

Psych Ed

Assessment Services

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Teaching Mathematical Skills

Children diagnosed with 22q11 typically have deficits in mathematical skills.

Mathematics learning disability (dyscalculia) refers to deficits in the development of the symbolic number system. Children continue to rely on the concrete number system (counting fingers/dots) past the age of seven i.e. they do not “speak numbers”. This prevents them from developing mental computational skills.

Deficits in the development of the symbolic number system can occur also for a variety of reasons. Recent studies have found that differences in the connections among certain brain areas appear to be related to mathematics difficulties. There is some evidence that deficits in the processing of spatial information contribute to mathematics difficulties.

Deficits in math word problem solving are typically related to deficits in numerical skills, abstract reasoning and reading comprehension.

The link between 22q11 and mathematics difficulties lies in difficulties with abstract reasoning (low scores on intelligence tests) and, likely, differences in brain organization related to the processing of numerical concepts.

Therefore, the mathematics program taught at school will be always too difficult for children who have 22q11. Starting at age six, parents need to put a program in place of teaching numerical skills at home, at the pace that makes sense to the child.

Teaching Strategies

General principle: anything that a child finds difficult to learn should be taught slowly, in small bits at a time, in more than one way, and distributed over time = no long cramming sessions.

The program should consist of fifteen minutes of daily practice, seven days a week, twelve months of the year (exceptions will be made, of course).

Always show the child exactly how something should be done and then start the practice.

The same repetitive approach needs to be taken to teaching all numerical operations. Teaching also needs to include periodic review of what has been previously taught. The Kumon tutoring system applies this principle, successfully, to teaching written numerical operations.

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The first goal is to teach the child to use the symbolic number system to add and subtract i.e. to complete these operations “speaking numbers”.

There is some evidence that in early childhood some information is acquired through physical interaction with objects and the kinesthetic feedback this provides. Therefore, in helping children make the transition from the concrete to the symbolic number system it is best to encourage them to count on their fingers but not to draw dots (they can feel their fingers moving and they always have their fingers with them).

Daily practice of adding two single-digit numbers whose sum is ten or less is a good beginning. This should consist of five minutes of mental counting and ten minutes of same operations completed in writing.

When this is mastered, as seen in fast responses without counting on fingers, then subtracting single digit numbers from numbers ten or smaller should follow; five minutes of mental computations and ten minutes of written work.

Next comes skip-counting, i.e. count up by two, three.

Counting can be also incorporated into daily tasks,

e.g. how many knives, spoons and forks do we need if it is three of us for dinner? Board games which require counting are also helpful.

Teaching multiplications

Start with skip-counting, e.g. count up by two to twenty. Then teach the 2 x time table showing the child how e.g. $3 \times 2 = 2 + 2 + 2$. Do the same with all other time tables.

Teaching divisions

Use small numbers and show how the division is related to the multiplication

e.g. $8 : 4 = 2$ and $2 \times 4 = 8$

Teaching fractions

Pies, cakes and pizza can be all served in fractions.

Word problems

Teach one type of word problem at a time. Model how you do it, making each step explicit.

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How much of this can be accomplished and how long will it take?

This will depend on the child. There is no point to teach the next step if the first one is not mastered. The aim is to make the child numerically as literate as he/she can be.

How to bridge the gap between the child's skills and the classroom's program?

It is important that an Individual Education Plan (IEP) be in place to provide “modifications” to the child's mathematics program. This will reduce the pressure.

If available, placing the child in the Resource Room for Mathematics instruction which can proceed at the child's pace will be helpful.

The IEP also needs to provide for test/assessment accommodations: assistance with reading questions, permission to use concrete aids (fingers, dots) and, later, permission to use the calculator.