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## **Dyscalculia: A Practitioner's View**

**Clare Trott**

### **Defining Dyscalculia**

DSM-IV (2000) defines Mathematics Disorder as “measured by a standardised test that is given individually, the person's mathematical ability is substantially less than would be expected from the person's age, intelligence and education. This deficiency materially impedes academic achievement or daily living”. From this definition, it follows that a standardised measure of mathematical ability should be undertaken. However, the nature of the ‘mathematical ability’ is absent from this definition. Furthermore, the definition is for “Mathematical Disorder” and this implies a stable cognitive root rather than achievement, which is mastery and subject to education and environment.

An alternative definition comes from The National Numeracy Strategy (DfES, 2001, page 2): "Dyscalculia is a condition that affects the ability to acquire arithmetical skills. Dyscalculic learners may have difficulty understanding simple number concepts, lack an intuitive grasp of numbers, and have problems learning number facts and procedures. Even if they produce a correct answer or use a correct method, they may do so mechanically and without confidence." In this definition, the emphasis is on ‘ability to acquire arithmetical skills’, highlighting acquisition rather than carrying out arithmetic procedures. It is also more detailed as to the nature of the mathematics, in particular the understanding of simple number concepts and a lack of an intuitive grasp of numbers. This places understanding at the core of dyscalculia; “A lack of a true comprehension or understanding of maths will be a key characteristic of dyscalculic people” (Chinn, 2006, page 16).

However, the definition continues by specifying problems learning number facts and procedures. This implies a reliance on rote learning and recall, areas known to be at risk for those with other neurodiverse profiles, especially dyslexia. It is important to make a clear distinction between students whose mathematical difficulties are due to dyslexia or other neurodiversities and those who struggle with mathematics as a result of dyscalculia. Returning to the core issue of the understanding of simple number concepts and a lack of an intuitive grasp of numbers, consideration should be given to how numbers are conceived and this, according to Butterworth (1999), is as a numerosity (a collection of items). Furthermore, an intuitive grasp of number necessitates comparisons of these quantities and an understanding of number relationships and possible inferences.

## DysCalculiUM: A first-line screening tool for dyscalculia

Trott and Beacham (2010) developed the DysCalculiUM first-line screening tool at Loughborough University in order to provide an effective tool to identify those who may be at risk of dyscalculia.

From the beginning of the development, it was crucial that the tool focused on the understanding of the concepts and inter-relationships that are the key element of the definition from The National Numeracy Strategy (DfES, 2001). The screening tool also includes several applications of these key elements, thus helping to identify what is conceptually understood and what can be effectively applied. The model is given in figure 1.

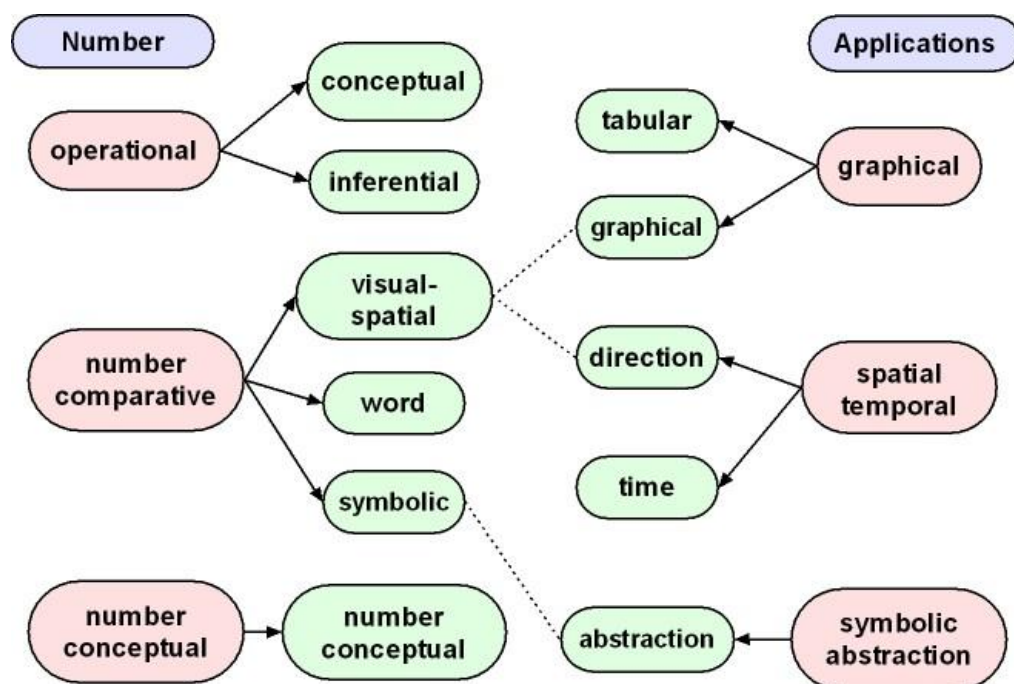


Figure 1: The model for DysCalculiUM: a first-line screening tool

The early trials of DysCalculiUM yielded very encouraging results (Beacham and Trott, 2005, 2006), particularly with regard to the ability of the screener to differentiate the dyscalculic student from the dyslexic student, an essential requirement. Trials on a larger scale collected general data for the Further and Higher Education population so that 'at risk' thresholds could be established. Data has also been gathered from students who had already been identified as dyscalculic and Trott (2007) reported very promising measures of sensitivity and specificity. "The overall picture of results gives substantial evidence in support of the effectiveness of the DysCalculiUM screening tool, not least in the substantial agreement between the appropriate indicators of 'at risk' performance on the screener and those individual students who have already been identified as

dyscalculic through recognised assessments” (Trott, 2009, page 134). DysCalculiUM provides an individual profile based on the model given in figure 1. In addition to an overall ‘at risk’ indicator, it provides a profile of the 11 categories. For a practitioner, the DysCalculiUM screening profile can provide a useful starting point for subsequent support.

### **Mathematical Anxiety**

There are various reasons why mathematical difficulties occur, one of which is dyscalculia. Other possible factors include knowledge gaps through poor teaching or long periods of absence and mathematical anxiety and low mathematical confidence. The role of mathematical anxiety is critical. The fear of numerical and/or symbolic material is very real and frequently inhibiting, impeding working memory. A comprehensive personal history will help identify those anxieties that may be deeply rooted in the early years of an individual’s mathematics education.

### **The Way Forward**

Our understanding of dyscalculia is many years behind that of dyslexia. More detailed research is required that is applicable to the practitioner who supports students challenged at the conceptual level of mathematical thinking. With the development of appropriate strategies and growing confidence, dyscalculic students can move forward, become more independent in their learning and succeed.

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### **Author**

Clare Trott is Mathematics Support Tutor in the Mathematics Education Centre, Loughborough University. She specialises in the provision of one-to-one mathematics support for students with dyslexia and dyscalculia. Clare's current research interests focus on mathematics and specific learning differences in higher education, particularly dyscalculia and the development of a first-line screener for dyscalculia.