

## Math Difficulties and Spina Bifida

# What to Do?

### Preschool

Many of the skills necessary for math begin to develop during the preschool years. There are many opportunities for preschoolers to learn these skills, both at home and school. For instance:

- Practice counting with your preschooler throughout the day, such as the number of toys, pencils, chairs, etc.
- Help your child learn to sort items by category by having him or her separate a group of items based upon shared characteristics (e.g., “Put the animal toys in this pile and put the baby dolls in this other pile. Let’s count how many baby dolls you have. Do you have more animal toys or baby dolls?”).
- Help your child learn concepts such as more and less by comparing different groups of items. For instance, create two unequal groups of items (e.g., blocks, pennies, etc.) and help your child learn to identify the group of items that has more or less. Help your child to focus on “number” by having them double-check their decisions about “more” and “less” by counting objects to be compared. For example, young children often think that the longer display of items has “more” even when it has the same number or even fewer items than a shorter display.
- Sharing of a pizza or other food by cutting it into equal pieces is an early form of division. Help your child to count the people, divide the food, and distribute it to each person one at a time.
- Play fun counting games that happen to have math concepts embedded in them, such as Candyland®, dominos, etc.
- Help your child to recognize and label simple shapes such as a square, a triangle, or a circle.

### Kindergarten/Elementary School

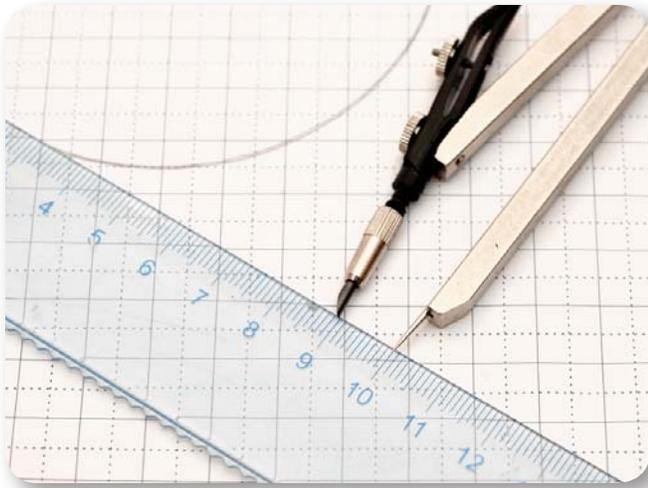
#### Building number sense

Number sense is the building block for many areas of mathematics, including calculations. Number sense is the ability to understand the actual size of a number (e.g., 1 is smaller than 10, 10 is smaller than 100).

Children with Spina Bifida often have difficulty understanding the actual size of different numbers, and may have difficulty identifying how far apart numbers are from each other on a “mental number line.” For instance, it might be difficult for a youngster with Spina Bifida to identify which of the following two numbers (the number 9 or the number 19) is furthest away from the number 12. If this is a problem, children with Spina Bifida should practice making these kinds of comparisons using an actual number line in order to help them see the size of differences between numbers. Learning the size of differences between numbers on a number line helps build number sense in general.

Another way to build number sense is to find fun ways to learn different math combinations. A deck of playing cards (without the face cards) can be used to play “plus zero,” “plus one,” “minus one,” etc., and build understanding of number combinations along the way. For instance, state the game (i.e., “add zero to every card





I show you”), and then quickly go through the deck, allowing the child to add zero to each number shown. This helps the child begin to memorize the idea of “adding on,” or “subtracting from,” and begins to make it more automatic.

Problems with number sense can also result in children with Spina Bifida having difficulty comparing different amounts of items and judging which group has more simply by looking at them. For instance, a child with Spina Bifida may have difficulty “eyeballing” two groups of dots (when comparing a group of 11 dots to a group of 17 dots) and quickly deciding which group has the most items without counting them. Children with Spina Bifida can improve their number sense by practicing these types of comparisons, and quickly determining which group has the most items simply by “how big it looks.” Children can then count the dots to check the accuracy of their answers (while also practicing adding skills).

As youth with Spina Bifida move further into elementary school, the need to develop number sense continues. Each grade presents larger number sets and concepts to be understood. One way of encouraging the ongoing development of number sense is to present the child with examples from real world situations. This helps students with Spina Bifida begin to understand “why” they are learning a particular skill. Teachers can support this by referencing the importance to math skills to different careers and by teaching meaningful student-centered problems (money, time, calendar, budgets, probability, data, etc) so students see the value in numbers and mathematics.

