 | 2.94 | 0 | 0 | 7.35 |
| 82. construction | 2.94 | 0 | 0 | 0 | 0 | 0 |
| 83. dynamic balance on beam | 0 | 0 | 0 | 0 | 1.47 | 1.47 |
| 84. development of preferred hand | 0 | 0 | 0 | 0 | 0 | 1.47 |
| 85. weight shift | 0 | 8.82 | 1.47 | 0 | 0 | 1.47 |
| 86. over use of tactile feedback | 38.24 | 14.71 | 25 | 0 | 14.71 | 16.18 |
| 87. body scheme | 0 | 0 | 0 | 0 | 1.47 | 1.47 |
| 88. pumping a swing to move | 2.94 | 1.47 | 2.94 | 1.47 | 1.47 | 2.94 |
| 89. tie a bow behind back | 1.47 | 0 | 0 | 1.47 | 1.47 | 0 |
| 90. misses the target in throwing | 35.29 | 8.82 | 22.06 | 23.53 | 69.12 | 42.65 |

# APPENDIX D  Delphi B: Term Clarification Questionnaire

Dear Paediatric occupational therapist

My name is Paula Barnard. I am a sensory integration trained occupational therapist, and am currently lecturing in paediatric occupational therapy at the University of the Witwatersrand.

I am developing a model of the motor component characteristics, focussing on motor output and excluding the effect of sensory input. It aims to consider the development of motor performance and will thus not consider disorders related to upper motor neurone lesions. This model is to form the basis for the development of a motor assessment for South African children from 5 years to 9 years old.

The development of this model is being done through a Delphi Technique of attaining consensus of term usage. Stage one surveyed the general population of paediatric occupational therapists for their views on term usage. In stage two the results of stage one are presented to a panel of experts in the field. The results of stage two will be presented to a focus group for discussion and reaching consensus.

Thank you for participating in stage one of this study. You have been randomly selected from the returns of the previous stage, based on your level of experience, to participate in stage 2. In this stage the results of the previous stage have been correlated to form a new questionnaire. This questionnaire serves to clarify the results and expand on them. The questionnaire has been distributed to 20 expert paediatric occupational therapists like yourself.

Agreement to participate in this part of the research is indicated by your completion of the questionnaire. Your responses will be kept confidential. Application for CPD point accreditation has been made. Should you choose not to participate in this stage you will in no way be negatively influenced.

Thank you for taking the time to read this letter and your participation would be greatly appreciated.

Yours truly,

Paula Barnard
BSc (OT) Wits

**TERM CLARIFICATION QUESTIONAIRE**
**DELPHI STAGE 2**

**Biographical Details**

Name:________________________________________

HPCSA Number: __________________________________

Postal Address:__________________________________

Brief academic background:

Brief clinical background:

Would you be willing to attend a focus group as the third stage of the Delphi Technique? This would be 1 – 2 mornings (non-concurrent) and would be CPD accredited. ☐ Yes ☐ No

If yes – Contact telephone numbers: ______________________

Please complete the following rating scales and questions based on your knowledge and experience. There is no right or wrong answer!

The rating scale is:

1 = extremely poor indicator
2 =very poor indicator
3 = poor indicator
4 = below average indicator
**5 = average indicator**
6 = above average indicator
7 = good indicator
8 = very good indicator
9 = extremely good indicator

This is not a prioritisation. Please view each characteristic individually in terms of the movement component. (ie there can be 3-4 items that score 8)

Please note that the role of sensory function and integration is not within the scope of this study, though the researcher acknowledges the impact that it has on motor function.

## A. COMPONENTS OF MOTOR FUNCTION

Please rate each characteristic of movement for it strength of indicating this component of motor function.

**PRAXIS**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Goal directed action | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Motor planning | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Imitation of movements | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Playing hopscotch | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Motor engrams formation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Initiates movement easily | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Conceptualisation of a movement | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Construction | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Good timing in action | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Copying a movement | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Pumping a swing to move | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Tie a bow behind back | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Quick to learn an action | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Anticipates motor responses | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Good reaction time | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **praxis** (in your own worlds)

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Please make additional comments regarding **praxis** and its characteristics:

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**POSTURAL CONTROL**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Co-contraction | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Stability | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Dynamic balance on a beam | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Weight-shift | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Equilibrium reactions | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Postural background movements | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Normal tone | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Control of movement force | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Upright sitting posture | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **postural control** (in your own worlds)

