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Specialized and updated training on supporting advanced technologies for early childhood education and care professionals and graduates

MÓDULO VI.1

Psychomotor development

Docente

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Table of contents

CONTENTS

I. INTRODUCTION 4

II. OBJECTIVES 4

III. CONTENT SPECIFIC TO THE THEME 4

3.1. Concept of psychomotor development 4

3.2. Laws and principles of psychomotor development 5

3.2.1. Main laws of development 5

3.2.2. Five principles of development 6

3.3. Development of psychomotor skills 6

3.3.1. Muscle tone and postural control 6

3.3.2. Locomotion motor skills 8

3.3.3. Manipulative motor skills 9

3.3.4. Graphomotor skills 10

SUMMARY 11

GLOSSARY 11

BIBLIOGRAPHY 12

RESOURCES/WEB 12

I. Introduction

This topic deals with psychomotor development and the changes that occur in the first months of life, showing how psychomotor development follows a series of laws and principles. It describes how psychomotor skills develop: muscle tone and postural control, locomotion motor skills, manipulative motor skills and graphic motor skills. It focuses on the changes that occur in psychomotor skills during their acquisition over the course of children's development.

II. Objectives

The objectives of this thematic unit are:

- • To understand the concept of psychomotor development.
- • Observe the development of psychomotor skills
- • Understand psychomotor developmental milestones.

III. Content specific to the theme

3.1. Concept of psychomotor development

The term psychomotor refers to psychomotor activity, which is a very confusing and ambiguous term, mainly due to the great variety of meanings with which it is used. Looking at etymology, the word psychomotor contains the term "psycho" which refers to psychological activity (cognitive and affective); "motricity" which refers to motor movement; by joining these two definitions, psychomotor can be understood as a relationship between psychological activity and motor function. This relationship is a direct consequence of the unity and totality of the human being; therefore, psychomotor activity is not only a motor activity, but also a conscious psychological activity that is triggered in certain motor situations (Justo, 2014).

Human development is a very complex process, during the first stages of life it is amazing how many changes occur in human beings from birth to adulthood. These changes are very significant, both quantitatively and qualitatively, occurring in the first years of life, although transformations continue to a lesser extent into old age. Development is a linear, continuous process, but milestones or high points can also be identified. These milestones are reached at approximately the same ages in all individuals in normal situations, although there may be differences due to genetic load and environmental changes in each person. Motor, affective, cognitive and social development are interrelated and conditioned by the environment development takes place in.

Psychomotor development can be seen as a continuous process from conception to maturity (García and Martínez, 2016). It is continuous development of the capacities to perform a series of bodily movements and actions, as well as the mental and conscious representation of these (Justo, 2014). Psychomotor development cannot be assumed to be something that simply happens to the child, but is something that the child will produce through their desire to act on the environment and to become increasingly competent. Therefore, the aim of psychomotor development is to achieve mastery and control of one's own body in the environment (Gil, 2003).

Psychomotor development is manifested through motor function, which is made up of movements oriented towards relationships with the world around the child. These motor functions are the beginning of the child's development, to the extent that movements are the only psychological manifestations that can be observed in babies. Therefore, psychomotor development is a composite process closely related and conditioned by (according to Cabezuelo and Frontera, 2012):

- Motor development, skills linked to the musculoskeletal system, capable of increasingly complex and precise movements. Muscular activity is coordinated by the nervous system.

- Psychological and affective development, linked to brain activity that functions such as language, affective manifestations and social relations depend on.

The ultimate goal of psychomotor development is to achieve control of one's own body in order to achieve all actions that promote experiences at all levels.

3.2. Laws and principles of psychomotor development

Children's movements in their first weeks are mainly uncontrolled and uncoordinated, in the form of jerks affecting both arms and legs. As children grow, they exhibit a notably different picture, since their movements are voluntary and coordinated, and they control the position of their body and body segments (Gil, 2003). The transition from the first weeks to the achievements that occur in the second half of the second year follows laws and principles.

