

winther

Insights

Children learn by moving. To support and encourage children in their play activities, it is important that we give them access to a wide range of toys that inspire many different types of play.

All Winther's products are designed to make children want to play. Our products invite activity. They create that magical space where youngsters lose themselves in play; involved, happy, and active. In this environment, children form healthy habits that will last a lifetime.



Sigrid Mitchell is a qualified physiotherapist, that has worked for many years developing motor skills in children of all ages at Copenhagen International School, Herlev District, as well as in her own clinic.

She has, the last few years, been developing her specialism in Brain based training, through Z Health performance and The Franklin method, in which she uses applied neurology in combination with exercises to stimulate improved performance.

The Physiotherapist has the floor and gives her professional assessment of how children can benefit from a good biking tradition.



By physiotherapist, Sigrid Mitchell

Biking is a part of life in many cultures and becoming more in others. It is a skill that gives you lifelong opportunities and builds a foundation for a healthy life of movement.

Biking stimulates the brain widely: Vision, vestibular system (balance), proprioception (joints and muscle), Cerebellum and all the other senses. Cerebellum refers to hand/eye and foot/eye coordination, which are skills in high demand, when navigating by physical and visual input.

Vision

Both the peripheral vision, near/far and focal vision are stimulated when navigating through the surroundings, avoiding obstacles and other bikers using saccades, smooth pursuit, converging and diverging.

Vision is an incredibly complex system that creates large amount of activation over many areas of the brain.

70-90% of the sensory input comes from the vision and is governed by both reflexive and cognitively driven mechanisms.

The vision controls up to 70% of postural activities and is directly connected to the vestibular system by the VOR (vestibule ocular reflex) to have smooth visual information available while moving through the world.

The eyes are each controlled by 6 muscles. Vision is therefore a skill and requires practice to be used efficiently.

Vision can be divided into 5 skills:

Gaze stabilization: the ability to stay in focus on a target over time in all directions.

Smooth pursuit: the ability to move the eyes in all directions to follow an object.

Saccades: the ability to switch between targets in all directions while staying in focus.

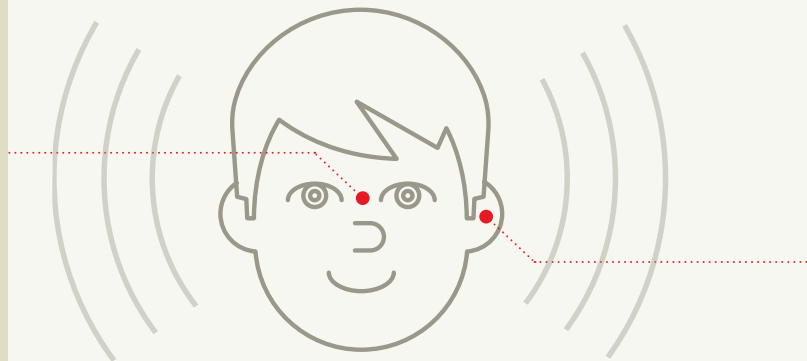
Near/far: the ability to switch between converging and diverging while staying in focus.

Peripheral vision: the ability to stay aware of the surroundings while having one focus point.

How biking affects your vision

When children are riding a bike, trike or scooter and navigating through the surroundings the eyes are constantly switching between all of the above skills, the gaze stabilization when focus is on one target to navigate around, smooth pursuit when following a moving target to navigate around, saccades when switching between focus points to keep an eye on surroundings and potential obstacles, near/far when switching between objects far, to plan a head the route, and near, navigating where you are right now, and the peripheral vision will constantly be in use and adjusting in combination with each of the other four skills in order to react quickly to any changes in the surroundings.

As these skills are practiced and deepened, the ability to switch between skills becomes smoother and happens quicker which in turn means the rider can move with more coordination and speed, which in turn challenges and deepens the practice and transitions between the skills. In other words, the more you practice the better your vision becomes, the better you can cycle.





Vestibular system

The canals and otoliths of the inner ear are both stimulated, when the body is moved forward, backwards or sideways compared to the surroundings, and turning the head to observe and navigate.

The vestibular system is very small, placed in the inner ear, but with a big impact upon movement and postural alignment. The system registers which way is up and where the body is in space, as well as the direction of movement, through movements of the head. It keeps the body balanced and reflexively delivers information to postural muscles.

