Dyscalculia

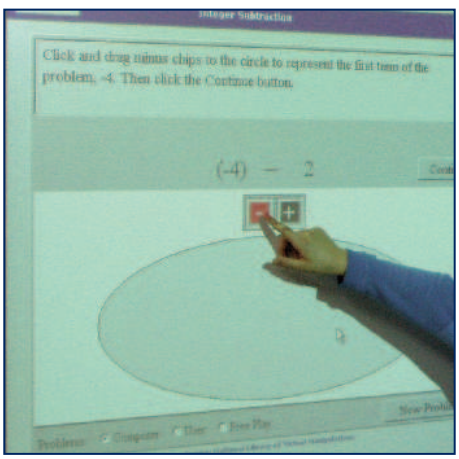
What is Dyscalculia?

Dyscalculia is one of a number of specific learning difficulties which is recognised by the central governing body for education in the UK, the Department for Children, Schools and Families (DCSF).

There exists a variety of definitions of dyscalculia. The differences in definitions reflect the different theoretical and research perspectives of different experts. Some experts define dyscalculia in terms of an underlying presumed genetic, constitutional or neuroanatomical immaturity in specific areas of the brain (Kosc, 1974). Some definitions of dyscalculia are more general and do not presuppose any genetic or underlying neuroanatomical substrate. Thus, the DCSF defines dyscalculia as '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'.

How many children are Dyscalculic?

We know from research that many people have difficulty with maths. Some of these difficulties may be associated with lower than average levels of intellectual ability, absence from school, less than adequate teaching, personality factors or emotional reactions to maths. With regard to children whose attainment in subjects other than maths is average or above, estimates of the prevalence of dyscalculia range from 3% to 7% of the population. Of those children diagnosed as dyslexic about 40% to 60% are also dyscalculic.



What is the cause of Dyscalculia?

It should be said that the research on dyscalculia is less developed than the research on dyslexia.

For many of those experts who consider that dyscalculia is a term reserved for specific individuals who do not have one or more of the factors mentioned above, dyscalculia is considered to have a genetic component. If one identical twin has dyscalculia there is a 70% chance that his twin will also be dyscalculic, whereas for non-identical twins the likelihood is 55%. These figures indicate that inheritance plays a part but is not the complete answer. Some researchers consider that there is some immaturity in the inferior parietal cortex and its interconnections with other areas of the brain.

A study on children's responses to numeracy lessons is revealing. Headteachers and SEN coordinators from five schools selected groups of 8 and 9-year olds with high, medium and low maths ability. Researchers then carried out interviews with each group, in which they discussed children's thoughts about numeracy lessons. Below are selected quotes from the low ability groups (likely to include dyscalculic children):

"I feel like screaming and saying 'why are you doing this, why are you doing this?' and I feel like punching the teachers."

"It makes me feel left out sometimes… When I don't know something, I wish that I was like a clever person and I blame it on myself."

"I would cry and I wish I was at home with my mum and it would be – I won't have to do any maths."

What are the difficulties which Dyscalculic children have and how do they impact on learning?

Basically, the child will be performing in maths below the expected level and for no obvious reason. They will seem to be underachieving in comparison with their potential or with their ability in other subjects.

Short-term/working memory

Many children with dyscalculia have inefficient working memory skills in visual, auditory or kinaesthetic (touch) aspects or in a combination of such. This can cause difficulties with processing numbers. For instance, a child trying to add 49 and 13 mentally has to hold the sum in his memory, probably try to add 9 and 3 whilst remembering to carry 1 and to add 4 plus1 plus 1, then recalling the 2 and putting them together in the right sequence to get the answer 62.

Short-term working memory difficulties may even prevent the child from commencing to process a sum because he may forget some or all of what the teacher has said.

Long-term memory

It is well known that dyscalculic children and other children with difficulties in maths often have a considerable difficulty in learning basic mathematical facts such as the multiplication tables. Clearly, without such knowledge, the dyscalculic child will experience problems in those mathematical tasks

which require table knowledge. Poor long-term memory also affects retention of and thus knowledge of mathematical formulae and methods.

Attention span/concentration

Many children with dyslexia and dyscalculia have difficulty in maintaining focus on a particular task. This will affect their attention to the teacher's instructions and may also affect their short-term memory ie they may be able to focus on one aspect of instructions (written or oral) but not the remainder of the instructions, meaning that they begin tasks with incomplete information.

