



Parent's Corner: Arousal

What is arousal?

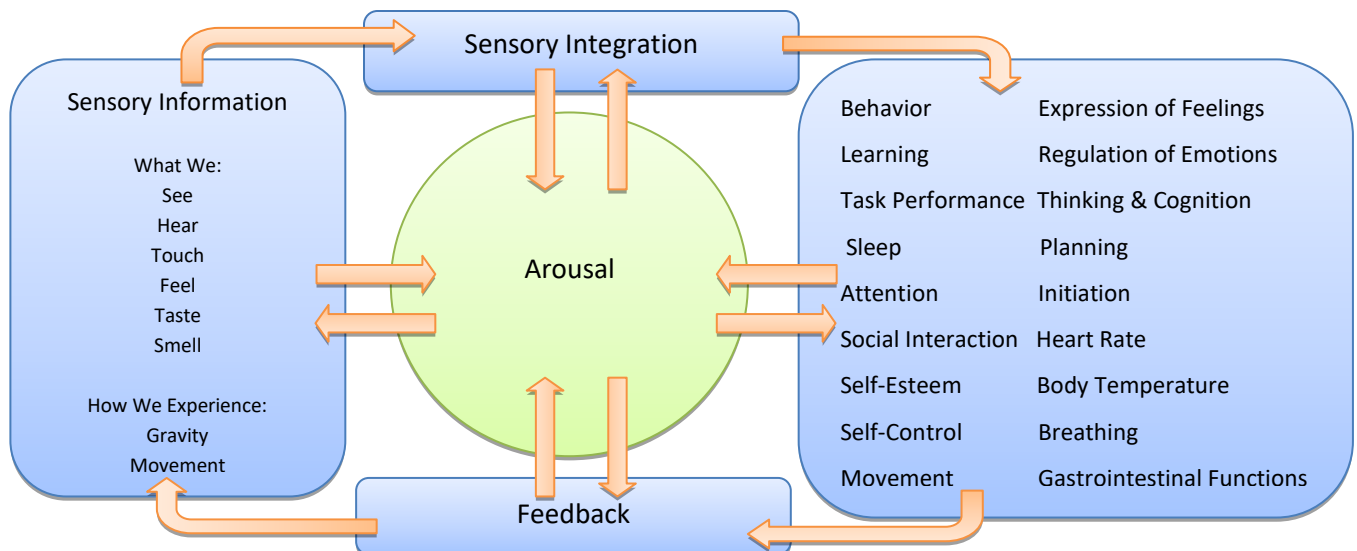
Arousal can be considered a state of the nervous system describing how alert one feels, ranging from extremely alert to not very alert at all (and everything in between). In order to attend, plan, relax, and perform tasks in a manner suitable to the situational demands, one's nervous system must be in an optimal state of arousal (or neurological readiness) for that particular task. *Self-regulation* is the ability to attain, maintain, and change arousal appropriately for a task or situation. Most individuals regulate their arousal levels throughout the day, with no conscious thought or effort. In the morning when one wakes up, one moves from a low arousal state (sleep) to an optimal level (commensurate with the demands of the situation) so one can engage in the day's activities. When the day is done, one moves back to a low arousal state in order to fall asleep.

Arousal levels fluctuate throughout the day in response to various sensory events (e.g. a car honking on the freeway or burning one's hand on the stove may momentarily startle [increase arousal], eating too much for lunch may produce a brief food coma [decrease arousal]), but most individuals are usually able to regulate their nervous system so that their arousal stays within an optimal zone. Some individuals, however, are unable to regulate their arousal level and may experience:

- 1) low arousal through much of the day (e.g. cannot seem to get going, unable to focus, lethargic, slow, sedentary).
- 2) high arousal through much of the day (e.g. seems unable to calm, hyperactive, unable to attend, unable to be still, minor incidents result in major meltdowns, easily overwhelmed).
- 3) large fluctuations through most of the day ranging from very low to very high arousal and everything in between, resulting in a mismatch between the situation and the response (e.g. high arousal when it is time to sleep or low arousal when it is time to play).

How does sensory input affect arousal?

