

Towards a Uniform Taxonomy of Motor Terminology: Stage 2

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ABSTRACT

A uniform taxonomy within occupational therapy has become a recent focus of discussion in the literature. The study reported on in this paper investigated how South African occupational therapists use and understand terms related to motor performance in children with learning difficulties and developmental delay. This article reports on the second stage of a Delphi Technique, in which the information from an initial study was reformulated. Sixteen expert occupational therapists were then surveyed and asked to rate the level of association (weak to strong) of each characteristic of movement to six motor component terms and to define each term in their own words. 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 was still ambiguity and overlap of understanding, which was reflected in a worrying inconsistency of the descriptions of these terms in the literature and how occupational therapists use the terms in clinical practice.

Key words: motor terminology, learning disabilities, motor performance, assessment, paediatric, developmental delay

Introduction

The study reported on in this paper forms the second stage of a project to develop a uniform taxonomy of terminology related to motor performance specific to the occupational therapy treatment of children with learning disabilities and developmental delays. During the first stage of the study, 68 occupational therapists participated in a survey. The participants were required to allocate given characteristics of movement to six motor component terms that were identified from a literature search as being inconsistently and ambiguously used¹. The results of the first survey formed the initial data for the current study in which the Delphi Technique was used.

Almost half of the South African occupational therapists focus their practice domain on treating children with learning difficulties and developmental delay². These therapists commonly work in a multi-disciplinary environment, liaising with parents, teachers, medical specialists, speech therapists, psychologists and physiotherapists regarding the assessment and treatment of clients.

Occupational therapists, working in this field, use motor assessment tools to evaluate the motor skill performance of children in order to provide a targeted therapy regimen that will enhance the child's occupational performance. Children with developmental delays or learning disabilities commonly experience motor performance delays which contribute to their difficulties in all areas of their occupational performance³⁻⁶. Poor motor ability influences the development of academic skills such as writing, cutting^{3,7}, and sitting upright at a desk⁸; self care activities such as brushing teeth and dressing^{3,7,8}; and leisure activities such as playing sport^{7,8}.

The terminology used by occupational therapists to describe these motor abilities or difficulties is often derived from the terminology used in the assessments that occupational therapists use to evaluate their clients' performance, such as the Bruininks-Oseretsky Test of Motor Proficiency^{7,9}, the Movement Assessment Battery for Children^{7,10}, or the Sensory Integration and Praxis Tests¹¹. These terms are used in report writing and communicating the client's strengths and weaknesses. There is poor consistency of terminology in these assessments, which is impacting on the motor terminology used by occupational therapists practising in the field of learning disability and developmental delay. This problem extends further in occupational therapy as noted by Borst and Nelson¹² and Nelson¹³, who focused their research on poor consistency of terminology use in occupational therapy derived from published uniform terminology documents and text books.

Problem statement

An initial investigation, aimed at clarifying the motor terminology used clinically by South African occupational therapists¹, was direct-

ed towards the development of a South African uniform taxonomy of motor function related to learning difficulties and developmental delay. Results of the initial investigation revealed a lack of consistent use of motor related terminology by local paediatric occupational therapists. The lack of uniform terminology was not restricted to South African occupational therapy as 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 1979¹⁴. Three further documents^{15,16} have been published by AOTA, all trying to establish a uniform taxonomy across all areas of occupational therapy. It is limiting to establish a taxonomy across all areas of occupational therapy practice, as the clinical features of the many conditions treated by occupational therapists as well as the treatment methods that are successful, are not interchangeable.

Jennifer Creek 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"¹⁷.

In partial response to this dilemma, this study aimed to build a taxonomy of uniform motor terminology from which to develop research and conceptual structures in the area of paediatric occupational therapy related to learning disability and developmental delay.

Literature review

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)¹⁸, the International Classification of Function, Disability and Health (ICF)¹⁹ and the International Classification of Diseases and Related Health Problems (tenth revision) (ICD-10)²⁰. All three taxonomies aim to provide a globally recognised system for labelling and identifying the various conditions that afflict humans. The ICF is, unlike the DSM IV and the ICD-10 in that it does not focus on medical diseases and disorders, but rather on the nature of healthy functioning and the state of human health²¹. The ICF has been recognised by Haglund and Henriksson²¹ as the system that is most related to the practice of occupational therapy. While the ICF is comprehensive and detailed in breaking down movements into small, measurable activity descriptions and lists body functions, it does not include a classification system to describe the nature and quality of movement needed by occupational therapists to analyse movement difficulties²¹ for accurate assessment and reporting.

