THE BENEFITS OF MIDLINE CROSSING ACTIVITIES

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https://www.publishinginspiration.com/Presentations/

What are the Midlines?

Why is Midline crossing important?

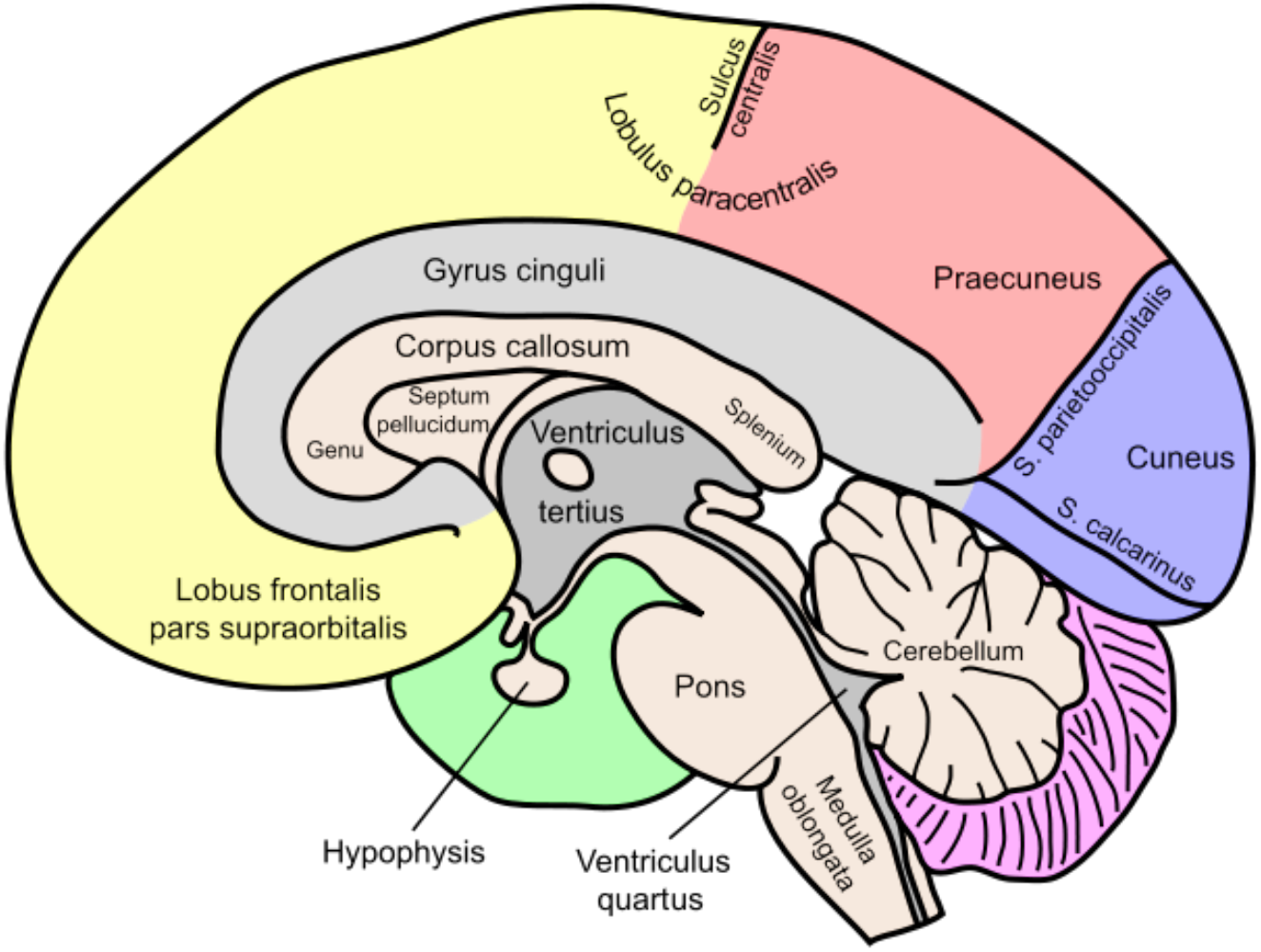
How do we do this?

Midline crossing exercises/activities help to strengthen the corpus callosum, the bridge between the two halves of the brain.