3.2.1. Main laws of development

These indicate that the body's muscles do not all mature at the same time, but according to the following laws (Cordoba, 2018, Gil, 2003):

- Cephalo-caudal law: first the muscles closest to the child's head mature and then the muscles further away from the head develop, i.e. movement control matures from the head to the feet. The child holds its head before it is able to sit upright and is able to use its upper limbs skilfully before it is able to use its lower limbs skilfully.

- Proximal-distal law: the child controls the movements of the body first in the areas closest to its body axis, whereas the areas furthest from this body axis are controlled later. Thus, the shoulder joint is controlled before the elbow joint, which in turn is controlled before the wrist joint, which in turn is controlled before the finger joints.

- Law from the general to the specific: children develop gross motor control before they develop fine motor control. Thus, children develop control over the whole of their arm before they develop the ability to pincer grasp with their fingers.

- Law of development of flexors and extensors: control of the muscles responsible for flexor functions occurs earlier than control of the muscles responsible for extensor functions. Thus, children acquire the ability to grasp rather than to pull objects earlier.

3.2.2. Five principles of development

The five principles of development were stated by Thelen in 1989:

- Motor development can only be understood in terms of the developing system, as movement is the result of the interaction of many subsystems.

- What determines how these subsystems come together is the task, not pre-existing genetic instructions. Tasks that require motor skills are context-dependent, and children draw on whatever components are available that are best suited to the task.

- Developmental processes are not linear. As small changes to one or two available components occur, the child reorganises the system to better suit the task.

- Action and perception form an inseparable circuit. This means that children can modify their actions to fit their perceptions.

- Variation is an important aspect of development. Children will change the way they approach specific tasks, partly because they can draw on different components.

3.3. Development of psychomotor skills

The different psychomotor skills develop in accordance with the laws and principles detailed above. These skills can be grouped for study into four conditions (Justo, 2014., Córdoba, 2018): 1) muscle tone and postural control; 2) locomotion motor skills; 3) manipulation motor skills; 4) graphic motor skills.

3.3.1. Muscle tone and postural control

Muscle tone is defined as the active tension of the muscle at rest that develops under the control of the central nervous system (Cordoba, 2018). Tone is the state of slight contraction that the muscles of our body are in. This contraction is not constant but variable and is harmonised continuously to allow the individual to be in a static position or in movement. Tone plays a very important role in psychomotor development, as the control of posture and mastery of fine and gross motor skills depend on tone. Tone develops in various ways (Alvarado-Ruiz et al., 2012); the tone of the limbs in newborns is high (hypertonia) so that the arms and legs remain flexed; axial tone is at low levels (hypotonia) (Córdoba, 2018., Alvarado-Ruiz et al., 2012).

There are two stages in the development of tonic control:

- First stage: this stage is global and uncontrolled. Newborns cannot distinguish body segments and use only those they need without control.

- Second stage: children progress in the development of the tonic control of body segments, this increased control will allow them to use only those structures that are necessary in each activity.

The most significant milestones in the normal development of muscle tone, according to Cordoba (2018), are:

- Hypertonia at birth, except in the neck and spine which are atrophied as a result of the prolonged intrauterine foetal position.

- From two to six months, hypotonia occurs, except in the neck and spine, which begin to acquire muscle tone.

- At six months, there is generalised stiffness throughout the child's body.

- Around the age of one year, the tone of the neck and spine is fortified until the bipedal position that will allow walking is possible.

- After the first year, tone control will increase to the level of coordination that will allow control of muscle tension and relaxation.

Figure 1. Motor milestones. Source: Shumway-Cook, 2019.

Postural control is the set of anatomical-functional structures aimed at maintaining the body's relationships with itself and with space (Justo, 2014). During the first years of life (Figure 1), children develop a repertoire of skills including independent crawling, walking and running, climbing and manipulation of objects in a variety of ways, the emergence of these skills requires postural control that supports primary movement (Shumway-Cook, 2019). Research on early development has shown that the simultaneous development of the postural, locomotor and manipulative systems is essential for the emergence and refinement of skills in all these areas (Justo, 2014., Shumway-Cook, 2019).

Traditionally, postural development has been related to a sequence of motor milestones, the most important milestones according to Shumway-Cook (2019) are shown below (Table 1), it should be noted that the ages shown are approximate.

Table 1. Motor milestones.