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Please make additional comments regarding **postural control** and its characteristics:

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**INTEGRATION OF MOVEMENTS**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Effective combining of movement of limbs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Bilateral arm and leg movements | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Midline crossing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Playing hopscotch | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Symmetrical movement | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Eats with a knife and fork | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Reciprocal movement | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Jumping two feet together | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Stabilising use of non-dominant hand | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **integration of movements** (in your own worlds)

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Please make additional comments regarding **integration of movements** and its characteristics:

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**SEQUENCING OF MOVEMENTS**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Rhythm | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Thumb-finger touching | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Good timing in action | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Diadokokinesis | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Projected action sequences | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Playing hopscotch | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Movements in an order | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Timing of clapping patterns | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Smooth transition between movements | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **sequencing of movement** (in your own worlds)

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Please make additional comments regarding **sequencing of movement** and its characteristics:

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**CO-ORDINATION**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Smoothness of movement | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Effective combining of movements of limbs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Manual dexterity | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| In-hand manipulation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Pencil control | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Thumb-finger touching | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Eye-hand | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Hand-hand | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Eye-hand-foot | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Gross motor | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Handwriting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Cutting on a straight line | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Bat and ball games | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Tracing skills | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Smooth drawing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Movement accuracy | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Accurate target throwing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **co-ordination** (in your own worlds)

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Please make additional comments regarding **co-ordination** and its characteristics:

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**MOTOR SKILL**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Manual dexterity | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| In-hand manipulation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Pencil control | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Gross motor | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Handwriting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Cutting on a straight line | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Bat and ball games | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Forward rolls | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **motor skill** (in your own worlds)

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Please make additional comments regarding **motor skill** and its characteristics:

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## B. COMPONENTS OF MOTOR DYSFUNCTION

Please rate each characteristic of movement for it strength of indicating this component of motor dysfunction.

**DYSPRAXIA**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Clumsiness / accident prone | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor motor planning | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Hesitates between movements | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Awkward | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor motor engrams formation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Difficulty initiating movement | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Misjudging a movement | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Uses splinter skills | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Trial and error approach to task performance | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Puts on shirt before vest | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Pumping a swing to move | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Lack of timing in action | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Slow to learn a motor skill | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor anticipation of motor responses | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Delayed reaction time | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **dyspraxia** (in your own worlds)

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______________________________________________

Please make additional comments regarding **dyspraxia** and its characteristics:

________________________________________
________________________________________
________________________________________
________________________________________

**POOR POSTURAL CONTROL**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Clumsiness / accident prone | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Instability | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Rests head on hand | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor weight-shift | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Floppy | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Fatigues easily | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Excessive body adjustments in sitting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor equilibrium reactions | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Hooks feet around chair legs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Low tone | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor control of movement force | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Flexed sitting posture | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Fixation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Tight pencil grip | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Exaggerated movements | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Neck hyperextension in sitting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Increased pencil pressure | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Anterior pelvic tilt | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| W-sitting on the floor | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **poor postural control** (in your own worlds)

________________________________________
________________________________________
________________________________________
________________________________________

Please make additional comments regarding **poor postural control** and its characteristics:

________________________________________
________________________________________
________________________________________
________________________________________

**POOR INTEGRATION OF MOVEMENTS**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ineffective combining of movement of limbs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor bilateral arm and leg movements | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor midline crossing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Difficulty jumping with two feet together | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor stabilising use of non-dominant hand | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **poor integration of movements** (in your own worlds)

________________________________________
________________________________________
________________________________________
________________________________________

Please make additional comments regarding **poor integration of movements** and its characteristics:

________________________________________
________________________________________
________________________________________
________________________________________

**POOR SEQUENCING OF MOVEMENTS**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Hesitates between movements | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Looses place in a task | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Lack of timing in action | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| dysdiadokokinesis | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Puts on shirt before vest | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Miss times clapping patterns | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **poor sequencing of movement** (in your own worlds)

________________________________________
________________________________________
________________________________________
________________________________________

Please make additional comments regarding **poor sequencing of movement** and its characteristics:

________________________________________
________________________________________
________________________________________
________________________________________