- This helps the two halves of the brain to communicate better, resulting in:
  - Better behavior due to better impulse control
  - Improvements in schoolwork
  - Increased cognitive function and memory
  - Better coordination
  - Etc. We don't have all of the answers yet!

Directionally, the corpus callosum is located underneath the cerebrum at the midline of the brain. It resides within the interhemispheric fissure, which is a deep furrow that separates the brain hemispheres.

https://www.thoughtco.com/corpus-callosum-anatomy-373219


Sulcus centralis
Lobulus paracentralis
Gyrus cinguli
Praecuneus
Corpus callosum
Septum pellucidum
Genu
Ventriculus tertius
Splenium
S. parietooccipitalis
Cuneus
S. calcarinus
Lobus frontalis pars supraorbitalis
Cerebellum
Pons
Medulla oblongata
Hypophysis
Ventriculus quartus

The corpus callosum is a thick band of nerve fibers that divides the cerebral cortex lobes into left and right hemispheres. It connects the left and right sides of the brain, allowing for communication between both hemispheres. The corpus callosum transfers motor, sensory, and cognitive information between the brain hemispheres.

Function

The corpus callosum is the largest fiber bundle in the brain, containing nearly 200 million axons. It is composed of white matter fiber tracts known as commissural fibers. It is involved in several functions of the body including:

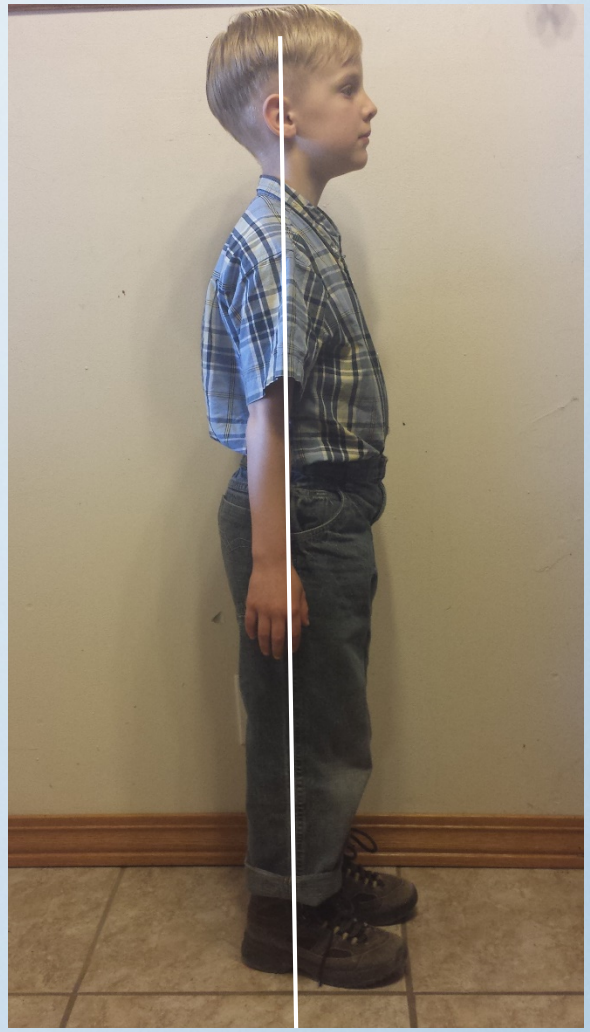
- Communication Between Brain Hemispheres
- Eye Movement and Vision
- Maintaining the Balance of Arousal and Attention
- Tactile Localization
- https://www.thoughtco.com/corpus-callosum-anatomy-373219

Where are the body's midlines?