The system is built up of 3 semicircular canals (horizontal, Anterior, Posterior) and 2 Otoliths (Utricle, Saccule containing the ear stones) on each side of the head.

The 3 canals register head motions and velocity of movement.

The Otoliths register linear acceleration and are divided into the **Utricle** which registers horizontal linear acceleration and head tilt when the body is upright and the **Saccule** which registers vertical linear acceleration and head tilt when the body is lying down.

Balance is a reflective skill and is therefore trained by improving vision and proprioception, as well

as the sensitivity of the canals and Otoliths to register head movements through actions such as tumbling, rolling, spinning and moving at different speeds.

How biking affects your vestibular system

When children are riding on a bike, trike or scooter and moving forward and staying up right stimulating the Otoliths - mainly the Utricle, but the Saccule will be registering when going over bumps.

When you move your head to navigate you stimulate all 3 canals, which tells the brain the position of the head compared to the horizon, so the brain can make sure the body counter adjust, so you do not fall.

The different bikes challenge the canals and otoliths on different levels.

The **Winther push bikes** have a lot of support from the seat and the feet has contact to the ground, so the challenge of staying up right is small, but the moving forward and navigating systems are full on.

The **Winther Tricycles** are more stable being supported on the ground by the three wheels, but now the feet are not on the ground but on the pedals, which gives a little more challenge to the Utricle and the canals to keep the body up right, while they still register the forward movement and navigating.

The **Winther Bicycles** have not got the extra support and therefore is the most challenging together with other two-wheel models.

The **Winther Scooters** also challenge the balance, instead of sitting you are standing on one leg while pushing the scooter with the other leg, in between balancing on the two wheels, moving forward and navigating.



Proprioception

When joints are moved and muscles are activated continuously the brain is working to make sure that the movement is the right for the task, stimulating big areas of the brain.

Proprioception is creating a 3-D awareness map of the body in space and time, composed by the brain, spinal cord and peripheral nerve endings.

There are several different Peripheral nerve endings, but 5 of the main ones are:

The mechanoreceptors signal tension, speed and angle of movement from periphery to the brain and predicting movement through the environment.

Baroreceptors senses pressure. Here the interesting ones are in the feet and hands. The ones in the feet are a big part of the balancing system. And the ones in the hands gives the ability to manipulate objects and tools.

Chemoreceptors, signal chemical changes in tissues.

Thermoreceptors signal differences in temperature in our environment.

Nociceptors also called threat receptors, signal threats to the brain and carry pain signals from the brain. All of these signals are integrated in the brain and the better and more correct the signals are the more coordinated the body can move.

The mechanoreceptors are the main signals in creating the awareness map. The better the movements of the joints and ability to tension the muscles, the more detailed awareness map the brain has and can coordinate the bodies movements better and learn new skills faster.

Movements of the joints and tensioning of the muscles are skills and can therefore be trained through practice.

How biking affects your proprioception

When sitting on the saddle, or with the feet pressing the pedals or the hands holding the handlebar the brain recognizes the contact with the bike and acts as if it has become an extension of the body.

When cycling you are moving joints in the foot, ankle, knee and hip as well as stabilizing the joints in the arms and spine, using muscle tension, the Baroreceptors register pressure in the hands holding and steering the handlebars and the feet pressing on the pedals.

The brain is continuously working to adjust the tension and pressure, in response to the signals it receives, to make sure the movement fits the task, with regards speed and balance.

The **Viking Swingcart** challenges the proprioception by making the upper body the mobile part and the lower body the stabilizing part. It demands good upper body strength and coordination developing your non-dominant side as it is this side that determines the strength to be used and therefore speed travelled, otherwise you end up going around in circles.

The **Viking Foot Twister** challenges the proprioception of the lower body by changing the classic pedals to a twister where the pressure applied determines the direction and the speed.

Other Senses

The tactile sense is stimulated by the wind, air temperature, sun, rain felt on the skin of the face and body. Also, the smell and sound are stimulated.

None of the above works individually, it is a great network working together and by each other so the brain can collect experiences to improve decision making and predicting possible actions.



Learning by Moving

All in all the biggest benefit is learning new skills by joyful play with multiply repetitions, failing and trying again which create this unique myelination process in the brain, where the nerves gets extra insulation of its axon enabling them to transport the signals/information faster, enabling you to get really good at what you are doing.

Therefore, it is important to challenge children physically in many different ways, so they keep exploring the opportunities of the brain and body.

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