AOTA has been striving since the late seventies¹⁴ to develop a document that provides uniform terminology for the occupational therapy profession. AOTA has released four such documents since then through the formation of terminology task forces or committees of occupational therapists from varied areas of practice. They convened with the express purpose of establishing uniform terminology documents resulting in presentation to and acceptance of the documents by the Representative Assembly of the Association^{15,16}. Each document published then replaces its predecessor^{15,16}. The objective of these documents was to provide a generic outline of the occupational therapy domain of concern^{15,16}, 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 in occupational therapy and to other professionals and clients¹⁶.

Borst and Nelson¹² investigated the adoption of the Uniform Terminology for Occupational Therapy – Second Edition, into occupational therapy practice, and found poor agreement between the document categorisation and definitions, and the way in which the 113 sampled occupational therapists used them. They cited possible reasons for the poor consistency of use 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 existence¹². 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 not only to produce a succinct and definitive taxonomy document, which obtains input from the occupational therapists who would use it, but also to plan an implementation and evaluation process to ensure that the document is adopted by the practising occupational therapists¹⁷.

According to Nelson¹³ 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 pointed out that in the **classification** of terms it is:

- Imperative for a term to have a clear rank at a particular hierarchical level, to prevent it from being 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 hierarchy¹³.

The Uniform Terminology for Occupational Therapy – Third Edition (UT-III) was expanded to include occupational contexts, while the motor related terms of the second edition are consistent with those of the third¹⁶. However the definitional and classification errors identified by Nelson¹³ were evident when the motor related terminology of the UT-III¹⁶ were analysed. The source of confusion and inconsistency became evident as the word "controlled" is used in defining terms that include "co-ordination" in the term name. The word "co-ordinating" is then used in defining terms that have either "control" or "integration" in the term name. This *definitional parsimony* error implies that the words "control", "integration" and "co-ordination" can be used interchangeably in describing movement quality.

The UT-III also fails on *classification exhaustiveness* as the only mention of balance occurs in defining "postural control" and yet

static and dynamic balance are motor terms that are incorporated as measurable constructs in most paediatric motor assessments⁹⁻¹¹. It is possibly for these reasons that the AOTA decided to implement a completely new structure and taxonomy with the 2002 "Occupational Therapy Practice Framework: Domain and Process"¹⁵, referred to as "The Framework" in many texts.

"The Framework"¹⁵ 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 Nelson¹³, 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*. Nelson¹³ 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 the Model of Human Occupation (MOHO)²², 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 devices (e.g. cane, walker, wheelchair) during the task performance*"¹⁵. Fischer 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*"²². 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) 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 another²² is unfamiliar to most South African occupational therapists. "Transports" as a motor term has been avoided in local training as there is a majority of second language English speakers and the use of the term would lead to confusion with the conventional sense of vehicular transport.

The creation of confusing new terms and the looseness of motor terminology usage in other texts is highlighted by Exner²³, who noted that the term "hand skills" is used interchangeably with "fine motor co-ordination" and "dexterity".

The literature however does also describe areas of consistent terminology relating to motor performance. The basic biomechanical terms such as "muscle strength", "range of motion" and "muscle tone", are well defined and consistently used. The division of motor ability into "gross motor" and "fine motor" is also consistently used. Such terms were thus not investigated in this study.

Study method: Delphi Technique Stage 2 – Expert Survey

Some of the terms used in the methodology of this study are not commonly used and thus warrant explanation and definition of terms. These are underlined.

- Motor components: refers to the six motor related terms that were investigated in this study (and the dysfunction forms of each) that were noted in the literature to be confusing and ambiguous i.e.: *praxis* (dyspraxia), *postural control* (poor postural control), *sequencing of movement* (poor sequencing of movement), *co-ordination* (poor co-ordination), *integration of movement* (poor integration of movement) and *motor skills* (poor motor skills).

- Characteristics of movement are phrases that were given in stage one of the study, that described movement actions and qualities, such as "handwriting" and "pencil control". These phrases were brought forward from the first stage into the Likert scales used in this study.
- Units of meaning are the phrases that were qualitatively extracted from the respondents' definitions of the motor components in the surveys of this study, such as "practised movements".
- Semantic clusters reflect the qualitative grouping of characteristics of movement and units of meaning according to common meaning.

