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

MODULE V

Cognitive, social, communication, language and cognitive development

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e-EarlyCare-T

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I. Introduction

Module V refers to the study of the most representative milestones of human development between 0-6 years old. It also addresses how they relate to early intervention strategies from the point of view of primary and secondary prevention.

II. Objectives

a) To learn the most representative milestones of human development between 0-6 years of age.
b) To learn strategies for early intervention between 0-6 years old.

III. Content specific to the topic

3.1 Introduction

In the last two decades, analysis of the progression of human development has made significant progress with respect to when certain skills, especially cognitive, communication and problem-solving skills are acquired. This is due to advances in technological instruments for measurement and observation. This progress has allowed developmental psychology to bring forward the time of acquisition of certain skills or abilities. However, Piaget's scheme (1952) remains valid as a reference point for the progression of human development.

Experimental data (Goswami, 2008) show that infants from birth exhibit perceptual and action skills. These skills enable them to develop a sense of their environment and interaction with themselves. For example, infants will acquire perceptual awareness of their own bodies when looking in the mirror. Just as when they hear their heartbeat, breathe, feel pain, hear their own voice, or move. Babies develop self-perception by experiencing multimodal or cross-modal sensations of their own body (stillness, movement, silence, the noises it produces, hunger, pain, feelings of comfort, joy...). Before the age of two months, infants have a very limited repertoire of social responses and their social interactions lack reciprocity. At around nine months, a major change occurs. Infants begin to show anxiety in the presence of strangers, or a

tendency to include adults in the exploration of physical objects. The most common form of interaction of parents or foster caregivers with their babies is repetition and mirroring of their emotions: face-to-face interactions and *feedback* of emotions. Emotional mirroring is a source of self-knowledge because it gives babies the chance to see and objectify how what they feel inside affects others, it is externalised and the subject of social interaction reflects it back to them. Adults offer infants "emotional simulation" through responses in face-to-face exchanges. Understanding of oneself goes hand in hand with understanding of others. According to Gibson (1979), perceiving the environment means co-perceiving oneself. At these moments, self-perception is inseparable from the perception of objects. Any perception involves the point of view of the perceiver. Thus, the perception of objects will entail self-perception and will also produce co-perception. Knowing something about something is inseparable from knowing something about oneself (co-cognition). Essential to this whole perceptual process is the development of object permanence and the permanence of oneself in the environment. Babies plan in relation to a series of planned goals, searching for and deploying increasingly precise strategies to achieve those goals. Although the perceptual capacities of new-borns are still emerging, they provide an essential basis for the construction and expression of the first physical knowledge. Babies move from being mere active spectators attending to sounds and images to being active transformers of the world of objects, with direct action and exploration that they themselves initiate (important transition from the first to the second year of life). Between birth and 6 months infants develop new ways of apprehending physical objects and move from predominantly oral exploration at around 2 months to a complex combination of manual, oral and visual inspection at around 4 months of age together with the onset of correct and systematic hand-eye coordination.

3.2. The most representative current theories of human development

Below, we summarise the most representative theories of human development from an up to date perspective.

3.2.1. Theory of the Origins of Mind (Donald, 1991)

The symbolic and acculturated mind of human beings evolved from the episodic mind of non-human primates which resolved time-bound (immediate) situations to a mind that would transcend the immediate, a mimetic mind capable of producing conscious and intentional figurative acts and of adding awareness and planning. With language and conventional signs, we would speak of a mythical mind of a symbolic and acculturated nature. The evolution of the episodic mind would characterise the level of cognition of the human mind. The mind at the beginning, more primary, would operate in the here and now. Later, as it acquired symbolisation, it would be able to plan and reflect on its own cognition. It would also be able to represent to itself the mental state of people and situations in the world (how they are, how they were, how they should be and how they will be). In human development, the first ontogeny goes from 2 to 9 months, from the mimetic mind to the symbolic mind (Gómez, 2007).

3.2.1.1. Learning and development

Babies have an early propensity to learn. From birth they learn to use their own bodies to produce or reproduce an effect on the environment. Classical and operant conditioning have been explained by Piaget's (1952) development of secondary circular reactions, which reflect behavioural plasticity. Early learning experiences give rise to new forms of behaviour and conditioning in early childhood and contribute to the infant's development. Infants are not susceptible to every stimulus; they learn what motivates them and what they can learn. Learning through conditioning depends on developmental changes:

-The baby's repertoire of actions.