Visual perception

The pupil may confuse certain written numerical symbols and letters. He may tend to reverse them or invert them (turn them upside down). Common errors are to confuse the numbers 6 and 9, 3 and 5, E and number 3. Additionally, and this may relate as much to a central processing deficit as to a visual perceptual deficit, many dyscalculic children have problems in discriminating the basic mathematical symbols ie: +, -, ÷, x.

Auditory perception

Some dyscalculic children (and, indeed, others with auditory problems) have difficulty in distinguishing spoken numbers such as 9, 19 and 90.

Information processing speed

It is known that children with specific learning difficulties often work more slowly than their less disabled counterparts. Whilst the rest of the class is on question 11, a dyscalculic child may still be working on question 5. He may get less work completed and thus may get much less practice and exposure to number processes.

Sequencing, laterality and directional confusion

Many dyscalculic children have difficulty with concepts of leftness and rightness. This is associated with letter and number reversals.

They also have difficulty in remembering the correct sequence of the months of the year, the days of the week or the seasons. Mathematically, they frequently have difficulty with knowing what number comes after a particular number or what number comes before a particular number.

Children asked to write 18 may write 81.

In our Western culture, reading is a left to right scanning process. Often, children are required to scan from left to right in maths ie:

6 + 2 + 1 =

23 – 6 =

4 x 2 =

If a child has difficulty with directionality and sequencing, he may attempt to move from right to left rather than left to right.

In maths, there is an additional problem over literacy which is that there are different start points of different types of sums.

264
312 +

In the above sum, the child starts at the right and works towards the left. However, in the following sum, a subtraction sum, the child starts at the bottom right and has to remember to take the lower number from the top number, 'borrow' from the left upper number and move left:

692
367 -

In long division, in contrast, the child starts at the left and moves towards the right and moves downwards whilst writing the answer at the top:

$4\overline{)369}$

Problems of remembering sequence, laterality and direction make life hard for a dyscalculic child who has to cope with all three of these issues - often at the same time.

The language of mathematics

Maths thinking is to a considerable extent dependant on the language used in maths. This language needs to be learned thoroughly in order for a child to be successful in maths. For instance, the division sign (÷) can be described in the following words 'divide', 'division', 'goes into', 'share', 'group', 'split', 'apportion', 'quotient' etc. Similarly, the number 3 can be described as follows 'three', 'one third', 'treble', 'triple', 'tri-', "triangle" etc.

Reading

For many mathematical problems it is necessary to read the problem accurately. A mathematical problem such as 'If two sides of a room have a length of four metres and the other two sides have a length of two metres, what is the area of the room?' it is necessary to be able to read accurately the words in the problem. As we have seen, many dyscalculic children are also dyslexic and will have a difficulty decoding single words and interpreting the meaning of the question. Any child who cannot read particular key words or does not take note of a negative, i.e 'not' in the question will be in difficulties.

Maths learning personality/cognitive style

Professor Mahesh Sharma considers that there are two basic mathematics personalities, i.e the qualitative (whole to parts) learner or the quantitative (parts to whole) learner. He considers that children usually begin by being qualitative (holistic) learners. However, many teachers teach a quantitative (stepwise) approach. Many children with dyscalculic difficulties fail to adapt to this change in style.

Dr Steve Chinn conceptualises the problem as noted by Bath and Knox (1984) as follows: the two extremes of the continuum of cognitive styles are referred to as 'grasshoppers' and 'inchworms'. In analysing and identifying the problem the inchworm will focus on parts and attends to details whereas the grasshopper tends to be holistic, forms concepts and puts items together. In trying to solve a problem the inchworm will be formula- and recipe-oriented using numbers exactly as given and tending to use pencil and paper to compute, whereas the grasshopper will use more controlled exploration, will adjust or break down or build up numbers to make an easier calculation and will tend to perform computations mentally. In terms of verification the inchworm is less likely to try to verify but if he does he will use the same procedural method whereas the grasshopper will be likely to verify usually by using an alternative procedure.

Clearly, all pupils exist on this continuum between the two extremes. A good mathematician needs to be flexible in both styles.

Anxiety

Present in many people with mathematics difficulties is what we might call a mathematical anxiety. This is

usually a secondary reaction to the child perceiving himself to be poor at maths. It can be a cumulative problem which is self-reinforcing ie the more the child fails, the more anxious he becomes, which then leads to more failure and lowered self-esteem.

Professional Staff

These assessments are conducted by some of the leading practitioners in their fields in the U.K.