**POOR CO-ORDINATION**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Clumsiness / accident prone | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Ineffective combining of movements of limbs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor manual dexterity | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Overshoot the outline in colouring in | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor pencil control | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor thumb-finger touching | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor eye-hand | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor gross motor | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Untidy handwriting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Difficulty cutting on a straight line | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Intention tremor | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor tracing skills | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Shaky drawing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor movement accuracy | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Tends to drop objects | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Misses the target in throwing | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **poor co-ordination** (in your own worlds)

________________________________________
________________________________________
________________________________________
________________________________________

Please make additional comments regarding **poor co-ordination** and its characteristics:

**POOR MOTOR SKILLS**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Poor manual dexterity | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor in-hand manipulation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Poor pencil control | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Below average gross motor | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Untidy handwriting | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Difficulty cutting on a straight line | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Please define **poor motor skill** (in your own worlds)

Please make additional comments regarding **poor motor skill** and its characteristics:

## C. COMPONENT CONFUSION

1. The term "playing hopscotch" reached significance in *praxis, integration of movements*, and *sequencing of movements*. Describe how you view this characteristic in each.

2. The terms "lack of timing in action", "hesitates between movements" and "puts on shirt before vest" reached significance in *dyspraxia* and *poor sequencing of movements*. Describe how you view these characteristics in each.

3. The term "clumsiness / accident-prone" reached significance in *dyspraxia* and *poor co-ordination*. Describe how you view this characteristic in each.

4. The terms "manual dexterity", "in-hand manipulation", "pencil control", "gross motor", "handwriting", "cutting on a straight line", and "bat and ball games" reached significance in *co-ordination* and *motor skills*. Describe how you view these characteristics in each.

5. How do you interpret the term "motor control"?

6. How do you view the impact of concentration on movement?

Thank you for your participation in this part of the study. Your knowledgeable input is greatly valued.

## APPENDIX E1 Informed Consent for Card Sort Group

INFORMATION SHEET: RESEARCH CARD SORT GROUP

Dear______________________

My name is Paula Barnard and I am conducting research on the use of motor terminology by South African Therapists. This will be the final phase of my research, in which I require the opinions of experts in the field of paediatric occupational therapy. Your name was included on the list as your level of academic achievement, and your clinical experience meet the criteria, and you may have been involved in earlier phases of this project.

You are invited to attend a focus group. The focus group will be well structured for time efficiency. There will be 2-3 other therapists in the group, all of similar experience. Please do not feel that you will be required to brush up on your knowledge.... The research is about what you use daily in your therapy, the literature has no bearing here.

We request permission to video record and audio-tape the group. This is purely for the purposes of accurately documenting the data, and these tapes will be destroyed after full transcription.

Please return the attached form to confirm your attendance.

In completing the form you agree to attend and participate, and acknowledge that you have been informed about the processes of this research.

My contact number is 082 454-8659, or email: paula.barnard@wits.ac.za

CONSENT FOR CARD SORT GROUP

I ___________________________________, content to attending a card sort group for the purpose of research.

Please mark your preferred group with an X

| | | | |
|---|---|---|---|
| | Monday 28th January<br>Durban – Ingrid<br>18:00 to 20:30 | | Tuesday 29th January<br>Cape Town – Ray-Anne<br>18:00 to 20:30 |
| | Wednesday 30th January<br>Cape Town – Ray-Anne<br>18:00 to 20:30 | | Thursday 31st January<br>Bloemfontein – Corina<br>18:00 to 20:30 |

Name: ________________________________________________________

Tel: (______)___________________ Cell: ____________________________

HPCSA Number: ______________________________________________

Academic qualifications:

______________________________________________________________________

______________________________________________________________________

☐ SI certified ☐ NDT certified

In completing the form you agree to attend and participate, and acknowledge that you have been informed about the processes of this research.

My contact number is 082 454-8659, or email: paula.barnard@wits.ac.za

## APPENDIX E2 Protocol for Card Sort Groups

**<u>Set up:</u>**
All cards were laid out on a large table prior to arrival of therapists. A packet of large white envelopes and a packet of medium brown envelopes were on the table. Some white envelopes were spread on the table.

**<u>Introductions:</u>**
Many of the participants knew each other, but those who didn't were introduced, and most were introduced to the researcher by the hostess. All participants were encouraged to help themselves to something to drink and snack on.

**<u>Instructions:</u>**
Once the group was settled around the table, the researcher would give the following instructions:

"Good evening / *morning* everyone! Thank you for giving up your time to assist in this research project. You are here because you are considered to be an expert in paediatric occupational therapy, with special interest in learning difficulties and developmental delay.

