



**FUNDACIÓN CENTRO SAN JUAN
DE JERUSALÉN**

**NEUROFUNCIONES EN EL
RENDIMIENTO ESCOLAR**

**QUITO- ECUADOR
2020**



SECOND DISCUSSION GROUP

TOPIC: "Neurofunctions in school performance"

DATE: Thursday May 24, 2020

WRITTEN FOR: Teachers, Educational Psychologists, Psycho-Pedagogues, Occupational Therapists, Speech Therapists, and parents.

Objectives:

- Demonstrate the importance of neurofunctions during early childhood and their relationship with the structuring of reading, writing and arithmetic through an interdisciplinary intervention.
- Describe clear and practical procedures for stimulating the development of neurofunctions.
- Explain the methodology of pedagogical corners with a neurofunctional approach.



1. DEVELOPMENT OF NEUROFUNCTIONS AND THEIR IMPORTANCE IN THE ACQUISITION OF READING, WRITING AND ARITHMETIC

Leslie Carrillo, licensed Occupational Therapist from the Foundation, explains the meaning of neurofunctions and the importance they have in the acquisition of reading, writing and arithmetic in her presentation; she also outlines the process of stimulating each neurofunction.



Learning is a process in which the subject generates or builds knowledge through experience, manipulation of objects and interaction with people (Jean Piaget)

At first learning is achieved through the senses, this sensation is perceived and stored in memory, then it will become learning that can be recalled whenever needed.

Neurofunctions are mental abilities that are developed from birth and acquire a leading role in preschool education, both in the sensorimotor stage, between 1-3 years of age, when the child is an explorer, and from 3 to 5 years, when



neurofunctions are completing their development and will be integrated into thought; this is why it is necessary for teachers to have an understanding of neurosciences and neurodevelopment, with the purpose of providing adequate stimulation and preventing errors in learning, especially in reading, writing and arithmetic.

The social isolation caused by the Covid-19 pandemic limits children of these ages to develop these neurofunctions through bodily experiences and also poses a threat to the acquisition of social skills.

❖ Division of neurofunctions

Neurofunctions are the foundation of the processes of reading, writing and arithmetic. The body schema is the first neurofunction to develop and from this the basic motor behaviors will develop (balance, visual-motor coordination, general dynamic coordination), neuromotor behaviors (fine motor skills, laterality) and perceptual motor behaviors (rhythm, spatial and temporal structuring); in addition, to achieve consolidation of learning, it is important to stimulate complex mental functions such as language and executive functions.



❖ Detection of difficulties in neurofunctions

Leslie mentions that the first people who will be able to identify difficulties or deficiencies in neurofunctions are teachers, since they interact with children on a daily basis, parents can also detect difficulties when carrying out activities at home. The warning signs in a child with problems in the development of neurofunctions are:



- Different development from that of their peers.
- Dislike or fear of doing activities using their body (expressive art and design activities, gross motor exercises, attention problems, etc.)
- They do not consolidate learning.
- They find it difficult to complete tasks the teacher sends home.
- Reading, writing and arithmetic activities, etc frustrate them.

When the risk signs have been detected, it is important to refer to a specialist Neuropsychologist or Child Psychologist, so that evaluation tests can be performed appropriate to each case. According to the results referral will be made to an

Occupational Therapist or Speech and Language Therapist; for the education or re-education of the deficient neurofunctions.

❖ **Development of neurofunctions in children with disabilities**

The development of neurofunctions in a child with disabilities will vary depending on the limitation that each child presents, they can be cognitive, motor or sensory, this is why Leslie says that the therapist's intervention is personalized depending on each child's need.



A child with physical disabilities presents limitations in their motor abilities that prevent or limit the movement of their body, because of this difficulty, the child will not adequately perceive the sensations that their body produces when moving, for example: the child has problems moving themselves forwards, backwards, or going up and down a slide, now these feelings of movement help children learn the concepts of space; so this child with motor limitations will not have this experience, and consequently it will be difficult for them to perceive and learn these concepts.

Leslie explains that having this difficulty, makes the job of the adult (parents, teachers, therapists) very important, since they are going to be the facilitator of movement and will generate the bodily experiences.

Also, it is common for children with cerebral palsy to have alteration in feeling, especially when a stimulus is put on the touch receptors, this sensation generates discomfort or displeasure that can even appear to hurt the child, so it is important that the Occupational Therapist and the family work on desensitization of touch, since this discomfort can limit the child in the development of manipulative abilities, fine motor skills and, for that matter, writing difficulties.

