



Music and ... Math

Research Highlights

Ages 18 months to 3 years old



Introduction

“Early experiences with music that are successful and fun prepare children to be successful in other areas of learning, particularly math.”*

Research is showing that music has the power to jump-start your child’s brain, including triggering the areas of the brain used for mathematics. Why? Like your toddler, music doesn’t stand still. **When your child plays an instrument or listens to a catchy tune, her brain is constantly being challenged to process and make sense of the tune and the rhythm.**

What’s great is that all that neurological exercise can be playful and fun! The activities in Kindermusik classes have been carefully constructed to leverage all the findings from the latest and greatest scientific research on the links between music and math. So, how does that work?

GEOMETRY: *Space and Shapes*

What is it?

Geometry before age three? You bet! Toddlers learn geometry through their eyes, hands, and bodies as they crawl through tunnels, run around corners, and stack boxes. Your little explorer gains spatial sense as she experiences how her body moves in relation to objects and structures in the world. As she moves “my body” and “my things”, she starts to show her understanding of location and position by using or understanding words like *on*, *off*, *under*, *below*, *in* and *out*, and of distance by using words like *near*, *far*, and *next to*.

Geometry concepts keep popping up as your child explores objects that are different shapes. As he plays with blocks, your child learns that some

* Sawyers, K. & Hutson-Brandhagen, J. (2004). Music and Math: How do we make the connection for preschoolers? *Child Care Information Exchange*, July/August 2004. For all other reference citations and a full version of this paper, please visit us at www.kindermusik.com/benefits.

objects are similar to others in their shapes: some are rounded, some have corners; some fit under the door, some get stuck! Just past the age of three, your child may begin to represent shapes as visual images in his mind, and then move them around mentally. This is called spatial-temporal reasoning, and is important not just for chess champions, but for math and science understanding too.

How It Works in a Kindermusik Class

“Shake your shaker above your head. Can you shake under your leg? Look at Graham shaking it behind his mommy’s back!” It’s easy to understand how Kindermusik classes build your child’s spatial sense. As your child moves his body through the center of the circle, plays his instrument in creative ways, and responds to your teacher’s directions to move his body, expert educators would say he is developing important foundations in geometry . . . while having fun!

As your toddler gets toward preschool age, scientists say you’ll see some surprising benefits of making music. Children who participate in music instruction, including Kindermusik classes, show stronger spatial-



Developmental Milestones: *Geometry*

Toddlers and two-year-olds demonstrate understanding of space and shapes when they :

- * Try to put their stuffed bear into a box that is too small, then find a larger box and put the bear in.
- * Play with shaped blocks.
- * Match shapes or say the names of some shapes: “This is a circle. It’s my plate!”
- * Know whether to go *around*, *in*, or *through* a structure to get to a friend.
- * Bend down to look when you say, “Your shoes are *under* the bed.”

NOTE: Every child is unique, and different children may reach milestones at different times. If you’re concerned about your child’s development, talk to your pediatrician.

temporal reasoning skills than those without music instruction. Research shows that with training, even children as young as two can demonstrate surprisingly advanced skills in the area of spatial reasoning.

What is it about music instruction that improves these specific geometry skills? In your toddler's brain, certain neurons are actively firing as she plays rhythms on the drum. **The same brain pathways that are created by this music-making are used for more complex spatial-temporal geometry tasks.**



What You Can Do at Home

- * **Yummy Shapes.** Point out the shapes around your kitchen or dining room, especially those on your toddler's plate. Point out the round banana slice or triangle-shaped tortilla wedge. Or, offer your child the choice of square or triangular toast pieces.
- * **Dance, Dance, Dance.** Use scarves or streamers to wave *in* and *out*, *near* and *far*. Sing out the words, then see if your child can be the dance teacher telling you what to do.
- * **Rainy Day Playground.** Encourage your toddler to climb *over* and *under* pillows and cardboard boxes and sheets turned into tunnels. See how her body fits in these new creative spaces!!

Patterns

What Are They?

Patterns are all around us in the world, and children have "an intrinsic desire to search for patterns, explanations, and solutions." As your toddler explores his world, he is building important foundations in mathematics by picking up on the patterns he sees and experiences. For example, that consistent daily schedule you've been working on keeping plays an important role not only in helping your child stay safe, but also in understanding a recognizable pattern of daily life. The black-white-black-white stripes that

make a zebra a fun-to-recognize animal at the zoo? That's a visual pattern. Maybe your little investigator has "sung" to you the distinctive low-mid-high tones of your mobile phone's ring? That's a pattern of sound. Or, perhaps she has pointed out the up-down-up-down movements of a merry-go-round. That's a pattern of movement!

How It Works in a Kindermusik Class

In talking about toddlers, mathematics experts point out, "When children use beat, rhythm, and melody, they can begin to recognize mathematical patterns." **Music builds on the informal experiences your child has in the world, and expands your child's perspective in a developmentally appropriate way to include more mathematics.**

Kindermusik classes provide rich experiences with patterns through both music and movement. You've probably heard about "steady beat", but perhaps not realized that mathematically speaking it's an important way to match a set of beats to a set of actions. For example, when your child matches the steady beat of a drum with a clapping movement, she is translating a simple pattern. Or when he echoes a rhythm Miss Kathy sings to the group, that's a beginning stage of patterning, too.