Tonight/*today*, we are going to do an open card sort. On the table there are card with movement related phrases on them. As a group, please sort the cards into meaningful clusters. You can use the large white envelopes to delineate each cluster.

There is no correct or incorrect way to do this, but it should pertain primarily to your experience with children who have learning difficulties and developmental delay. The cards on the table are all phrased in terms of function/*dysfunction*, and should be clustered with this in mind. Please focus on movement and movement related clusters.

I will observe and not participate, but you are free to ask me questions. Groups and clusters may be changed and moved as you progress."

**After the group has completed the initial sort onto white large envelopes:**
The researcher opens the packet of smaller brown envelopes and says:

"Here are some envelopes. If you wish to subdivide any clusters, you may use these to do so".

After the group has sub-divided the clusters as they feel appropriate:
The researcher instructs:

"Now we should label all the envelopes" and using a marker writes a consensual label on each envelope, placing brown envelopes into white ones.

**<u>Other factors</u>**
If asked to assist the researcher answered that it was the groups decision but to focus on movement in children with learning difficulties and developmental delay.
If the researcher noted that the group was deviating from the task, a break or redirection was offered.
If the researcher noted that decisions were not been made consensually, the group was refocused on the need for the cards to be consensually place.

# APPENDIX F Excerpt of Audit Trail

12/3

Meeting with Dee

Histogram of TCQ 1 was discussed.

* Decided to take a 50% cutoff as this indicates a majority and as few items reached significance
  => this may indicate how loosely terms are used in OT's re motor fxn.
  -> less than 33% of items reached 85% significance ∴ brought down to 50%

TCQ2
* Placed those items that could convert easily from function -> dysfunction under both to determine their impact & significance within each.
* Some items reached significance in more than one component ∴ q's about clarity.
* Apply for CPD
* Phone each person to see if will participate before sending.
* Do TCQ2 self to determine ± time for filling in.

Got less qualified therapist to fill in ~~to~~ as a pilot to ensure ease of structure of questions.

Note
Motor skill all items bar 1 were also significant in co-ordination
=> Motor skill global term?

29/4

Meeting c̄ Dee.

* Find proportion of areas of practice from OTASA = More than 10%.
* 20 experts is really the start point of the Delphi as only experts to be included in a (N) Delphi
* Select ± 20 experts.
  => personal phonecall
  => phone universities & ask who their postgrads lecturers are.
  => give them a return date
  get commitment upfront.

Meeting c̄ Dee 30/5

-> paper for congress complete -> submit
-> Buff up for submission to Journal.
-> Write up chapter for MSc on the TCQ component.
-> Experts

| Experts | Phoned 29/5 | Sent | |
|---|---|---|---|
| [redacted] | ✓ | ✓ | |
| [redacted] | ✓ | ✓ | (e) |
| [redacted] | ✓ | ✓ | (e) |
| [redacted] | ✓ | ✓ | |
| [redacted] | week 02/6 | ✓ | (H) |
| [redacted] | ✓ | ✓ | (e) |
| [redacted] | ✓ | ✓ | (H) |
| [redacted] | ✓ | ✓ | |
| [redacted] | ✓ | ✓ | |
| [redacted] | ✓ | ✓ | (e) |
| [redacted] | | ✓ | (e) |
| [redacted] | | ✓ | (f) |
| [redacted] | | ✓ | (f) |
| [redacted] | | ✓ | |

Names blocked out for confidentiality

27/2

Meet c̄ Dee

* Collect one more Delphi 2 so that have 15.
* ~~Co~~ Code the qualitative info from the questionnaires.
* Organise information for focus group preferably in March.

20/4

* Sorted the ratings
* Started the coding for definitions
* Complete all to show Dee on 6th May.

11/6

Continue to sort definition

Focus groups :-

② Confirm sequences under heading.
③ Group information for definitions
~~③ Explore additional~~
① Brainstorm around each heading to see what ~~cateto~~ indicates head..

? Fr[redacted] — video group.
? Wi[redacted] — flip chart + pens → record consensus
? Ka[redacted]
? Sh[redacted]
? In[redacted]er.
? Be[redacted]
? Cl[redacted]

Cape Town ② Function

T[redacted]
L[redacted]
K[redacted]NDT current MSc student
M[redacted]s SI + NDT (lectured for UCT.)
v. cohesive group - all equal participate!