While classroom accommodations such as calculators can be helpful, many youth with Spina Bifida require special intervention

to address their level of learning disability in number sense. Early screening of math skills is recommended for children with Spina Bifida. Problems with number sense can be identified at an early age (e.g., age 5 or 6).

### Understanding math procedures

Math calculation includes many different procedures, and children with Spina Bifida often have difficulty learning to use these procedures (e.g., “borrowing,” “carrying,” long division). Even when youth with Spina Bifida learn these math procedures, many have difficulty remembering to use them consistently. Several approaches can be helpful in improving a child’s understanding of math procedures:

- Set a goal of helping the youth with Spina Bifida develop an understanding of each math procedure, rather than simply learning the steps of doing them on paper.
- Sometimes the use of “word pictures” can help develop an understanding of math procedures (“For this problem, I will be taking a smaller piece (i.e., 48) out of this larger piece (i.e., 92)”).
- It is important that children with Spina Bifida spend time mastering math vocabulary, so that they recognize these terms when presented with “word problems.” Math vocabulary is best taught with a corresponding visual or example problem. Word walls, picture glossaries, journals and problems of the day are helpful tools to reinforce math vocabulary. A new math vocabulary word should be introduced with classroom discussion, visuals, and then reviewed often to ensure understanding.
- Many of the mistakes youth with Spina Bifida make when completing math procedures occur when they “go on cruise control” and do not keep the math concept “in mind” when doing the problem. For instance, when working on the problem to the right, the student might simply start subtracting numbers (e.g., 8-2; 9-4) without remaining aware that he or she is “subtracting this smaller number (i.e., 48) from this larger number (i.e., 92).”
- Students with Spina Bifida should be encouraged to “think out loud” when completing a problem. Listening closely as the student “thinks out loud” will allow the teacher to quickly provide immediate error correction so that the student does not keep working in the “wrong direction.” This will also help the teacher assess conceptual understanding and awareness, and will help avoid careless “slips” and calculation mistakes. In math, it is very important to kindly correct errors immediately so that wrong procedures do not become habits.

- Students with Spina Bifida should learn to “work backwards” (i.e., inverse operations) as a way of checking their work for accuracy. For instance, after completing the problem noted above, the student should add their answer to the number 48 in order to see if the sum equals 92.
- Another way to self-assess the “reasonableness” of answers to math problems is to generate a second answer using “rounded” values. For instance:
  - 1. The student with Spina Bifida calculates an answer to the question “ $92-48=$ \_\_\_\_\_”.
  - 2. The student then rounds each of the numbers of the question to the nearest “10” (e.g., 90 and 50).
  - 3. The student calculates an answer to the question using the rounded values (e.g., “ $90-50=40$ ”).
  - 4. The student’s answer to the original question is “reasonable” if it is somewhat above or somewhat below 40.

Early and periodic screening of math skills is recommended for students with Spina Bifida. Early problems with the acquisition of math procedures can be identified by 2nd or 3rd grade. However, as new math procedures continue to be learned as students advance in grade, close monitoring of math progress is recommended.

While not the focus of this tipsheet, there are additional intervention strategies for older youth with math difficulties which may also be helpful when they are presented with word problems, geometry, algebra, etc. These interventions and accommodations include direct explicit instruction, presenting information in a step-by-step manner, presentation of examples and models, low student:teacher ratio, and using meaningful manipulatives.

## Curriculum and Internet resources

- <http://illuminations.nctm.org/>
- <http://www.nctm.org/>
- <http://interventioncentral.com/>
- <http://thinkfinity.org>
- <http://calculationnation.nctm.org/>
- <http://www.econedlink.org/>
- <http://nlvm.usu.edu/en/nav/vlibrary.html>
- <http://www.fun4thebrain.com/index.html>
- <http://www.superkids.com/>

## Teacher resources:

- Direct Instruction techniques found to be effective for math disability (Carnine et al 1991)
- Explicit Instruction in procedural math skills & conceptual math knowledge (Fuchs et al 2001, 2002)
- Peer mediated practice (Fuchs et al 2001, 2002)
- Teacher modeling to improve math computation & problem solving (Rivera & Smith 1987)
- Explicit instruction in “problem solving rules” (Fuchs et al 2003a&b)
- Teaching word problems of a similar type (e.g., addition word problems with similar syntax) together to improve generalizability (Quilici and Mayer, 1996, Fuchs et al 2003a&b).
- Teaching word problem solving specifically for children and adolescents with Spina Bifida (Coughlin & Montague, 2010)