Developmental Milestones: *Patterns*

Toddlers and two-year-olds demonstrate understanding of patterns and relationships when they:

- * Notice patterns of daily time (e.g., Mom comes to get me after story-time).
- * Say a word that is repeated in a storybook while you read it aloud.
- * Notice visual patterns like the colors of a carpet or on a shirt.
- * Group toy cars: the big ones in one spot and the little ones in another spot.
- * Show interest in following patterns of beads, blocks, or shape toys.
- * Beat a drum, imitating the way you do it, or after hearing you clap your hands.
- * Put the rings of a stacking toy in order of size.

With Kindermusik, the fun with patterns grows from there. When your child hears the steady tick-tock rhythm of a clock and matches with it a movement, bending at the waist from side-to-side, she is exploring a consistent two-item pattern. From the sing-song and tap-clap movements of pat-a-cake and other rhythmic songs, say math experts, stems the later ability to work with physical patterns of big and little blocks. So, bang that tambourine and keep the steady marching beat . . . your child is off to a good start with patterns!



What You Can Do at Home

- * **Sportscast Patterns.** As you see or experience patterns around you in the world, describe what your toddler sees, hears, or does: “Look at the flashing light. The colors go: blue, white, blue, white!”
- * **Call and Response.** Release your inner bongo-player and make some rhythm patterns for your child to repeat. Use a real drum, the eraser end of an unsharpened pencil on a table, or even just your hands. Tap the “drum” three times then wait . . . does your child do the same?
- * **That Sock Drawer** is a great tool for working on patterns! Start with sorting the socks into piles or pairs, by color. Then see if you can create simple repeating patterns of color, or by placing them up high then down low in a line on the floor.

Numbers

What Are They?

Toddlers are fascinated by numbers, even if they don’t quite “know” many of them deeply yet. Researchers tell us that an early step in learning about numbers is to memorize the counting sequence by rote. Early on, your toddler may not even realize that the phrase, “one, two, three” is made up of separate words, and instead hear them as a single “chunk”.

During the toddler years she will recognize each number-word and begin to associate the words with the ideas.

Young children learn about the concept of numbers well before they solidify their counting skills or understanding of number words.

Through sorting objects based on which are the “same” color or shape or size, and by hearing which instrument sounds “different”, your child classifies things and experiences. By matching one cup to each stuffed animal at the rainy day picnic, she builds understanding of what educators call “one-to-one correspondence”. And by arranging toy cars in order of size (smallest to biggest, etc.) your child works on order within a series. These concepts are all important foundations for understanding numbers!

How It Works in a Kindermusik Class

The music and movement combination in Kindermusik classes is a wonderful way to build an understanding of numbers! By repeating counting rhymes like “One-Two-Buckle My Shoe” and singing songs like “Five Little Monkeys”, your child deepens his knowledge of the counting sequence. With fingerplays like “Ten Fluffy Chicks”, your child gets important practice relating numbers to the fingers on their hands.

In addition, your child is building the important foundations in numbers described above. By comparing the fast beats of a samba to the slower beats of a smooth jazz, she is practicing classification.



Developmental Milestones: *Numbers*

Toddlers and two-year-old children demonstrate understanding of numbers when they:

- * Stomp around the room, singing, “one, two, one, two.”
- * Imitate a simple counting rhyme.
- * Help you put a napkin on each plate when you set the table.
- * Notice that another child has a larger lump of clay and ask you for “more”.
- * Respond appropriately to the request, “take just one”.

When your teacher passes out one shaker instrument per child in the circle, that's one-to-one correspondence. Match a step-step-step-step motion to those spoken words and to a steady musical beat . . . those are important precursors to answering "how many?" And a musical scale played on the xylophone? Great practice for ordering musical tones from lowest to highest.



What You Can Do at Home

- * **Count It Out.** Keep the numbers rolling with your child. How many buttons on your shirt? How many steps did we climb? Did we use five blocks or only four?
- * **Hare and Tortoise.** Read the classic story, *The Tortoise and the Hare*, making a slow tap—tap—tap on your lap to match the slower movement of the tortoise. Compare that slow tempo with the fast tap-tap-tap sound for the hare.
- * **Mother, May I?** Remember the classic game you used to play? It's great for reinforcing numbers, even without the tricky asking rule. "Take five giant steps! Now turn around two times."
- * **Sharing Blocks.** Playdates are great times to practice both sharing and number concepts. You might say, "You have so *many* and Jack has so *few*. And look, I have *none*! Would you please give us *more*?"

Conclusion

Great thinkers like Einstein and Pythagoras have seen and used the connections between music and mathematics. The good news is that you don't need to be a genius of those proportions to see and benefit from the music-math connection! Science shows that **by engaging your child in music and movement, you're giving him or her very beneficial experiences in early space, shapes, patterns, and numbers**, all while having a good time moving and making music.



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