Long "Balance" discussion NB

Across groups
→ look at one word in phrase & make a assumption - then go back and look at whole phrase
→ default back to "movement"

Early division
· Praxis
· Equilib / Postural control
· Bilateral integration

topdown = looking at endproduct
age app
end product
judgement
success

hierarchically.
Hierarchically
Can look at it hierarchically.

executive function group
more cognitive
decisions were based on "developmentally treated first"

→ Praxis
Fine motor
Bilateral
Integration midbrain
↑ Postural

group agreed

Motor Skills "is a" "part task"

# APPENDIX G1 Excerpt of Definitional Audit

This table presents a list of definitions gleaned directly from the literature. As this is an audit of definitions, direct quotes from the sources have been taken in all instances. Quotation marks have thus not been included as all definitions are direct quotes. The first quotes in most instances are taken from Uniform Terminology for Occupational Therapy – Third Edition[19], and Occupational Therapy Practice Framework: Domain and Process[2]. Where the term is not used in either document, the first is then taken from a Sensory Integration source, and thereafter from other theories and practice domains. Words in bold italics at the start of a definition reflect the term defined in that particular text, that the researcher felt was synonymous with the main term being defined. While this is a comprehensive audit, it represents only a few of the available definitions for each term, in order to present the core of definitions available, and in the interests of efficient analysis. There are many other examples of each definition formulated slightly differently, but at least one of each version for a particular term has been included in order to highlight similarities and inconsistencies. In the list (v) refers to verb and (n) refers to noun.

| **Motor Abilities / components needed for skill** | |
|---|---|
| Ability | ▪ Stable, enduring trait that, for the most part, are genetically determined and that underlie individuals' skilled performance.[37] pg 28<br>▪ A component in performing a variety of skills.[36] page 10 |
| Motor ability | ▪ A general trait or capacity of an individual that is related to the performance of a variety of motor skills.[36]page 10 |
| Gross co-ordination | ▪ Using the large muscle groups for controlled, goal directed movements.[19] pg 1053<br>▪ The ability to coordinate the action of several parts of the body while the body is in motion. Fleishman cited in [36] pg260 |
| Coordination (n) | ▪ Relates to using more than one body part to interact with task objects in a manner that supports task performance.[2] pg 621 (this is a paraphrase of Fisher[1])<br>▪ ***Coordinates (v)***: Uses two or more body parts together to stabilize and manipulates task objects during bilateral motor tasks.[2] pg 621 (this is a paraphrase of Fisher[1]) |
| Manipulates (v) | ▪ Uses dextrous grasp-and-release patterns, isolated finger movements and coordinated in-hand manipulation patterns when interacting with task objects.[2] pg 621 (this is a paraphrase of Fisher[1]) |
| Bilateral integration | ▪ Coordinating both body sides during activity.[19] pg 1053<br>▪ The brains function that enables coordination of function of the two sides of the body.[54] |
| Bilateral coordination | ▪ The ability of the two sides to of the body to work together motorically.[54]<br>▪ Refers to the use of two sides of the body, including the trunk[6]<br>▪ ***Bimanual coordination***: Motor skills in which successful performance depends of two arms performing simultaneously.[36]<br>▪ ***Bilateral hand use***: Use of two hands together to accomplish an activity.[50] p290 |
| Sequencing | ▪ Placing information, concepts, and actions in an order.[19] pg 1053<br>▪ The ability to appropriately order a series of actions, an important element of motor planning. This term also is sometimes used to refer to the ability to replicate a series of sensory stimuli in the correct order.[54]<br>▪ Refers specifically to anticipatory projected movement sequences (i.e. the feedforward dependent sequence of movements necessary to get ones limbs to a particular place in time to act.[5] |
| Motor control | ▪ Using the body in functional and versatile movement patterns.[19] pg 1053 |
| Moves (v) | ▪ Pushes, pulls, or drags task objects along a supporting surface.[2] pg 621 (this is a paraphrase of Fisher[1] who also included that it can be along a supporting surface or about a weightbearing axis. ) |
| Transports (v) | ▪ Carries task objects from one place to another while walking, seated in a wheelchair, or using a walker.[2] pg 621 (this is a paraphrase of Fisher[1] pg 118) |
| Lifts (v) | ▪ Raises or hoists task objects, including lifting an object from one place to another, but without ambulating or moving from one place to another.[2] pg 621 (this is a paraphrase of Fisher[1] pg 118) |
| Calibrates (v) | ▪ Regulates or grades the force, speed, and extent of movement when interacting with task objects (e.g., not too much or too little).[2] pg 621 (this is a paraphrase of Fisher[1] pg 118) |
| Grips (v) | ▪ Pinches or grasps task objects with no "grip slips".[2] pg 621 (this is a paraphrase of Fisher[1] p118) |
| Postural control | ▪ Using righting and equilibrium adjustments to maintain balance during functional movements.[19] p1053<br>▪ Postural muscle contractions occur which not only stabilize the individual joints, |