The Delphi Technique applied in this study was not the conventional technique in which a survey is sent out, the results analysed, the information reformulated, and the revised information resent to the surveyed group for additional comment²⁴⁻²⁶. This cycle is then repeated until consensus is achieved²⁴⁻²⁷. Such research is often subject to attrition and in many cases the repeat process is stopped due to lack of sufficient survey returns rather than due to consensus²⁵. In this study a hybrid of the Delphi Technique was used, which was structured to minimise the drop out while ensuring that consensus was achieved. Two phases for the survey were planned - the first to the general paediatric occupational therapist population, and the second to expert occupational therapists. A Likert scale, like those commonly used in the Delphi Technique, measured the strength of the participants' opinion about the topic²⁶.

The first stage of the Delphi Technique, a survey on term clarification¹, established a set of characteristics of movement which more than 50% of the 68 participating occupational therapists felt pertained to each of six motor components (or the respective dysfunction form of the motor component). The results of this first stage highlighted motor term confusion among occupational therapists practising in the field of learning disabilities and developmental delay¹, demonstrating the need for the second stage to the Delphi Technique.

The research questions for this stage were:

1. How do occupational therapists who are expert in the field of developmental delay and learning disability rate the relevance of the characteristics of movement identified as correlating to each motor component?
2. How do these expert occupational therapists define each of the motor components?

The second stage of the Delphi Technique, reported in this article, used a mixed method, non-experimental survey design. The sample consisted of the 28 occupational therapists that responded to the first stage of the study who met the criteria of postgraduate qualification and more than seven years experience working in the field of developmental delay and learning disability. Sixteen of these expert occupational therapist responded to this stage of the study.

To address the first research question the respondents were required to rate each characteristic of movement within each motor component or its dysfunction form (as identified in the first stage of the study¹) on a nine point Likert scale that ranged from 1 = "extremely poor indicator" to 9 = "extremely good indicator". The data was descriptively analysed yielding quantitative means and standard deviations. The results of each motor component related to function were compared to those of the corresponding dysfunction form of the motor component.

This stage also canvassed the participant's own definition of each of the six motor components and the respective dysfunction form of each motor component. The definitions were qualitatively analysed by extracting units of meaning from each definition (vertical analysis). These units of meaning are phrases used in the definitions that were common among the sample. The semantic clusters were

synthesised by grouping the units of meaning across all the responses regarding each motor component (horizontal analysis) as well as the characteristics of movement from the Likert scales (refer to Table 1). The semantic clusters assisted in the development of key parameters for defining each motor component in the final stage. The units of meaning and characteristics of movement from this stage were placed on cards for the card sort groups, which will form the next stage of the study.

Results and discussion

The Likert Scales

A detailed view of the results for co-ordination and poor co-ordination (refer to Table 1) will be presented in this discussion, as well as a summary of the findings in the other motor components. In the quantitative analysis, the occupational therapists were asked to rate the characteristics of movement that were associated with co-ordination. Figure 1 illustrates that a mean of above 5 on the Likert scale was achieved by all characteristics of movement. This suggests that the sample felt that all the characteristics of movement were associated with co-ordination, which was expected as these were allocated to this motor component by more than 50% of the occupational therapists sampled in the first stage. This consistency, noted across all six motor components, validated the results of the first survey.

