

Case Study- Supporting Sam to Overcome Dyscalculia

Introduction

This is a case study about Sam, a young learner aged 6 years and 10 months. At school, Sam was in the top set for English. However, his school felt that they could not deal with his severe maths difficulties and had suggested that he should attend a special school. Sam was a very willing pupil, never difficult or disruptive, and he had made many good friends at his school. His parents felt that a move of school would be very unsettling for him and preferred that he stay at his current school if possible. They were willing to provide whatever extra help was needed to enable Sam to catch up with his peers in maths. He was having occupational therapy to help his dyspraxia and had previously received speech therapy.

Sam had been having some extra individual maths lessons and, when first assessed, he could count to 25 with ease but became confused when counting beyond this number. He could accurately count downwards from 10 to 0. He could recognise the number patterns on a dice to 6, recognised 1p and 10p coins and could accurately count out 5 counters. He could not work out $8 + 1$.

Scores from Sam's WISC-IV

assessment: Age 6 years 4 months

Verbal Comprehension Scale sub-tests

	<i>Percentile rank</i>
Similarities	95 th
Vocabulary	91 st
Comprehension	75 th

These scores gave Sam an overall verbal comprehension score of 121, a 92nd percentile ranking. This means that out of a group of 100 children he would be verbally superior to 91 of them.

Although testing is not an exact science, these scores do indicate that Sam is a child of high/superior underlying verbal ability. The verbal scores may also be taken as an indication of future academic achievement and these scores would indicate a pupil who should easily progress to a university degree.

However, there was a great disparity between Sam's verbal scores and those for perceptual reasoning, working memory and processing speed.

Perceptual Reasoning Index sub-tests

	<i>Percentile rank</i>
Block Design	16 th
Picture Concepts	9 th
Matrix reasoning	9 th

Working Memory Scale sub-tests

	<i>Percentile Rank</i>
Digit Span	16 th
Letter Number sequencing	16 th
Arithmetic	2 nd

Processing Speed Scale sub-test

	<i>Percentile Rank</i>
Coding	2 nd
Symbol Search	16 th

The disparity of Sam's scores is extreme and indicates a child with severe specific learning difficulties. Sam was diagnosed by the Educational Psychologist as being both dyspraxic and dyscalculic. The two difficulties are often comorbid with the former leading to the latter. At age 6 years and 10 months, Sam began specialist tuition with a dyscalculia expert.

First Assessment

At the first assessment stage, Sam only managed to correctly answer the following:

- Matching each object with exactly one other object in one-to-one correspondence.
- Counting out small collections of objects from a larger collection.

It was evident from both this assessment and his arithmetic scores from the WISC that, despite his high underlying verbal skills, Sam had failed to make normal progress with maths. Specifically, he found gaining and retaining any automated sequential knowledge of numbers extremely hard. He had very little understanding of how numbers relate to each other, place value or how numbers can be manipulated.

Remediation

Sam began an intensive programme of maths intervention involving 2 hours of specialist one-to-one tuition each week, together with Dynamo Maths for 15 minutes each day and maths games to play at weekends at home. Sam's parents were extremely supportive and ensured his work at home continued consistently. Sam was confident with IT and greatly enjoyed Dynamo Maths which he found easy to use and worked at independently every day.

His first terms maths objectives were:

- Number work and counting
 - Work on accurate counting to 50
 - Practise counting on from random numbers
 - Give the number following x (where x is between 1 and 30); tie this in with x plus 1 and 1 more than x
 - Give the number before x (where x is between 1 and 30); tie this in with x minus 1 and 1 less than x
 - Work with number line to 50
 - Work with '100' square to 50
 - Develop automated counting in 10's to 50
 - Gain firm knowledge of bridging points at end of decades
 - Work on descending counting from 20 – 0
- Number Bonds
 - Learn the bonds of 10
 - Practise with base 10
- Place Value
 - Learn to 'read' numbers with tens and units below 50
- Develop working use of mathematical vocabulary
- Learn to write simple number sentences
- Learn to solve simple prose problems

In the opinion of his specialist teacher, Dynamo Maths alongside manipulatives, was vital in providing the consistent, daily practice that Sam needed, on both a visual and interactive level to enable him to gain automated knowledge of essential underlying maths concepts. He found it very easy to move from the kinaesthetic

interaction with number pattern trays to similar coloured number rods to manipulating the coloured number rods on the computer screen.

Second Assessment

After 10 weeks Sam could count confidently in 1's to 30, in 10's to 100, in 2's to 10 and 5's to 25. He could also count accurately down from 20 to 0. He could sequence random numbers to 30 and provide interval digits. He could give the number following, and before, any number below 30. He was gaining an understanding of place value to 99. He had a firm knowledge of his bonds of 10, both as $2 + \underline{\quad} = 10$, $8 + \underline{\quad} = 10$ and $10 - 2 = \underline{\quad}$. Sam could carry out simple column addition sums and use his acquired knowledge to work out very simple prose problems.

On the second assessment Sam correctly answered the following:

- Matched each object with exactly one other object in one-to-one correspondence.
- Could say numbers in correct sequence to 20. Uses direct physical modelling for addition and subtraction.
- Compared collections of objects and states whether equal in number.
- Counted out small collections of objects form a larger collection.
- Could say numbers in order to 99.
- Read a given set of no-sequential two-digit numbers.
- Could say the number sequences for counting in twos, fives and tens.
- Ordered a given set of non-sequential two-digit numbers.

- Used a counting on strategy for addition.
- Could say numbers backwards from 20.
- 'Knew answer' when adding single-digit numbers to a multiple of 10.
- Interpolated between multiples of 10 on a number line.

At the end of his first term of intervention, Sam's parents had a meeting with his school who agreed that his maths progress was such that they felt he could remain at the school with the extra support continuing.

Teacher's notes

1) When a pupil receives academic intervention it is impossible to isolate the differing factors and confirm their impact in the programme - class teachers, specialist teachers, parents, occupational therapy, manipulatives and IT play their combined roles. For a child with a similar profile to Sam, having low perceptual reasoning, processing speed and working memory, the intensive delivery of a highly visual, interactive maths programme is very beneficial. Dynamo Maths can be accessed daily alongside the concrete use of manipulatives during lessons, and provides the practice that these pupils so badly need.

2) It should be noted that although Sam suffers from dyscalculia he does have a high level of underlying cognitive verbal ability. All pupils cannot be expected to make the rapid progress that he achieved.

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