In children with cognitive disabilities, neurofunctional activities should be according to the child's cognitive development, not their chronological age, professionals should adapt the activities for the child, doing them with short instructions, and with clear, simple language.

❖ **The Role of Occupational Therapists in the intervention of difficulties in the development of neurofunctions in children with disabilities.**

Occupational Therapists are specialists in the development of basic functions for learning, they have knowledge on how to improve the quality of life of a child with disabilities both

in their independence and in the stimulation of learning to achieve educational inclusion. The therapist's intervention will be done in the following manner:

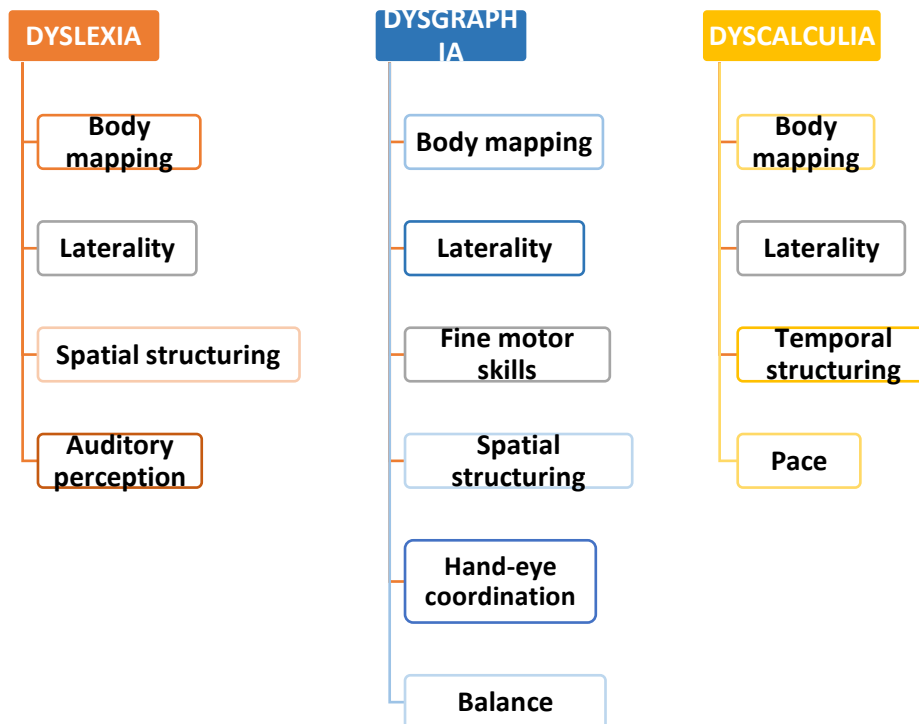
1. Assessment using standardized tests in order to identify the neurofunction in need of education or re-education.
2. Intervention in the education and re-education of neurofunctions using multisensory stimulation techniques.
3. Intervention in the education and re-education of higher mental functions necessary for the consolidation of learning.
4. Adapting learning tools, with orthotic accessories or assistive technical aids.



❖ **Specific learning disorders and their relation to neurofunctions**

Leslie mentions that learning disorders are highly related to insufficient stimulation of neurofunctions, or failure to acquire them.

Learning disorders affect a child's ability to receive, process, analyze or store information. The neurofunctions associated with each learning disorder are:



- ❖ The role of the Occupational Therapist when intervening in learning disorders associated with inadequate development of neurofunctions.

Occupational Therapists are specialized in the detection and intervention of children with learning disorders. This process is carried out in the following manner:

1. Evaluation of the origin of a learning disorder using standardized tests.
 - The Harris Test (observation of laterality)
 - The Frostig method of evaluating visual perception
 - The d2 Test of Attention
2. Education and re-education of neurofunctions: Intervention in, and education or re-education of, a deficient or absent neurofunction



❖ GUIDE TO THE STIMULATION OF NEUROFUNCTIONS

The stimulation of neurofunctions should be done using 5 very important aspects:

1. Providing the child with corporeal experiences (through their senses).
2. It should be done through play
3. The stimulation or intervention should be guided by an adult.
4. A clear explanation, with simple instructions should be used
5. Lastly, we will use repetition



✓ Body mapping

The body map is a representation of the body, an idea that we have about our own body and its different parts, and about the movements that we can or can't do with it. It's a mental image that we have of our body in relation to our environment, while in a static or dynamic state.