Coronal

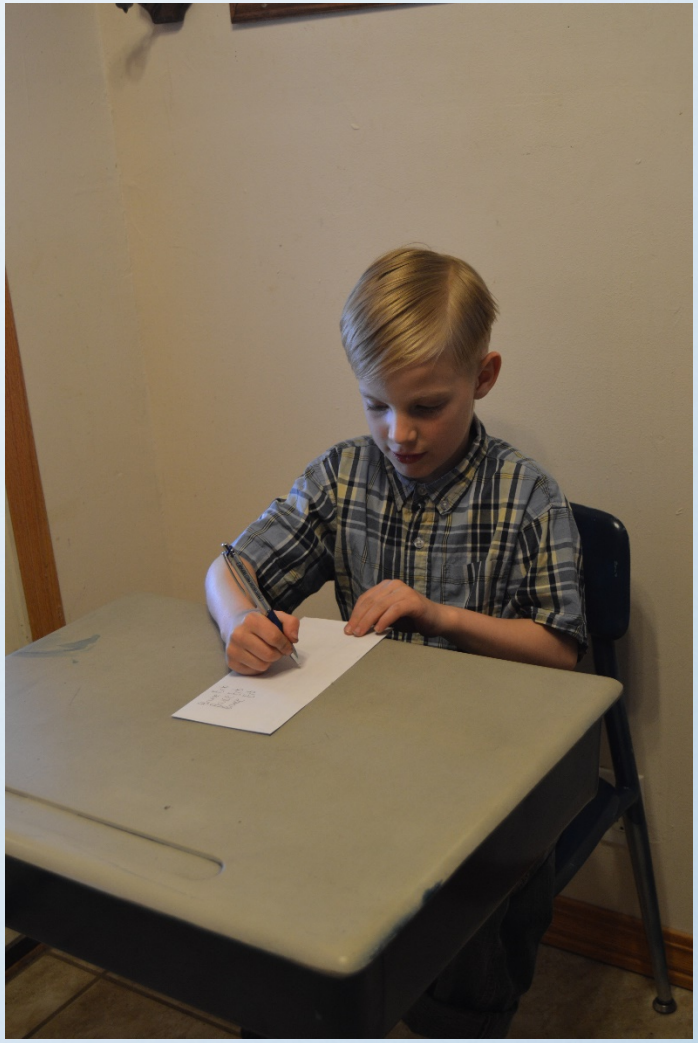
Horizontal

Sagittal



Observing children with midline crossing difficulties

Children **without** midline difficulties *generally sit straight in their chair* because they can use both sides of their brain together easily.



Observing children with midline crossing difficulties

Children with midline issues tend to sit crooked and try to do all of their work on one side of the body.

Observing children with midline crossing difficulties

If children are expected to draw on a large paper that crosses their own midline, they will often switch the pencil to the other hand.

Children develop large muscle groups first then work towards refining smaller muscle groups. So in order for a child to be able to cross the midline in reading or writing later on in life, having a good foundation in crossing midline for gross motor movements is important.

- https://www.growinghandsonkids.com/10-crossing-midline-activities-for-toddlers.html

Why Is Midline Crossing Important?

On the **brain level**, a lack of midline crossing may indicate that the left and right sides of the brain (the left and right hemispheres) are not communicating well together.

Because each hemisphere carries out different tasks, it is important for each hemisphere to **communicate** with the other across the corpus callosum in order to **coordinate learning and movement**.

https://www.ot-mom-learning-activities.com/crossing-the-midline.html

- On a **physical level**, when your child spontaneously crosses the midline with the dominant hand, then the dominant hand is going to get the practice that it needs to develop good fine motor skills.

  If your child avoids crossing the midline, then both hands will tend to get equal practice at developing skills, and your child's true handedness may be apparently delayed, and fine motor skills may not be as good as they could be.

  One of the factors affecting handwriting is having a specialized, strong hand that does a good job of controlling the pencil.

  If both hands are being used equally, then your child may well end up with 2 mediocre hands rather than one strong, specialized hand.

  And mediocre hands do not produce great handwriting!

Midline Exercises and the Frontal Lobe

- According to researchers, the frontal lobe is responsible for shaping observable behavior and personal characteristics. It controls things such as personality, voluntary movements, impulse control, problem-solving, motivation, sexual and social behaviors.
- The **left and right sides** of the frontal lobe handle some different functions. The right frontal lobe is primarily associated with non-verbal skills, such as interpreting social cues. The left frontal lobe has greater control over language expression.
- Both the right and left sides of the frontal lobe communicate with each other, so **damage to both sides** tends to have more profound effects.
- https://www.verywellhealth.com/frontal-lobe-head-trauma-1720020

As you monitor your child's development, if you notice they can't cross the midline, they may need additional help to improve their learning in the classroom. Without additional help, you may continue to notice delays in your child's learning or side effects that can cause toe walking, W-sitting, bed wetting, poor balance and coordination, underdeveloped vestibular and **proprioceptive systems**, and trouble with motor planning.