| | |
|---|---|
| | but also may produce subtle movements of the trunk to counterbalance movements of the arms to maintain the body's centre of gravity within the postural base.[68]<br>▪ The body's position in space for the dual purpose of stability and orientation.[68] |
| Posture | ▪ Relates to stabilizing and aligning one's body while moving in relation to task objects with which one must deal.[2] p621 (this is a paraphrase of Fisher[1] p116) |
| Stabilizes | ▪ Maintains trunk control and balance while interacting with task objects such that there is no evidence of transient (i.e. quick passing) propping or lack of balance that affects task performance.[2] p621 (this is a paraphrase of Fisher[1] p116)<br>▪ Steadying ones body and maintaining trunk control and balance. Maintain dynamic postural control during trunk or limb movements used in occupational performance.[1] p116 |
| Co-contraction | ▪ A pattern of activity characterized by the simultaneous contraction of the agonist muscles (i.e., those that produce the action) and the antagonist muscles (i.e., those that oppose the action).[37] p195 |
| Dynamic balance | ▪ Balance in the context of voluntary movement.[5] p477 |
| Praxis | ▪ Conceiving and planning a new motor act in response to an environment demand.[19] p1053 |
| Motor learning | ▪ Changes in internal processes that determine an individual's capacity for producing a motor task. The level of an individual's motor learning improves with practice and is often inferred by observing relatively stable levels of the parson's motor performance.[37] p12 |
| Somatopraxis | ▪ An aspect of praxis that is heavily dependant on somatosensory processing.[54] |
| Fine co-ordination/ dexterity | ▪ Using small muscle groups for controlled movements, particularly for object manipulation.[19] p1053 |
| In-hand manipulation | ▪ Adjustment of an object within the hand after grasp.[50] p290 |
| Manual Dexterity | ▪ When performing a manual task the head, the eyes, the hand and the trunk function as a unit.[11] p123 |
| Reaches | ▪ Extends, moves the arm (and when appropriate, the trunk) to effectively grasp or place the task objects that are out of reach, including skilfully using a reacher to obtain task objects.[2] p621 (this is a paraphrase of Fisher[1] p117)<br>▪ ***Reach***: Movement of the hand to a desired location. Reach is coded for direction and distance in relation to the body scheme; the object's location in relation to a person is important for the action.[5] p479<br>▪ ***Reach***: Movement of the arm and hand for the purpose of contacting an object with the hand.[50] p290 |
| **Sensory Perceptual terms related to motor function** | |
| Body scheme | ▪ Acquiring an internal awareness of the body and the relationship of the body parts to eachother.[19] p1053<br>▪ An unconscious mechanism underlying spatial motor coordination that provides the central nervous system with information about the relationship of the body and it's parts in space.[5] p477<br>▪ An internal representation of the body; the brain's map of body parts and how they interrelate.[54] |
| **Neuromusculoskeletal functions of the body** | |
| Reflex | ▪ Eliciting and involuntary muscle response to sensory input.[19] p1053<br>▪ ***Motor reflex functions***: stretch reflex, asymmetric tonic neck reflex.[2] p625 |
| Range of motion | ▪ Moving body parts through an arc.[19] p1053<br>▪ Passive = mobility of joint functions.[2] p625 |
| Muscle tone | ▪ Demonstrating a degree of tension or resistance in a muscle at rest and in response to stretch.[19] p1053<br>▪ ***Muscle tone functions***: degree of muscle tone (flaccidity, spasticity)[2] p625 |
| Strength (muscle) | ▪ Demonstrating a degree of muscle power when movement is resisted, as with objects or gravity.[19] pg 1053<br>▪ Muscle power functions[2] p652 |
| Endurance | ▪ Sustaining cardiac, pulmonary, and musculoskeletal exertion over time.[19] p1053<br>▪ ***Endures (v)***: Persists and completes the task without obvious evidence if physical fatigue, pausing to rest, or stopping to "catch one's breath".[2] p621 (this is a paraphrase of Fisher[1] p119)<br>▪ Muscle endurance functions.[2] p625 |
| Postural alignment | ▪ Maintaining biomechanical integrity among body parts.[19] p1053<br>▪ ***Aligns***: Maintains an upright sitting or standing position, without evidence of a need to persistently prop during the task performance.[2] p 621<br>▪ ***Aligns***: Maintains vertical alignment of the body. Maintain the even distribution of ones body over ones base of support.[1] p116 |