The process of recognising the body map must be stimulated by adults in the following manner:



1. Teaching the child to recognise his body parts.
2. To feel his body, the sounds, the movements and the strength of each of his body parts.
3. To recognise it visually.



✓ **Laterality**



Laterality is the preference shown by the majority of human beings for one side of their own body

The stimulation of laterality will likewise, be done by fulfilling the following steps



1. Stimulate one side of the body, and then the other side
We play games in which the child uses one side of the body, followed by the other side. For example, they kick the ball with one foot, followed by the other (we don't say yet whether it's the left or right foot).

The objective is for the child to perceive their capacity, or ability to carry out, the movements with each part of their body. It also has benefits such as:

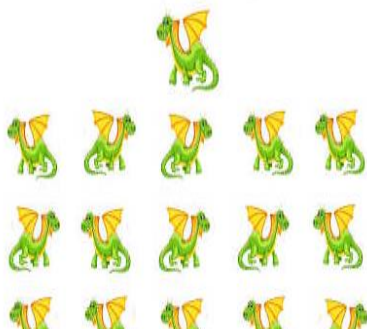
- Engage both cerebral hemispheres.
- It allows the child to feel both sides of their body and decide with which side they feel most comfortable or most able.
- This will be the child's preferred side, which will later be defined as dominant.



2. Half consciousness:

This allows the child to recognize that their body is one unit, that is simultaneously made up of two parts

The child can be placed in front of a mirror divided into two parts.



3. Directionality

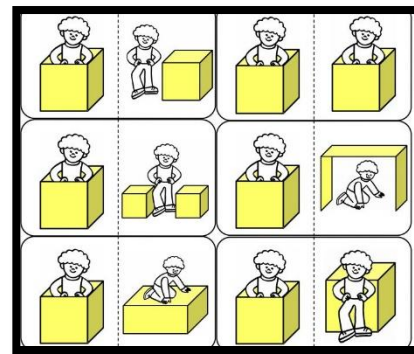
Stimulate the child's capacity to distinguish that he's going in the same direction, and in reverse

This will develop the child's perception of their position in space, which is related to differentiating letters such as p and q, or b and d

✓ Spatial structuring

This is the ability to process the distribution and organisation of objects in space. The stimulation of this neurofunction, along with other neurofunctions, should be done with respect to developmental milestones, in the following manner:

1. Spatial location: recognizing the concept of your own body
2. Spatial organisation: Recognizing the concept of our environment
3. Spatial structuring: The ability to locate our body within the concept of the environment



✓ Balance

Balance not only allows a child to have control over their body, but will also help them to write in a measured manner, with controlled strokes, stopping when necessary. Equally, when reading, it will help them to stop and take into account punctuation marks.



It should be stimulated in the following manner:

1. Static balance: standing on one foot, balancing the body without lifting their feet off the floor.
2. Brake: going from movement to rest
3. Dynamic balance: maintaining balance while walking along a narrow path.

In the San Juan Foundation, we use the traffic light technique, through which a child is taught the meaning of the colors of a traffic light: green - keep going, red - stop



To begin this stimulation, various games are played using the traffic lights. For example: when the light is green we'll dance, and when it's red we'll stop dancing. Then we'll make marks on the floor. At the beginning, the green light will act as a signal to carry on, and the red light at the end, to stop. This can then be done using numbers and letters.

✓ General dynamic coordination



A child's gross motor skills will be stimulated using dragging, crawling, marching, running, hopping, rolling and climbing.

The child will acquire gross motor skills and body-movement control skills, along with the synchronization and coordination of movements.

✓ Hand-eye coordination

Hand-eye coordination is the ability to coordinate hand or foot movements with those of the your eyes. Here, it is important to have obtained an adequate level of oculomotor development: fixing one's gaze, following, and visual exploration.



In a child born with risk factors for developmental disorders (prematurity, hypoxia, seizures, among others) it is important to carry out an early evaluation in overall and orofacial motor function; and psychomotor and oculomotor development.

In the oculomotor assessment identify the development of gaze strategies, as they are closely related to the process of reading and writing.

✓ Fine motor skills

Fine motor control is the coordination of the muscles, bones and nerves to produce small and precise movements. On stimulating or intervening with fine motor control the following aspects should be taken into account:



✓ Pace

1. Stimulate hand-eye coordination
2. Stimulate muscular strength and individualization of groups
3. Maintain normal feeling

Pace is the perceptible division of time or space into equal intervals, this neurofunction allows the child to develop abilities of sequencing, serialization and classification which are the basic functions for the process of calculation



✓ Attention

Basic function for the acquisition and consolidation of learning, activities will be carried out according to the child's age.