- https://ilslearningcorner.com/2016-02-cross-the-midline-crossing-the-midline-exercises-using-arms-and-legs-for-brain-integration/

Proprioceptive System

Proprioception, sometimes referred to as the sixth sense, informs us of our body position in space. Receptors for this system are located primarily in our muscles and relay information on muscle length and tension. This allows us to know where our joints are positioned as well as the amount of force against our body and the effort our muscles need to apply at any given time. To get an idea of how the proprioceptive system works, imagine closing your eyes and having someone move your arms to an extended position in front of you.

Even though you can't see them, you can feel that your arms are outstretched. Now if someone were to place 10 pound weights in each hand, your proprioceptive system would signal for you to make one of two decisions. Either let your arms fall to your sides due to the increased force or contract your muscles with greater effort to match it. We rely heavily on this sense throughout the day to keep track of what our bodies are doing. …Proprioception is necessary for building body awareness and security in how we fit in with our environment.

Proprioceptive Dysfunction

- Many children with processing disorders report feeling scattered or disjointed which may be related to a faulty proprioceptive sense. Children who are clumsy, uncoordinated, and sensory seeking are often experiencing proprioceptive dysfunction. The following are common signs of proprioceptive dysfunction:
- Sensory Seeking (pushes, writes too hard, plays rough, bangs or shakes feet while sitting, chews, bites, and likes tight clothes)

- https://blog.brainbalancecenters.com/2015/08/proprioception-explained

- Poor Motor Planning/Control & Body Awareness (difficulty going up and down stairs, bumps into people and objects frequently, difficulty riding a bike)
- Poor Postural Control (slumps, unable to stand on one foot, needs to rest head on desk while working)
- These children often self regulate by engaging in behaviors that provide proprioceptive input such as toe walking, crashing, running or flapping. One study found that proprioceptive difficulties among children may contribute to decreased motor planning and postural control leading to disruptive behaviors that negatively affect their participation in daily tasks.

How to know if my child can't cross the midline

If your child can't cross the midline, you may see some of the following signs:

- **Uses right hand activities on the right side of the body and uses left leg activities on the left leg of the body.**
- **Has trouble with tracking words from right to left**
- **Poor fine motor skills (pencil grip, handwriting)**
- **Has trouble switching different feet and arms in sports.**
- **Had developmental delays as a child (crawling, jumping, skipping)**
- **Poor muscle tone (neck, arms legs) and balance and coordination**
- **Switches hands when drawing, painting, coloring**
- https://www.growinghandsonkids.com/crossing-midline-exercises-for-kids.html

Children who have difficulty crossing midline may appear ambidextrous because they are often observed using both hands, but they actually have a hidden neuroprocessing issue. Both sides of their brains are not communicating, resulting in decreased coordination, decreased motor control of movements and difficulties achieving higher level skills. Often, these children end up with two unskilled hands.

REVIEW OF LITERATURE

- An article addressing this issue but within the framework of math discusses the difficulties that students might have with math if they are not proficient at crossing their body's midline.
- The author also discusses ways to spot these students in the classroom so that steps can be taken to help the student with the techniques that they need to be successful.
- This includes sitting sideways in the chair, turning the paper at odd angles, and other such behaviors.

Mackinder, L. (2010). How_the_body_midlines_affectmath_.PDF. *Lilipoh*, 45–51.

REVIEW OF LITERATURE

A study discussing autistic children on the island of Oahu found:

- There was a **significant difference** in the manifestation of **off-task behaviors** in autistic children when midline crossing exercises were performed at the beginning of the school day.
- This difference was apparent the very day the exercises were done, and different classrooms were asked to complete the exercises on different days according to a coin toss.

Dustow, J. E. (2007). *DO BILATERAL EXERCISES THAT CROSS THE MIDLINE DECREASE OFF TASK.*

REVIEW OF LITERATURE (CONTINUED)

A study that focused on movements and brain exercises was performed on senior citizens in Jakarta

This study concerned memory deficits and attention span.

The results of this quantitative study showed that the subjects showed **increases in cognitive performance and memory** after brain movement and exercise.