-Postural and motor contacts.

-Their reasons for communicating.

-Their motives for learning.

Conditioning plays an essential role in shaping emotional life and is an important vehicle for behavioural change, learned responses and good and bad habits. It is part of the survival of the new-born. Actions that have pleasant consequences tend to be

repeated. Events that are associated with pleasure are also often sought. Actions that have painful consequences tend to be eliminated. Human beings tend to avoid events associated with pain (Thorndike's law of effect, 1932). In motivation, pleasure is the basis of the law of effect, maximum pleasure and minimum pain. The human brain has developed its own reward system and manufactures its own pleasure through highly addictive inducing chemicals that eliminate pain.

Reference can be made to two explanatory theories, the infant development theory which understands development as a continuum (successive phases) and the theory which understands development as a discontinuous process (key transitions). Next, the mechanisms underlying developmental processes will be explored. An outline of the process of change is shown in Table 1.

Table 1. Analysis of the change process.

What changes	How it changes	Why it changes
Evolutionary processes	Mechanisms	Maturational development Contextual stimulation

Processes and mechanisms require evolutionary explanations that go beyond mere description. In any causal explanation there is always an element of judgement. Causal mechanisms interact and in this interaction physiological, psychological and cultural mechanisms will converge. Prediction in research terms refers to developmental correlations between phenomena observed at different levels and domains of functioning. There is a correlation between the development of particular brain regions and world-specific behaviours, and between the development of the frontal cortical lobe and the emergence of object permanence (Diamond, 1990). As well as a developmental relationship between different ways of attending to visual stimuli in early childhood and later cognitive skills or patterns of intellectual functioning (Colombo, 1993). To summarise, we can say that in the first year of life and human development there are two revolutions; at two months and at nine months, the beginning of symbolisation.

3.2.1.2. Theories of Infant Development

Other theories of development speak of the indeterminacy of development. A distinction can be made between chaos theory and dynamical systems theory. For the latter, the baby's behaviour, like any other behaviour, would be the result of a complex

interaction between a large number of systems functioning simultaneously and distributed on different levels. From a lower level of brain, muscular and skeletal or motivational functioning to higher levels of functioning (perceptual, emotional and cognitive). The application of this theory to infant functioning would not allow for a very causal explanation "The development of infant behaviour would essentially be a soft assemblage, the result of an interactive (fluid) process within multiple parallel and distributed systems at all levels of functioning. It would not be based on "hard" perceptions of modular structures or on a kind of "little men" or homunculi that would determine from the baby's head what would develop next. These changes are basically the expression of multiple control variables interacting chaotically at all times and at all levels of infant functioning" (Rochart, 2004 p. 276). In the midst of this chaos, researchers have sought constant developmental processes that manifest themselves at all ages regardless of developmental domains:

- Balancing.
- Self-organisation.
- The dynamic systems of child development.

Equilibration: the infant shares with other organisms the dynamic equilibrium between itself and the environment. Organisms in the process of equilibration go through periods of relative equilibrium followed by periods of disequilibrium that are accompanied by actions that are more or less designed to restore equilibrium (homeostasis). Infants are thus open-loop systems that continually reinvent themselves and develop new ways of adjusting to environmental perturbations; an open-loop system is a source of novel and internal transformations. Piaget (1952) proposed a constructivist model of development in which he pointed to successive, progressive stages to explain the actual processes underlying the transition from one stage to another, which he explained from the equilibration model. For him, in the development of the baby, there are processes of interaction between phenomena of assimilation and accommodation. Assimilation would be the capacity to incorporate objects or actions into already existing structures . Accommodation, would be the tendency to modify one's own actions in order to assimilate more objects and situations to those the infant already masters or knows. The forces of assimilation and accommodation are in constant co-activation and lead to novel behaviours, namely novel organisations of action and cognition. In development, both forces reach a certain kind of general equilibrium and each corresponds to the Piagetian phases of the infant's development. In each of the phases there are modifications of the

