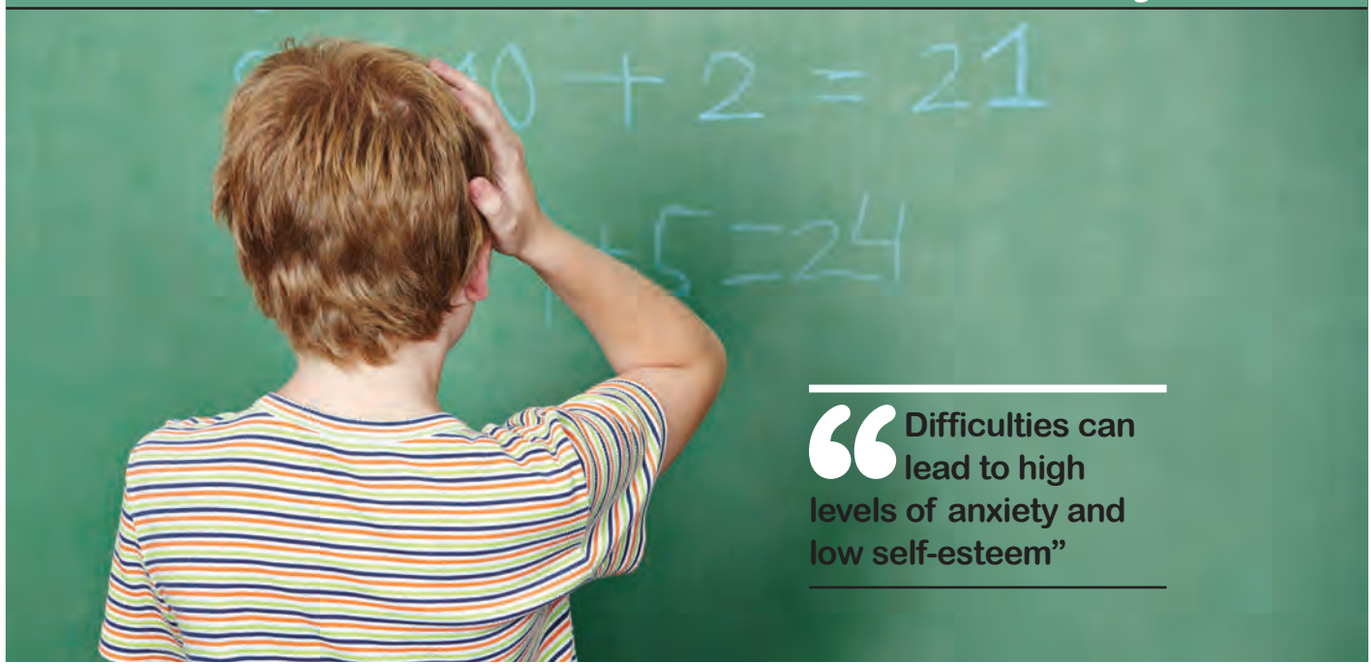


> "Difficulties can lead to high levels of anxiety and low self-esteem"

Forget Rain Man

The movie *Rain Man* led the world to expect people with autism to be a whiz at maths. In reality, many struggle because of dyscalculia. Karima Esmail offers expert insight

Karima Esmail is an independent educational and training consultant specialising in developmental dyscalculia. She has developed a framework, NumberSense MMR®, to detect developmental dyscalculia

Developmental dyscalculia is thought to affect one in 20 people. This means that in a classroom of 30, at least one pupil is likely to present symptoms of the condition. A number of pupils will also exhibit maths developmental delays, signifying they are not making age-appropriate progress.

Developmental dyscalculia and maths developmental delays are two different presentations of maths difficulties. These difficulties for some pupils are further exacerbated by the presence of co-occurring conditions such as working memory impairment, dyspraxia, auditory processing difficulties, visual-spatial challenges or attention sequential difficulties.

Teachers and parents tell us that their children are falling behind in maths and that they struggle to:

- transcode numbers
- remember the sequence of numbers – both forwards and backwards
- identify the place value of numbers
- understand and use the language within questions
- use and apply symbols
- appreciate the order of numbers
- remember mathematical procedures.

All of this leads to severe delays and very low skills in basic mathematics. In turn, these difficulties can lead to high levels of anxiety and low self-esteem.

Numbers are not merely things to memorise, they offer a structured pathway that involves development. Parents of young children often ask how they can identify symptoms of dyscalculia. In the first instance, if your intuition and observations as a parent tell you that your child is not using numbers up to 10 by the age of five meaningfully, you need to step in and seek help. Research and practice shows that with the right interactive experiences maths development can take place.

Interactive experiences

Autism Spectrum Condition (ASC) is a developmental condition and requires a developmental approach. The strategy should engage the pupil at their level of functioning, using interactive experiences to promote development in their specific areas of maths need.