Age	**Procurement**
1 month	Raise head
4 to 7 months	Supported sitting
4 to 7 months	Independent sitting
8 to 10 months	Trawl
8 to 10 months	Crawling
9 to 10 months	Pushing oneself upright

3.3.2. Locomotion motor skills

Independent locomotion may seem a relatively simple and automatic skill, however, it is a very complex task, the study by Adolph et al., (2012) found that children learning to walk performed an average of 2368 steps and 17 falls per hour; which is equivalent to 14000 steps and about 100 steps per day which indicates that to learn to walk children do a lot of practice.

Before being able to walk the child moves on the ground in a limited way, as locomotion is conditioned by the possibility of standing and balance, to achieve independent walking the child follows a series of phases detailed below (Shumway-Cook, 2019., Molina, 2020) (Figure 2).

- Phase 1 stepping reflex: alternating leg movements when holding the baby under the armpits.

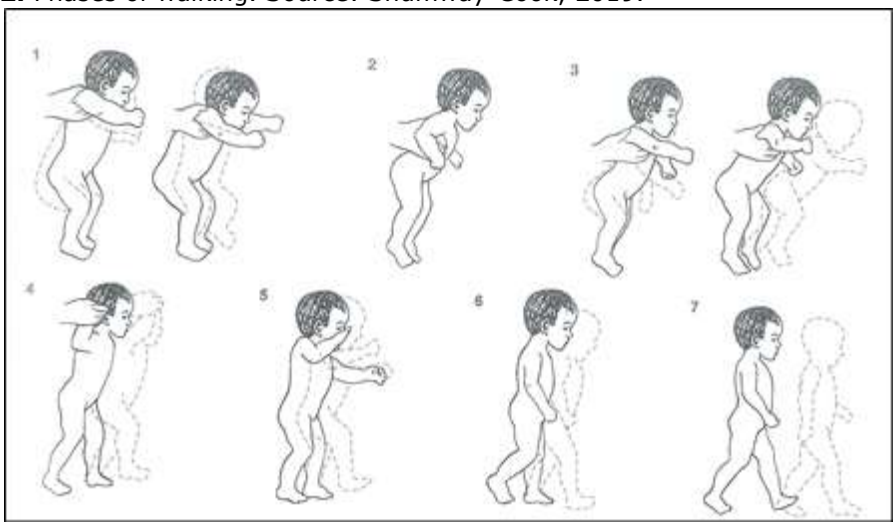
- Phase 2 disappearance of the stepping reflex: 98-99% of infants lose this reflex as a result of inhibition by maturing higher neural centres.

- Phase 3 reappearance of the gait reflex: the onset of self-generated locomotion is resumed, similar to the gait reflex.

- Stage 4 assisted locomotion: children begin to take their first steps in an immature, unsteady, unstable, irregular and uncoordinated way, they manage to take their first steps with the support of their hands.

- Phase 5, 6 and 7 independent upright gait: the hands gradually move from an elevated protective position (phase 5) downwards and to the sides (phase 6) and the trunk and head assume a more upright posture (phase 7).

Figure 2. Phases of walking. Source: Shumway-Cook, 2019.



According to research, a 10-step gait, without hand support, without carrying objects with a functional purpose and without falling, is achieved by 3% of children at around 9.6 months, 50-70% at 13-14 months and 97% at 18.4 months; for this to happen, all the components of gait must be ready (Martín, 2014, Molina, 2020).

3.3.3. Manipulative motor skills

The development of manipulative skills such as grasping, throwing and catching is complex; they develop progressively over time through the association and maturation of different parts of the nervous and musculoskeletal systems with experience. It is the sight of an object at rest or in motion that triggers the precise execution of movements to catch, throw or grasp an object, just as the object triggers the precise, adjusted movements in vision.

- Grasping: refers to the execution of the use of the object, the upper limbs and the context in which the action is performed; it is a complex act, which needs visual localisation, the hand approaching the object and grasping the object. The literature describes three ways of hand approach that correspond to the progressive involvement of three joints: shoulder, elbow and wrist, and how this approach of the hand to the object evolves determines the development of grasping (Table 3).

Table 3. Grasp development.