Through visual closure activities, discrimination of similarities and differences


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









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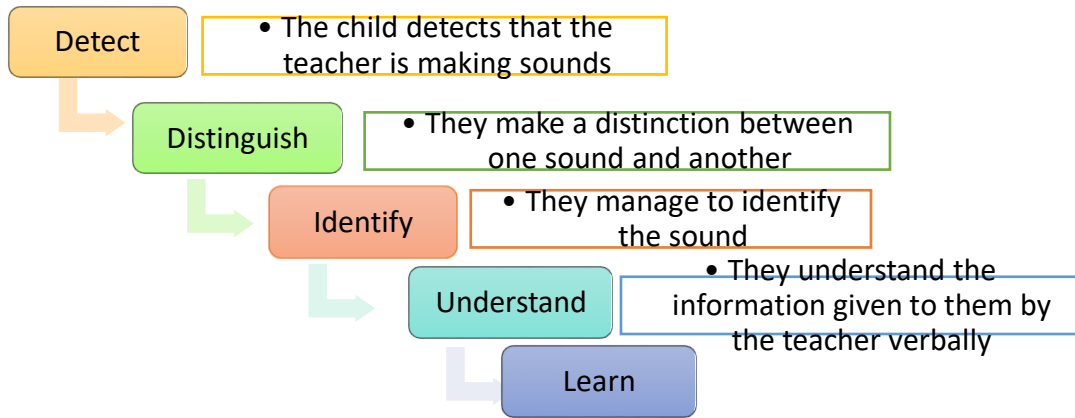
2. Auditory processing in neurofunctions

William Castro, the licensed language therapist from the Foundation, does a presentation on hearing, the development of auditory processing in language and its importance in the acquisition in reading, writing and arithmetic.

Every stimulus which enters our brain does so through our senses, all auditory information reaches our ears, travels through the auditory system and arrives at the brain to be processed.

We define auditory processing as the capacity to receive and interpret the information which reaches our ears and our brain, this capacity is going to depend on the state of the cognitive processes and previous experiences, this will be a pre-requisite for communication.

Auditory processing enables detection, discrimination, identification, recognition and understanding of sounds, and this will allow the child to learn new sounds, concepts and vocabulary. That is to say, auditory processing puts us in contact with the linguistic world in which we are immersed.



At the San Juan Foundation we care for children from a very young age, to make the most of cerebral plasticity and to be able to educate or re-educate the neurofunctions and auditory processing early.

Cerebral plasticity is the modification or readjustment of the brain in response to the needs which the child presents, that is to say the brain will form new cerebral connections with the aim of adapting to the needs of the child.

In a child with cerebral palsy it is important to have the earliest intervention possible, since thanks to the cerebral plasticity the results will be more evident than in a late intervention.

❖ Auditory processing abilities

- Auditory discrimination:
The ability of the speakers to identify relevant phonetic and phonologic units in communication.
The ability to differentiate some sounds from others. For example, listening to various animal sounds, the child should distinguish between the sound of a cow and a dog



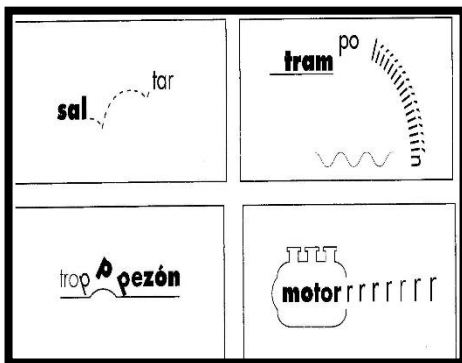
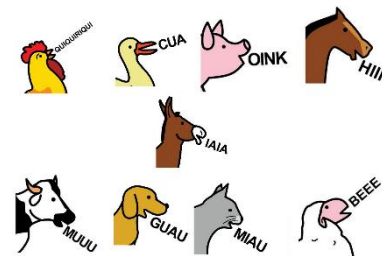
Auditory memory:

The capacity of the brain to register the sound stimulus, to retain in their short and long term memory and to recall information at the necessary moment.

Difficulties in this function will make it difficult for the child to remember the correct sound of one stimulus or another and also to recall them. For example, get the child to listen to a sound and ask them to tell us what made the sound they heard.