We are constantly receiving sensory information from our body and environment. This information is processed and integrated in our brain. When sensory information is processed and integrated appropriately, a response appropriate to the situation is the result, which allows for concentration to complete homework, attention to learn, or a sense of calm and focus to read a book or fall asleep. This is the case when one's arousal is at an optimal state. However, when there is a problem in this process (e.g. too much/little sensory information or a problem with processing and/or integration of sensory information), we experience a level of arousal that may be too high or too low to respond adequately to the demands of the situation. Each of the sensory systems can impact arousal by either increasing or decreasing it. The vestibular and proprioceptive systems, however, have direct connections with the part of the brain that controls arousal. When a child has difficulty processing vestibular and/or proprioceptive sensory information, arousal is frequently impacted as well. As vestibular and proprioceptive information is better processed, arousal tends to become more optimal. Hence, in therapy, we use vestibular and proprioceptive information to modulate arousal levels, or bring arousal to an optimal level to match what is required for the task at hand. The following image may help to understand this process:



Note: Portions taken from *How does your engine run?: A leader's guide to the Alert Program for self-regulation*, Mary Sue Williams & Sherry Shellenberger, 1994. Handout created by Samantha Beaumont and Irvine Therapy Services, Inc.

Take a moment to think about yourself. When you are in a meeting at work, what do you do to maintain your ability to stay awake (increase arousal) and concentrate on the topic at hand? Do you drink coffee, chew gum, tap your leg, or doodle on your notepad? These are sensory strategies you use, without thinking about it, to increase or maintain your arousal at an optimal level. Now think about what you do before going to bed. Do you “wind down” (decrease arousal) with a cup of tea, dim the lights, light a candle, or listen to soft music? Again, these are sensory strategies that calm the nervous system that you naturally use to bring your arousal to an optimal level to fall asleep. Most of the abovementioned strategies are using the tactile, auditory, gustatory, olfactory, and/or visual systems. These systems provide more subtle changes in arousal compared to the more intensive proprioceptive and vestibular systems. When there is a problem in the regulation process, one often requires vestibular and/or proprioceptive information to regulate arousal, since these systems have a more intense effect due to their direct connections to the “arousal” area of the brain.

How does vestibular information affect arousal?

The *Vestibular System* provides us with our sense of total body movement. Our vestibular receptors in the inner ear, along with the proprioceptors, give us information that helps organize the nervous system and influences postural responses, postural adjustments and eye movements, muscle tone, balance, body percept, emotional development, and behavior. Vestibular information can be alerting or calming. Slow, rhythmic, linear swinging (back and forth or side to side) is often calming and organizing to the nervous system; in other words, it decreases arousal. Fast, arrhythmic movement or spinning can be alerting, but too much of it can cause disorganized behavior and increased arousal. For example, imagine two children who both need to complete their homework assignments. One child’s arousal is too low and the child lacks the initiation and the attention required to complete his homework. The other child’s arousal is too high and he cannot sit still long enough to concentrate on his assignments. The child with low arousal may benefit from fast, arrhythmic vestibular movement (e.g. spinning on a playground swing) in order to increase arousal to an optimal level to do his homework. However, the child with high arousal may benefit from slow, linear vestibular movement (e.g. rocking in a rocking chair) to decrease arousal to an optimal level to complete the assignment.

How does proprioceptive information affect arousal?

Proprioception refers to the sense of position of our body parts in relation to our own bodies. When we shut our eyes, we know where our limbs are because the receptors in our joints, tendons, fascia and muscles are giving us such information. Proprioceptive processing is essential in coordination and integrating movement, because it allows us to know where our arms and legs are in space. Proprioception helps to modulate vestibular information, or “balance it out” so a child does not become over-aroused after intense vestibular experiences. Proprioception typically helps to calm the nervous system and decrease arousal. However, it is important to note that some proprioceptive information can be alerting to some children, especially depending on the specific proprioceptive activity (e.g. crashing into pillows or objects is typically more alerting). One way proprioception can be obtained is by engaging in *heavy work* activities. These activities involve pushing, pulling, or carrying heavy objects. Thus, heavy work helps to *calm and organize* the nervous system. If arousal is high, heavy work activities may bring arousal down to a more optimal level.

Some specific examples of activities that provide calming proprioceptive input include (but are not limited to):

- Hang (upright and/or upside down) on monkey bars or chinning bar.
- Climb on the jungle gym (e.g. ladders, ropes, and stairs) or up slides.
- Crawl through tunnels or small spaces.
- Pull a heavy wagon to the park.
- Dig in the sandbox.
- Jump on the ground, a wobble bridge, or a trampoline.
- Bite down on hard foods, eat chewy foods, or suck thick liquids from a thin straw.
- Carry heavy books, groceries, laundry, or other heavy items.
- Garden, dig, rake leaves, and do other yard work.
- Carry heavy items at home (e.g. groceries or laundry) or take out the trash.
- Give yourself or someone else hugs/squeezes.

It is important to note that all children respond to sensory information in their own special way. Talk with your therapist to discuss specific activities that may help YOUR child modulate his/her arousal.