Age	Procurement
4/5 months	The child is able to direct a hand towards an object by "sweeping"; only the shoulder intervenes by grasping the object between the last two fingers and the palm.

6 months	The object is grasped by the last four fingers (without thumb), the approach to the object is lateral and parabolic, as the elbow is involved; at this age the child is able to hit a table with the object and release it voluntarily.
7 months	The grasp is palmar, the child can pass the object from one hand to the other and is able to keep the object they have if offered another one.
8 months	Radial-palmar grasp, the thumb acts as a stopper, allowing the child to strike objects against each other.
9 months	Fine grasping appears, the child can grasp small objects with the thumb and forefinger gripper. Hand approach involves: shoulder, elbow and wrist.

- Throwing: the ability to throw develops in children before reception, appearing at around 6 months, from the sitting position, and detaching from the object in their hands in a coarse manner, to full control of the movements involved in the throw. This process develops throughout the maturational process from the age of 2 to 7 years (Table 4).

Table 4. Development of throwing skills.

Age	**Procurement**
2 to 3 years	The throw consists of an extension of the arm, without involving the trunk, with the feet fixed on the ground.
3 to 5 years	Without involvement of the feet, the throw is produced by a rotation of the trunk to one side to prepare and then to the other side to throw.
5 to 6 years	Feet start to get involved, there is more rotation to prepare for the launch
6 to 7 years	There is broad bodily participation. The lower limbs intervene in opposition to the upper limbs.

- Reception: this is the interruption of the trajectory of a moving object. The first trials are found in young children trying to intercept a ball rolling on the ground. In general, three stages in the acquisition of catching have been described: a) children under 3 years of age usually place their arms rigidly with their hands extended so that the ball falls between their hands. b) at around 4 years of age children open their hands to catch the object, although the movement of the hands is still a little rigid. c) at 5 years of age the arms remain relaxed next to the body before trying to catch the ball, the acquired behaviour is characterised by a balanced position of the feet, eyes, arms and hands that wait relaxed for the object.

3.3.4. Graphomotor skills

Graphomotor skills are very important, and are the ability to write or manipulate certain tools that leave an imprint or trace on a support (Córdoba, 2018). These traces may at first seem arbitrary and causal, but make sense as the child acquires skills.

Graphomotor skills develop through different stages that follow a common pattern, with some differences between individuals, through the following milestones:

- At one-and-a-half years old: the first graphic representations appear; the child is already able to pick up a writing utensil and make strokes on a support. At this stage, strokes are made with rapid, impulsive and uncontrolled movements.

- At twenty months: begins to use the elbow, so that scribbling takes on a different, clearer appearance.

- At the age of two and a half years: control of the wrist and finger pincer movement begins to develop and the line tends to become clearer.

- At the age of three years: Greater control of space appears, the child no longer goes off the paper, the child tries to close their lines.

- At four years of age: the child anticipates their productions, the relationship between drawing and paper is better.

- At five years of age: the child has the necessary characteristics to start pre-writing activities.

Psychomotor development is significant in the early stages of life. However, throughout life it changes to a lesser extent, and these changes are marked to a certain extent by those in the initial stages, therefore it is very important to know how psychomotor development takes place in order to detect alterations.

Summary

Psychomotor development can be seen as a continuous process from conception to maturity. It is therefore a continuous development of the ability to perform a series of bodily movements and actions, as well as the mental and conscious representation of these movements and actions, which in the early stages of life are of capital importance for an individual's development. This development takes place in the first weeks of life, following various laws and principles.

The development of the different psychomotor skills can be grouped for study into four conditions: 1) muscle tone and postural control; 2) locomotion motor skills; 3) manipulative motor skills; 4) graphic motor skills.

Glossary

Psychomotor development: continuous development of the ability to perform a range of body movements and actions, as well as the mental and conscious representation of these.

Muscle tone: active muscle tension at rest that develops under the control of the central nervous system.

Postural control: set of anatomo-functional structures aimed at maintaining the body's relations with itself and with space.

Grasping: execution of the use of the object, the upper limbs and the context in which the action is carried out.

Launch: ability to launch

Reception: interruption of the trajectory of a moving object.

Graphic motor skills: the ability to write or manipulate certain tools that leave an imprint or trace on a support.

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