Dr. Peter Gardner
B.A., DipPsych., M.A., Ed.D., A.F.B.Ps.S., M.I.Mgt., F.Inst.D.Chartered Psychologist

Peter gained an Honours Degree in Psychology from Nottingham University, a postgraduate diploma in Academic Psychology from University College London, a Master of Arts Degree in Therapy and Counselling from Antioch College, U.S.A. (London Branch) and a doctorate from the University of Bristol.

He has been a lecturer in a number of universities and was a tutor at the Child Guidance Training Centre, London, responsible for post-graduate training of educational psychologists on a British Psychological Society – and Department of Education and Skills – accredited course.

He is a Chartered Educational Psychologist, a Chartered Forensic Psychologist and a Chartered Counselling Psychologist of the British Psychological Society. He is a Full Practitioner Member of the British Psychological Society Division of Neuropsychology. He is a registered Psychotherapist (United Kingdom Council for Psychotherapy) and was a committee member of the Psychology and Psychotherapy Association.

Much of his work is legal work, including the preparation of detailed court reports and submission of oral evidence, working for Crown Courts, Magistrates Courts and Guardian ad litem panels. He acted as an expert witness in the precedent-setting Phelps v London Borough of Hillingdon education negligence case in the High Court in July 1997 and was described by Mr. Justice Garland as "particularly well qualified, careful and fair." His legal work is split roughly 50:50 between Claimant and Defendant work.

He is a founder of both Appleford School and of Daneswood, Shipham, near Cheddar, a care home for young adults with severe, profound and multiple learning difficulties, which is registered with and approved by CSCi.

Patricia H. Rush
B.A., B.Sc.O.T.(C), S.R.O.T., M.B.A.O.T.
Independent State Registered Occupational Therapist

Patricia has 24 years working experience since qualifying from Queen's University in Canada in 1982, with a B.Sc. in Occupational Therapy. She also has a B.A. Psychology from the University of Western Ontario (1980) and a post-graduate qualification in Neurodevelopmental Therapy (Bobath), which is a specialised method of assessing, treating and managing people with Cerebral Palsy. She has undertaken training with Sensory Integration International and is qualified to administer the Sensory Integration Praxis tests. She has also received post-graduate training in the provision of Sensory Integration Therapy.

She has cared for clients, particularly children and adolescents, in hospital and community settings. Initially she worked in a children's treatment centre in Chatham, Canada where she assessed and treated children with a variety of disabilities. Her next position was in a children's rehabilitation and long stay hospital where she assessed and treated children of all ages for the first year and then concentrated on providing a service to the infant and preschool unit; most of these patients had neurological problems, Cerebral Palsy etc. For the next three years she worked in the community in Kent assessing and treating children/adolescents in a home or school setting.

For the past 18 years, she has worked in her own private practice in Somerset working with children/adolescents in specialist and mainstream schools with a variety of diagnoses. Her present work involves assessing and treating children in a specialist, residential school offering specialist therapy provision for children with Specific Learning Difficulties and associated difficulties like dyspraxia, ADHD, ADD and Asperger's Syndrome. She works with children individually and in groups, and team-teaches in the classroom when appropriate. She is currently involved in providing assessment and treatment for children in other local schools.

She has provided expert witness reports for many solicitors over the past 10 years both Claimant and Defendant for personal injury cases and medical negligence. Patricia continues to be instructed by parents and solicitors to assess and provide detailed reports for Educational Tribunals. Oral evidence is also often required.

Nancy P. Arnaud
B.Sc., Reg. R.C.S.L.T., MASLTIIP, Reg. HPC
Independent State Registered Speech & Language Therapist

Nancy qualified from Leeds Polytechnic with a B.Sc. in Speech Therapy in 1983 and has worked with children for the past 23 years.

After qualifying she worked for the Health Service in both general and specialist posts in paediatrics for 5 years, including working at a Child Development Centre. Her final position was to develop a service for pre-school children in Thanet.

She is currently working in her own private practice in Somerset. Her clients include children with many different speech and language difficulties, as well as those associated with learning and physical difficulties, for example Cerebral Palsy. She has also provided a service to a residential school for children with severe learning difficulties, physical disabilities and challenging behaviour. She has also worked in two schools specialising in providing for children with Asperger's Syndrome and is currently providing Speech and Language Therapy at a specialist school for children with dyslexia and additional needs.

She has provided expert witness reports for many solicitors, both Claimant and Defendant, over the past 12 years and provides written and oral evidence for Special Educational Needs Tribunals. She has undertaken further training in the role of the expert witness devised by the Royal College of Speech and Language Therapists and the Association of Speech and Language Therapists in Independent Practice.

Contact

To make an appointment for your child or you to be assessed, please contact:

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