Complex difficulties with maths aren't unique to pupils with ASC. These delays are observed in pupils with:

- mixed sensory profiles
- motor processing and planning difficulties
- speech and language difficulties
- dyslexia
- auditory sensitivity
- slow speed of processing
- working memory impairments.

The traditional approach of 'one-size-fits-all' intervention, driven by a label, does not offer a targeted approach. It implies that all pupils on the autism spectrum show a homogenous profile, indicating incorrectly that their difficulties are the same. Validated frameworks such as NumberSenseMMR can help to identify different components of number difficulties. They can differentiate developmental dyscalculia from maths developmental delays.

Supporting pupils with autism and complex maths difficulties requires trained interventionists. These experts will study children's responses and thinking as they perform tasks with numbers in order to identify where the barriers lie. This is a dynamic approach where continuous adjustments of questions and interactive experiences take place, driven by the »

responses from the pupil. The goal is to promote intentional communication and thinking so that the critical components that are holding the pupil back can be addressed.

For instance, an assessment would have indicated that within the Counting Strand the pupil 'Could not count reliably up to ten'. The interventionist would observe:

- Is the correct cardinal value being verbalised?
- Are objects being counted too quickly or is the pupil losing his place?
- Is the pupil able to hear the numbers?
- Are the numbers being held sequentially while counting?
- Are objects being counted in the right number sequence?
- Are the correct words for numbers being used while counting?
- Is the pupil able to see groups of three without formal mathematical processing?
- If asked to pick eight objects from a basket, can the pupil give eight?
- Can the count of objects be written as a number?
- What are the thresholds? Can they count reliably up to 5, 10 or more?

In this way, the specific maths difficulties that a pupil is struggling with can be addressed. Each pupil is unique and the first step is to understand, irrespective of the label he or she carries, where the specific maths difficulties lie.

> **"If your observations as a parent tell you your child is not using numbers up to 10 by the age of five meaningfully, you need to seek help"**

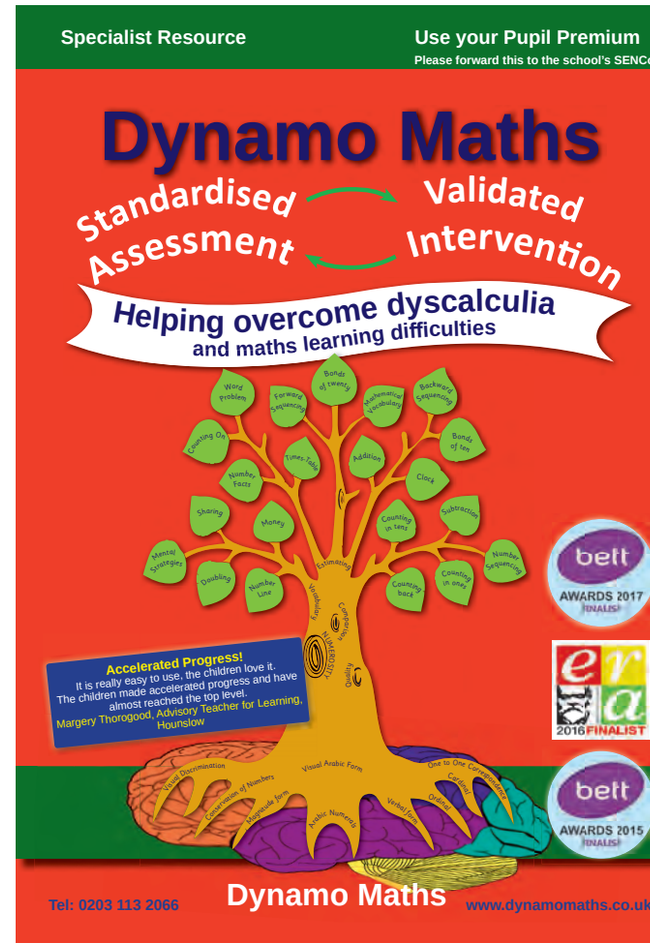
To genuinely support pupils with complex maths difficulties, interventionists need to be forensic in their approach. They need to observe the child's responses and thinking.

Surface behaviours

The maths difficulties that pupils present are surface behaviours that are processed by their unique nervous system. To understand these surface behaviours requires observation of how the child is thinking; they are not revealed through the child simply repeating numbers.

There is a place for repetition, but there is a far bigger need for children to receive focused intervention where the skills of thinking, communication and exchange of information can begin to start the process of change.

Autism is a complex developmental disorder, involving delays in three broad areas: social interaction, communication and imagination. It is therefore appropriate to offer a developmental intervention that has multiple approaches. This enables the interventionist to use a number of observation points in order to understand the small areas of difficulty that are preventing progress.

In supporting pupils with developmental dyscalculia with a purposeful intervention that is aligned to their individual differences, pupils begin to lay the foundations towards the academic requirements of mastering core number skills.

The powerful interactive engagement process develops spontaneous thinking, emotional engagement, attention, and broader use of language and communication. No longer does the pupil learn merely by memorisation.