Sidiarto, L. D., Kusumoputro, S., Munir, R., & Nugroho, W. (2003). The efficacy of specific patterns of movements and brain exercises on the cognitive performance of healthy senior citizen in Jakarta, *12*(3), 155–161.

Should this be true, although not all directly discussing academic performance, it would stand to reason that the benefits of better cognitive performance would also help students in the classroom, including with their **reading scores**.

Reading is a midline crossing activity.

When considering that midline crossing exercises can help:

1. Memory and cognitive function
2. Limiting off-task behaviors
3. The ability to write
4. Coordination
5. Math scores

Also considering that reading, by its very nature,
is a midline crossing activity,

It would be wise to consider whether daily
midline crossing exercises
will help to improve reading scores in children.

A variety of studies have suggested that early music training might be related to greater amounts of white matter in the corpus callosum. This study compared white-matter organization using diffusion tensor imaging in early- and late-trained musicians matched for years of training and experience.

The researchers found that early-trained musicians had greater connectivity across the corpus callosum. Musical training and practice at a young age improved due to the sensorimotor synchronization required to play an instrument. They concluded that training before the age of 7 years results in changes in white-matter connectivity that may serve as a solid scaffolding upon which ongoing experience can maintain a well-connected brain infrastructure into adulthood.

https://www.psychologytoday.com/us/blog/the-athletes-way/201311/musical-training-optimizes-brain-function

Thinking
starts
with
movement!

Helping your child cross the midline as they grow is very important for their brain's development. Midline crossing activities are often tied to higher learning skills such as speech, language, handwriting, reading, tracking objects, math sequencing, sensory integration, body awareness and other important skills for critical thinking.

It's also important for helping children retain information, improves attention and focus and allows them to listen to the teacher as they give directions (auditory processing).

Crossing the midline helps the right and left sides of the brain together. If we only work one side of the brain, the other side may become weaker, which could cause gaps in learning. Learning tools that come naturally for some children (organizing thoughts on paper, executive functioning, writing, comprehension and sitting still in a chair) **may not** come so easily to others who **can't cross the midline**.

- https://ilslearningcorner.com/2016-02-cross-the-midline-crossing-the-midline-exercises-using-arms-and-legs-for-brain-integration/

Dyslexia

Crossing midline all starts with crawling, which typically develops around age 7-11 months. Crawling is a very important developmental milestone. For many children, especially those with Autism, Dyspraxia (motor in-coordination), or Dyslexia, they may have "skipped" the crawling stage all together. Crawling is important because it works on upper and lower body dissociation, trunk/core rotation, weight-bearing/weight shifting, reciprocal movement patterns, and dynamic movement transitions (ie.: quadruped to side sit, quadruped to ½ kneel, etc.). This is also a precursor for crossing midline which is necessary for the brain to communicate across the corpus collosum, the thick band of nerve fibers which connects the two brain hemispheres. This is required for higher level skills such as reading and writing. In fact, research has shown that children with dyslexia have smaller, less developed, corpus callosums.

https://pollyheilmealey.com/2014/06/13/the-importance-of-crossing-the-midline-in-child-development/

Furthermore, when a child has difficulty crossing midline, it can affect his/her ability to read. While the child is moving his/her eyes from left to right across the page, the eyes will stop at midline to blink and refocus; however, when this happens, the child will very frequently lose his/her place on the line and become confused as to where they left off. It also affects handwriting, as diagonal lines cross the midline, and the child may need to stop in the middle of the page to switch hands when writing from left to right. Many self care and daily living skills require crossing midline. For example, perfecting the skill of putting socks or shoes on requires one hand to cross over to the other side of the body.