- o Auditory Association:
The capacity to relate concepts and spoken words in a meaningful way that the child uses and hears. To associate the sound with the mental image or with the concept, for example they associate woof woof with a dog, and meow with a cat



- o Verbal Auditory Closure:
The capacity to discriminate between words and sounds which are acoustically similar, to understand the complete message when part of the information is missing.
It can be stimulated through incomplete phrases or sayings like: I leave school and I go to the ca.. and the child completes the word, the animal that barks is a do.....g.

❖ Development of auditory processing

The development of auditory processing begins from pregnancy, where the child not only registers sounds coming from the mother, but also from the outside this is why the mother in the gestational stage can stimulate her baby by singing to them, talking with them and involving the father in this activity.

It is important to know the stages of development of auditory processing in children to be able to identify difficulties and to avoid problems in the future.

o Newborn

o Sensitive to the volume of sounds.



<ul style="list-style-type: none"> Processes sounds, doesn't locate them. 	<ul style="list-style-type: none"> Locates objects, people and the source of sound. They react with surprise at sudden sounds and look for the object.
<ul style="list-style-type: none"> Fourth month 	<ul style="list-style-type: none"> 2 to 3 years
<ul style="list-style-type: none"> More active, will search for sounds by looking for them. Will manage to locate the direction of sounds. 	<ul style="list-style-type: none"> Recognize sounds in noisy environments. Imitates sounds of objects and animals.
<ul style="list-style-type: none"> 5 to 6 months 	<ul style="list-style-type: none"> 3 - 4 years
<ul style="list-style-type: none"> Will imitate with vocalizations the sounds of the adult. Babbling 	<ul style="list-style-type: none"> Start singing known songs. Talk about the sounds they heard.
<ul style="list-style-type: none"> Second semester 	<ul style="list-style-type: none"> 4 to 5 years
<ul style="list-style-type: none"> Will search sideways for sound Around 12 months, first words. 	<ul style="list-style-type: none"> Names ambient sounds They like playing with words and the sounds of words.
<ul style="list-style-type: none"> One and a half years 	<ul style="list-style-type: none"> 5 - 6 years
<ul style="list-style-type: none"> They can search for the source of the sound in any direction and with more ease. Imitates sounds and wants to make them on their own. 	<ul style="list-style-type: none"> Articulates the words Pays attention to stories and longer activities.
<ul style="list-style-type: none"> Two years 	

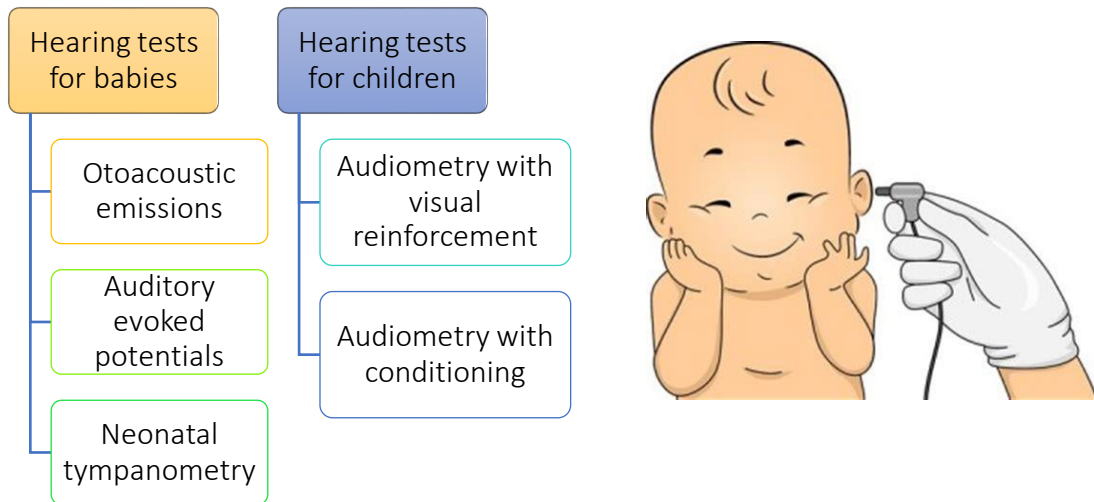
❖ Auditory processing and associated disorders

Inadequate development of auditory processing can cause learning difficulties, delays and language disorders in children. Also, in certain cases, auditory processing difficulties can be associated with disability, for example in the reduction of auditory capacity, which unfortunately in many cases is diagnosed late, already in school due to low grades or inattention.