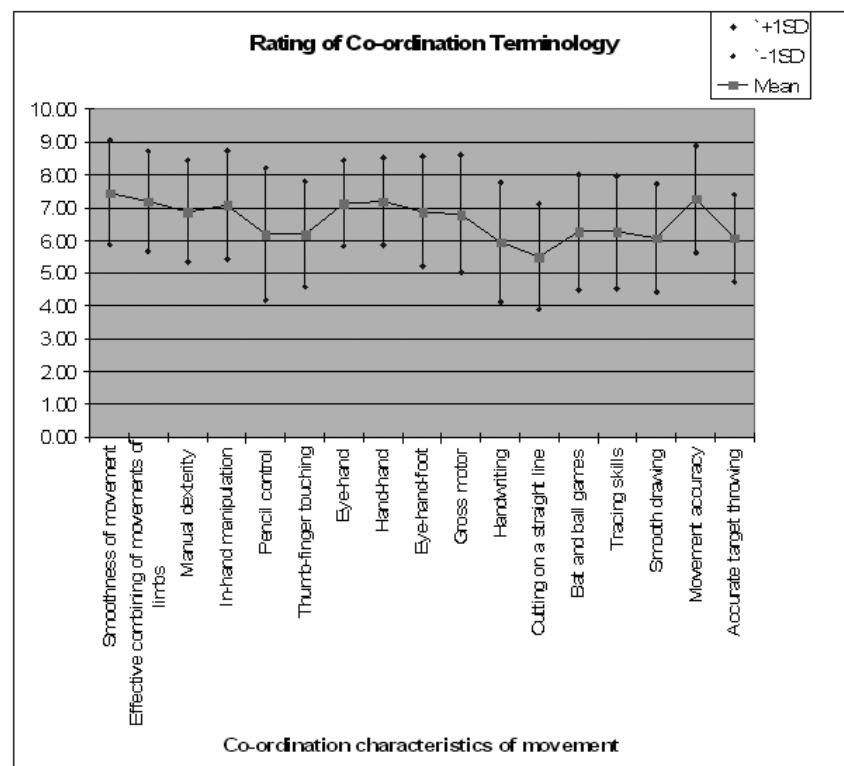


Figure 1: Results indicating Likert scale rating of co-ordination terminology

A higher mean score indicates a stronger association of a particular characteristic of movement to the motor component that is being rated. The smaller the standard deviation, the higher the consensus of the occupational therapists as to how associated the characteristic of movement was to that motor component. There was **strong consensus** ($SD = 1.3$) that "eye-hand" and "hand-hand" are **strongly associated** (mean >7) with co-ordination (Figure 1). Other characteristics of movement with a mean greater than 7, but showing **lower consensus** (larger SD) were "smoothness of movement", "effective combining of movements of the limbs", "in-hand manipulation", and "movement accuracy". Although there was **lower consensus** (larger SD), it should be noted that the means for characteristics of movement which relate to the smooth quality of the movement such as "smoothness of movement" and "movement accuracy" were slightly **higher** than those for characteristics of movement related to using more than

Function: Co-ordination

Semantic Cluster	Units of meaning from Definitions	Characteristics of movement from Likert Scales
QUALITY OF CONTROL	smooth mathematical effortless control of movement fluid / fluent automatic correct pressure correct speed correct force	smoothness of movement
COMBINING MOVEMENTS	co-ordinated movements combine movement patterns movement pattern functions on back ground of stability for distal mobility use of arms and legs move hand, foot or eye in required way more than one body part combine groups of muscles	effective combining of movements of limbs hand-hand eye-hand eye-hand-foot
PLANNING	within time limits feed forward and feedback not motor planning planned practiced movements	
ADAPTABILITY	match requirements of environment	
OUTPUT	gross and fine motor movement look at end product effective execution purposeful output of movement skilled movement sequence	manual dexterity in-hand manipulation gross motor bat and ball games tracing skills pencil control thumb-finger touching smooth drawing accurate target throwing handwriting cutting on a straight line

KEY:

- > 5 therapists cited this in their definition
- 3-5 therapists cited this in their definition
- < 3 therapists cited this in their definition

Dysfunction: Poor co-ordination

Semantic Cluster	Units of meaning from Definitions	Characteristics of movement from Likert Scales
QUALITY OF CONTROL	jerky movement difficulty controlling movement /motor control poor co-ordinated movement poor pressure poor force poor direction poor speed	awkward clumsiness / accident prone intention tremor
ACCURACY	movement accuracy	poor movement accuracy poor performance of movement skills / end products
COMBINING MOVEMENTS	poor combination of eye and hand poor combination of eye and foot poor use of dominant hand with non-dominant hand poor use of more than 1 body part to perform task poor combining groups of muscles for action poor combination between movements poor purposeful combination of movement	poor eye-hand ineffective combining of movements of limbs
TIMING	poor timing	
PLANNING	poor motor response without cognitive aspect of movement seen at start of activity	
EFFICIENCY	poor efficiency of movement	
OUTPUT	poor gross motor movements poor visual regard poor hand function poor use of dominant hand poor team motor skills poor eye convergence	poor gross motor overshoot the outline in colouring in poor manual dexterity poor pencil control poor thumb-finger touching poor tracing skills shaky drawing untidy handwriting difficulty cutting on a straight line misses the target in throwing tends to drop objects
END PRODUCT		end product of poor postural control end product of poor bilateral motor co-ordination end product of poor sequencing end product of poor praxis

Table 1: Horizontal analysis of co-ordination and poor co-ordination motor components

one body part simultaneously in a task such as “eye-hand” and “hand-hand”.

Figure 1 indicates that there was **strong consensus** ($SD = 1.3$) that “accurate target throwing” is **less associated** with *co-ordination* than most of the other *characteristics of movement* (mean = 6.1). “Cutting on a straight line”, “smooth drawing” and “handwriting” were the **lowest associated** ($mean \geq 6.1$) to *co-ordination*, possibly as these could be considered to be *motor skills*.