There has been at least one study providing evidence that early musical training enhances the development of white matter pathways in the corpus callosum (CC) and temporal lobe that support interhemispheric interaction and sensorimotor integration during a sensitive period around 7 years of age.[1]

https://www.quora.com/How-do-I-strengthen-the-corpus-callosum

An understanding of the concept of a steady beat helps a child speak and read with a smooth cadence, thereby enhancing communication abilities and reading comprehension. After all, the same sense of steady beat experienced in music can be experienced when reading. Ever try reading a Dr. Seuss book without a sense of rhythm or steady beat? One fish, two fish, red fish, blue fish just wouldn't be the same without it! It's no wonder that research shows children who can keep a steady beat score higher on reading assessments. They also rate higher on math tests AND behave better in class.

https://www.kindermusik.com/mindsonmusic/kindermusik/steady-beat-its-more-than-just-music/

Midline Exercises

The midline crossing exercises will include exercises that:

Cross the horizontal plane midline, which bisects the body at the waist,

Cross the midline between the right and left hemispheres of the body,

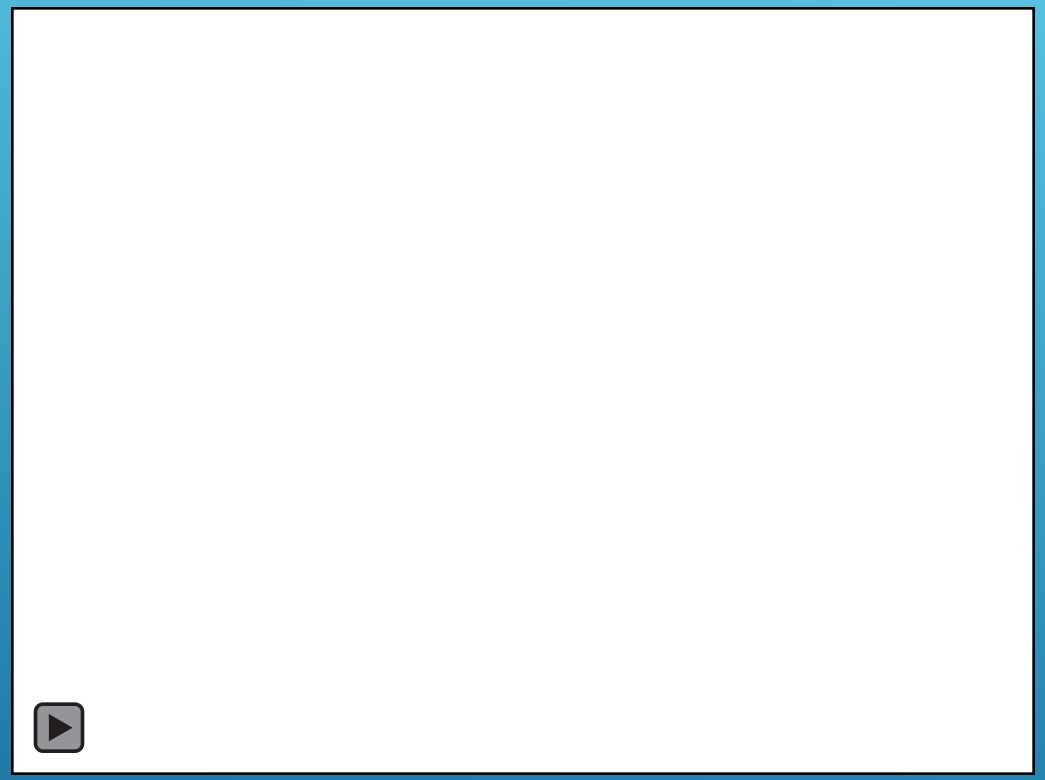
Cross the midline between the front and back parts of the body.

Many different exercises can be used as long as they cross the body's midlines.

Modified Grapevine

Put right foot over left, then straighten out.
Then right foot behind left, then straighten out.

Then left foot over right, then straighten out.
Then left foot behind right, then straighten out.



Clapping hands, then slapping the hand of a partner in front of them, right hand to right hand and then left hand to left hand, in the game Peas Porridge Hot for two minutes.

Standing on one foot for a period of time, lengthening out during the course of the study, then standing on the other for the same amount of time.

Lifting the left leg and touching the knee with the right elbow, then lifting the right leg and touching the knee with the left elbow, repeating both alternately for two minutes.

Handing off an object around the back and bringing it to the front again to change hands again.

Rhythm Sticks!

Feeling a steady beat – essential for reading skills

Crossing the midlines with them

Learning songs with fun reasons for repetition

A BYU-I student that worked with a disabled 16-year-old young man noticed that on the days they had dance in the mornings, he was much better behaved and did better on his schoolwork.

A first-grade teacher did midline exercises every morning, knowing that her students would do better in her classroom.

References

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