Impaired hearing or hearing loss can be: conductive (problems with sound passing from the pinna (outer ear), through the ear canal, to the eardrum) or sensorineural (problems with information passing from the auditory nerve to the brain)

There are hearing exams, or tests, that allow a diagnosis of someone's hearing difficulties to be made:





Once hearing loss has been diagnosed, it is important for the child to be fitted for hearing aids that allow them have auditory experiences, and develop their language skills.

❖ Central Auditory Processing Disorder

This is an ear canal disorder, a hearing disability unrelated to hearing loss.

The brain doesn't distinguish or process the different sounds of words. Language skill difficulties and problems related to future school performance, such as ADHD and autism, can affect a child's ability to listen and understand what they hear. The symptoms of this disorder are:



- Difficulty following verbal commands, not due to inattentiveness, but rather, to problems understanding several commands at the same time. They frequently ask questions like: What? How?
- They are easily distracted, especially by background noise.
- They have trouble reading or spelling.
- Problems with remembering the last thing they read or heard.
- Problems with math, mishearing numbers, for example: 1+3 and they hear 1+6

❖ Conditions related to auditory processing disorder.

Willy explains that there are several disorders related to auditory processing disorder, for example:

- Learning disorders: with phonological dyslexia, where a child doesn't distinguish the difference between the sound of "b" and "d".
- Attention Deficit Hyperactivity Disorder (ADHD).

3. Neurofunctions in early education

Neurofunctions are mental activities performed by a human being, that they continue to develop throughout their life based on their experiences and acquired knowledge. The development of neurofunctions is brought to a state of maturity, and is geared towards meaningful learning in the environment where the child develops.

❖ Work-play methodology

This involves organizing different learning spaces or environments. It's a flexible methodology that allows for greater attention to the diversity of the class. It allows the child to learn in a spontaneous manner, according to their needs.

Play is essential for children's emotional, social, physical and cognitive wellbeing. In the San Juan de Jerusalén Foundation Center, early childhood teachers use the methodology of learning corners, through which the development of neurofunctions is stimulated, while respecting the pace at which each child learns, along with their particular needs



The San Juan de Jerusalén Foundation Center uses the corner methodology as a way to facilitate the training of neurofunctions, in tune with the early education curriculum. The activities are adapted to the needs of each child, and they provide personalized attention to the differences within the classroom. The corners used as part of this methodology are:



1. **The home corner:** In this corner, auditory perception, visual, and tactile neurofunctions are stimulated. For example, preparing a cake:
 - At the beginning, the children are shown the ingredients that will be needed, using large images
 - The activity is done experientially, while accompanied by an adult

2. The reading corner: In this corner, attention, memory, language and temporal structuring are stimulated.

- Upon hearing a story, the child creates and arranges timelines
- The mental ordering of events, followed by their representation with images.
- Presentation of subjects or stories with images.



3. The math and logic corner: spatial and temporal structuring, reasoning, classification and seriation are stimulated

- The building of towers by color
- Classification by size
- Sequences of cubes by color, for example, yellow, blue, yellow, blue

4. The modelling corner: in this corner, body mapping, fine motor skills, hand-eye coordination, laterality and spatial structuring are stimulated.

- Modelling activities with clay, playdough
- Expressive art and design activities.



5. The music corner Neurofunctions of memory, auditory perception, general dynamic coordination and laterality are stimulated, in addition to the children's verbal and non-verbal language

- This can be done through singing.
- Playing the sounds of musical instruments
- Spontaneously dancing to songs, with the guidance of an adult

Patricia explains that, due to the COVID-19 pandemic, they have chosen to have classes take place virtually, with the teaching department using the Zoom virtual platform. These activities are done with the support of the children's parents.

The teacher gives the parent guidance on how to facilitate the activity, while respecting the established routine for the foundation's activities:

- Greeting: through songs
- Carrying out the activity: they help the parent to carry out the activity
- Conclusion: they finish the activity with a song

Activities will take place during a period of time that suits the child's age and level of attention. Furthermore, the google platform will be used to assign activities from Monday to Friday, to be carried out with the parents. Once completed, the parents should send them to be reviewed by the teacher.

The foundation maintains its vision of transdisciplinary work and as such, teachers remain in constant contact with the therapeutic and psychological divisions.