Similar trends were noted in the other five *motor components*. *Characteristics of movement* with a lower mean, thus **less association** with the *motor component*, also tended to have larger standard deviations, indicating **greater disagreement** among the occupational therapists. The converse was also true. When comparing the function form of the *motor component* to the dysfunction form it was evident that there was also strong consistency between the *characteristics of movement* that were rated as **strongly associated** with the *motor component*, for example: “normal tone (postural)” rated high (mean = 7.3) for the *motor component postural control*, and “low tone” rated high (mean = 7.2) for *poor postural control*.

Some inconsistencies continued to emerge, supporting the need for a further Delphi Technique stage. The literature cites handwriting and cutting with scissors as fine *motor skills*^{28,29}, and actions such as forward-rolls as gross *motor skills*²⁸. These three *characteristics of movement* however were rated lower (mean of 6.5 – 6.6) than *characteristics of movement* identified in the literature as underlying *motor skills development*²⁸, such as “quality of motor act” (mean = 7.1), “in-hand manipulation” (mean = 6.9) and “manual dexterity” (mean = 7.2). The latter *characteristics of movement* are descriptions of the quality of movement used in *motor skills*, whereas afore mentioned *characteristics of movement* are complex actions and thus are more difficult to rate.

Some *characteristics of movement* continue to **rate high** in more than one *motor component*, such as both “in-hand manipulation” and “manual dexterity” rating a mean > 6.8 in both the *motor components of co-ordination* and *motor skills*. Similarly “effective combining of movement of limbs” was **rated high** in *co-ordination* and in *integration of movements*, but “ineffective combining of movement of limbs” was **associated more strongly** with *poor integration of movement* (mean = 7.4) than with *poor co-ordination* (mean = 6.8).

The Occupational Therapists’ Definitions

In defining *co-ordination* and *poor co-ordination*, two general themes emerged from the *semantic clusters* which seem to counter balance each other in meaning as shown in *Table 1*. The first theme related to the accuracy and control of movements indicated by *units of meaning* such as “smooth”, “precise”, “control of movement” for the *motor component co-ordination*, and “awkward”, “jerky movement”, “poor accuracy of movement” for *poor co-ordination*. The second theme to emerge was that of combining movement of body parts such as “move hand, foot or eye in required way” for function, and “poor combining groups of muscles for action” for dysfunction. In occupational therapy the quality of the act is quite different to whether the body parts can work together. The quality of the act seems more related to precision, accuracy and control, whereas the body parts working together seem to pertain more to synchronisation and timing of movement.

There seems to be a “planning” *semantic cluster* that emerged in the definitions for *co-ordination* that was not apparent in the initial survey¹. While none of the *units of meaning* pertaining to “planning” were consistently presented by three or more occupational therapists, it emerged in both the function and dysfunction forms of the *motor component*. There was also some contradiction in that one therapist thought of *co-ordination* as “not motor planning”, while another related it to “planned movement”.

There were *semantic clusters* that emerged in most of the components that were not evident in the initial survey¹, which suggests that the second phase of the Delphi Technique makes a strong contribution to attaining a comprehensive view of occupational therapists understanding and use of motor terms. *Integration of*

movement emerged as having a strong *semantic cluster* for “bilateral action” and “accuracy and control of movements”, the latter being a *semantic cluster* in *co-ordination* and *sequencing of movement* and to a lesser degree in *motor skills*. This implies that either there is an aspect of “accuracy and control of movements” within each of these four *motor components* and it forms a hierarchically lower *motor component*, or that there should be an aspect of each of the four *motor components* that is related to a particular type of “accuracy and control of movements” that may be different from one *motor component* to the next.

Conclusion

The Delphi Technique stage 2 – Expert Survey has assisted in identifying *characteristics of movement* that are strongly related to each of the function and dysfunction forms of the six *motor components* investigated in this study. The initial survey¹ provided a foundation to investigate motor term use, but all the *characteristics of movement* and investigated *motor components* were provided within in the questionnaire. The second stage has allowed the occupational therapists to provide their own definitions; yielding *units of meaning* that are new movement qualities, in doing so *semantic clusters* associated with the *motor component* terms emerged which were not evident after the first stage.

There continues to be inconsistency and overlap between the six *motor component* terms. There is a clear indication that *motor component* terms are used by South African occupational therapists in more than one context with diversity of meaning and varied implications for clinical practice. This continues to impact negatively on the quality of professional communication within occupational therapy as well as between occupational therapists, other professionals and the 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. It is important that a third stage of the Delphi Technique is implemented before the motor taxonomy for occupational therapists working with children with learning disability and developmental delay is finalised, and that an implementation process is planned in order to ensure the adoption of the taxonomy by the South African occupational therapy community.

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