assimilatory schemas through accommodation within a transformation of the general order of the phase. These are micro-changes as opposed to the macro-changes that occur in the passage from one phase to another (self-organisation). This balancing process implicitly assumes that infants' activity structures their development. However, there are other theories that sensory and motor systems may integrate, not as a result of laborious structuring, but due to peripheral causes such as time-linked parallel functioning of the manual, visual and postural systems. Thus, developmental patterns are self-organising. Increasingly, Early Childhood researchers point to the process of new self-organising forms to explain how babies develop (Thelen and Smith, 1994). Self-regulation arises from multiple, differentiated interactions between individual subsystems. Biological cycles express the existence of a self-organising process in nature in which the simple interaction of multiple systems at different scales of functioning creates a pattern. Some authors propose that the early development of functional actions—such as picking up things, crawling, and walking—are a self-organised assemblage that originates in the spontaneous movements that the body can perform. The patterns may vary (speed, amplitude and trajectory) but they all have a recognisable mark (kicking, crawling). Thelen and Smith (1994) and Goldfield (1995) explained this from a dynamical systems approach. For them the patterns of sensory and motor actions may appear very early in development as self-organisation. Each variable involved in an action pattern changes over time. New forms of behaviour, instead of being determined by a central command, could also emerge from multiple systems that develop side by side in constant interaction. New behaviours in infant development may correspond in part to organisational change driven by a series of stabilisers and destabilisers (Goldfield, 1995). The change would be partly peripheral and have a distributed causality. It would be neither prescribed nor centralised in the form of hidden cognitive or higher command structures (Smith and Thelen, 1993). The process of self-organisation thus plays its role in determining the infant's behaviour and development. However, neither the equilibration nor the self-organisation models offer strong ideas about any of the general principles guiding infant development, as they do not analyse what would cause or drive infant development.

3.2.1.3. From birth to two months of age

A child's behaviour at birth can be described as the expression of pre-adapted action systems that are adapted to take advantage of the resources of the living environment. These behaviours are a complex repertoire that will become increasingly more complex. The action system of the infant at birth is currently considered to be a flexible system open to learning (sucking, but also exploring objects), sucking is not automatic and depends on the behavioural states of the infant (sleeping, awake, hungry...) and on the quality of the oral stimulus (taste, texture), as well as on the behaviours explained below:

- Rooting (search).
- Orientation.
- Kicking.
- Continue with the view.
- Suctioning.

They are therefore complex, open systems. Children are born pre-adapted to take advantage of vital aspects of their environment (people, food and perceptual novelty). As we have already seen, there is an evolutionary co-design between certain facial expressions that denote specific emotions from birth. Perceptual mechanisms will enable the infant to perceive these expressions, understand them and interpret them as empathic expressions. Likewise, infants are born with a high degree of readiness to behave skilfully in the environment both in their physiological constitution and in their behavioural functioning. The main limitation of the newborn is to act in the here and now. At this point the infant does not yet show signs of planning or systematic study of the environment. The world of the newborn is neither contemplative nor conversational. It demonstrates comfort and well-being, but essentially does so involuntarily, in a world that moves from calm to intense agitation without anticipation or simulation of what will happen next. From the foetal stage, the infant learns and develops new skills that transcend its basic behavioural repertoire. In the pre-adapted action system there is plenty of room for behavioural plasticity. Newborns have little control over what they experience around and within themselves. After this phase, infants outgrow the directness and immediacy of the pre-adaptive action systems with which they come into the world. The newborn phase ends when

infants begin to distance themselves from events and perceptual situations in order to achieve greater control over them. They overcome immediacy and are able to reflect on it, at around six weeks of age. This is when the precursors of planning begin, with actions being carried out with an obvious goal in mind rather than an immediate response to situations in the environment. In other words, babies begin to develop intentionality. Towards the second month, children open up to the world around them, the first socially provoked smile appears. The appearance of the social smile is one of the first signs of the mental distance that differentiates intentional acts from automatic or random ones. As infants become less dependent on stimuli, they begin to adopt a conversational, contemplative attitude and thus spend more time awake and attentive (Wolf, 1987). With this new situation comes a new variety of planned action systems that are not simply linked to a stimulus, but are based on the deliberate coordination of means-ends to achieve intended goals:

- Reach a novel object.
- Remove something to see an object.
- Find new ways to get in touch with something.
- Reproduce an interesting perceptual event.

However, it should be noted that by 20 weeks of gestation the behavioural repertoire of the foetus is similar to that of the neonate, with sucking, grasping, eye movements, swallowing and kicking. There is therefore behavioural continuity between prenatal and postnatal development (Prechtl, 1987). These findings form the basis for the development of intentional action, which would be the first feature of early childhood cognitive development.

3.2.1.4. The nine-month revolution.

The understanding of how babies relate to the people and objects around them begins. In this period, they will develop triadic competencies. At around nine months infants begin to try to understand others as intentional agents:

- They recognise people as like themselves.