| Skills and motor performance | |
|---|---|
| Skill | ▪ Small units of performance. Features of what one does.[2] p612<br>▪ ***Performance skills***: Observerable elements of action which have implicit functional purpose.[1] p113<br>▪ Discrete behavioural elements. [1] p113<br>▪ The capacity of producing a performance result with maximum certainty, minimum energy or minimum time; developed as a result of practice.[37]<br>▪ 2 aspects: 1) denotes an action or task that has a specific goal to achieve, using voluntary movement. 2) Indicate the quality of performance, the proficiency adherence to very stringent evaluation criteria.[36] |
| Motor skills | ▪ Skills in moving and interacting with task, objects and environment.[2] p621<br>▪ Observable operations used to move oneself or objects.[1] p113<br>▪ Movement of self or objects through space for the skillful execution of daily life task performance.[1] p116 |
| Mobility | ▪ Relates to moving the entire body or a body part in space as necessary when interacting with a task.[2] p621 (this is a paraphrase of Fisher[1] p117) |
| Walks | ▪ Ambulates on level surfaces and changes direction while walking without shuffling the feet, lurching, instability or using external supports or assistive devises (e.g. cane, walker, wheelchair) during the task performance.[2] p621<br>▪ Ambulating on level surfaces. It includes the ability to turn around and to change direction while walking. Unsteadiness or shuffling, lurching, and ataxia are examples of difficulty in walking. Using a wheelchair or ambulating with an assistive device represent modified methods.[1] p117 |
| Gross motor skills | ▪ Catching, throwing, jumping, kicking, running, hopping, skipping with rope, balancing.[70]<br>▪ Characterized as involving large musculature and a goal where the precision of movement is not as important to the successful execution of the skill as it is for fine motor skills.[36]<br>▪ Fundamental motor skills, such as walking, jumping, throwing, leaping etc., are considered to be gross motor skills.[36] |
| Fine motor skills | ▪ Colouring-in, cutting out , pasting, writing, managing or manipulating puzzles or construction toys.[70]<br>▪ Can be used interchangeably with “hand skills”, “fine motor coordination” and “dexterity”.[50]<br>▪ Skills that require control of the small muscles of the body to achieve the goal of the skill. Generally, these skills involve eye-hand coordination and require a high degree of precision of movement for the performance of the particular skill at a high level of accomplishment. Writing, drawing, sewing and fastening a button are examples of fine motor skills[36] |
| **Motor dysfunction** | |
| Dyspraxia | ▪ A developmental condition in which the ability to plan unfamiliar motor tasks is impaired.[5]<br>▪ A generic term that refers to developmentally based practice disorders with a variety of etiologies.[5]<br>▪ A condition in which the individual has difficulty with praxis. In children, this term is usually used to refer to praxis problems that cannot be accounted for by a medical condition, developmental disability of lack of environmental opportunity.[54] |
| Bilateral integration and sequencing deficits | ▪ A relatively high-level of sensory integrative based dyspraxia characterised by poor bilateral coordination and difficulty with projected action sequences; thought to have its base in poor processing of vestibular and proprioception information.[5] |
| Somatodyspraxia | ▪ A relatively sever form of sensory-integrative-based dyspraxia characterised by difficulty with both easy (feedback-dependant) and more difficult (feedforward-dependant) motor tasks; thought to be based in poor processing of tactile and likely vestibular and proprioceptive sensations.[5]<br>▪ Is characterised by poor tactile and proprioceptive processing as well as poor praxis.[54] |
| Bilateral integration deficits | ▪ The inability to use the two sides of the body together in a co-ordinated manner.[6] |

# APPENDIX G2Literature used for Stage 1: Definitional Audit




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