- They plan their actions.

- They carry out actions deliberately.

- They begin to refer to other people socially.

- They keep in mind others' emotional expression while planning actions or trying to understand a novel situation in the environment.

Children's understanding that others make intentional plans takes their learning potential to new levels. The ability to cooperate and learn to share with others emerges and declarative gestures begin:

- Point things out.

- Follow your gaze.

- Attempting to control the attention of others.

- Try to share with others an interest in objects and events in the environment.

Children begin to involve others and others begin to involve the child in constructing shared topics of conversation about the things that surround their relationship. This is the transition from primary to secondary intersubjectivity. That is, a sense of shared experience in relation to objects and events in the world. It begins the child's interest in constructing a shared world to which one can:

- Refer.

- Discover.

- Learn.

- Understand.

- Clarify.

All this, in collaboration with others, is why all the main engines of cultural transmission are set in motion:

- Teaching.

- Cooperation in problem solving.

- Language.

The emergence of secondary intersubjectivity and language are synchronous and correlate in the development of triadic competences such as:

- The joint attention patterns.

- Declarative gestures.

Both of these (joint attention patterns and declarative gestures) herald the utterance of conversational words (Tomasello and Farrar, 1986). Here language development is understood from its pragmatic aspect, which requires the child to understand the other as an intentional agent and also as a potential agent who can jointly understand things in the world through arbitrary signs such as words. Thus understood, the development of language is referential and fulfils a communicative function depending on the remarkable advance of secondary intersubjectivity. Language heralds the end of early childhood in the preverbal period of child development.

3.2.2. Cognition and development of empathy in early childhood. Therapeutic implications.

3.2.2.1. Physical cognition: the discovery of objects.

For Piaget (1952), the early development of object exploration is the basic process by which children acquire physical knowledge and represent the world of objects beyond the immediacy of perceptual experience. Piagetian research suggested the possibility of some prior physical knowledge to guide infants in their self-initiated exploration of objects. In the origins of physical knowledge, infants show from birth an organisation of sensory modalities. From an early age they are able to perceive cross-modally and to adjust the different modalities. Prior to manual activities they show physical knowledge and reasoning, such as the systematic search for hidden objects that Piaget (1952) documented in his classic observations on object permanence. Infants from a very early age manifest an awareness of objects from the systematic visual attention they pay to them. For Piaget, infants only begin to recognise the quality of object permanence in objects from the age of nine months. However, Baillargeon (1993)

indicated that these limitations could be explained more by motor competence than by cognitive limitations. The concept of the object is the result of a mental operation that can be separated from sensory experience. Babies therefore possess certain rudiments of the object concept. These will allow them to make predictions much earlier than the manual search for the object. In various experiments, Elizabeth Spelke (1985, 1991, 1998) has shown that babies, at least from the fourth month, seem to know that objects:

1.- exist continuously in space and move along connected paths (from the principle of continuity).

2.- occupy space exclusively, without the objects coinciding in the same exact place (principle of solidity).

3.- move independently unless they are in physical contact with another object (principle of non-action at a distance).

Therefore, it can be concluded that from an early age, object representation is dynamic rather than static and involves mental activities. From birth, babies usually fixate more on moving objects than on static objects. They also develop the concept of number from an early age, considering two properties: cardinality and ordinality. In addition, from an early age, babies will perceive, memorise, classify and thus begin to conceptualise objects and things. They will understand objects as a series or a group of things (things that look alike, things that sound alike, things that have similar attributes...). Children's actions are a direct reflection of their cognitive competence. There are different types of knowledge that are related to the development of cognitive and metacognitive strategies (Flavell, 1985): "knowing how" versus "knowing what", it seems that both types of knowledge develop in parallel and not sequentially as Piaget said. Early physical knowledge belongs to the knowledge of "knowing what", i.e. in Flavell's (1985) terms it would be conceptual knowledge. However, performance theory (which tries to explain the conceptualisation of the object) takes into account the idea that physical knowledge must be framed within functional limitations. For Gibson (1979), perception and action cannot be considered separately. Two types of physical knowledge would thus be understood as one pertaining to the direct perception and control of the practical things that can be done with objects

("knowing how") and the other to the indirect representation of what objects are and what happens to them ("knowing what").

3.2.2.2.2. Social cognition and empathy development.

Social cognition can be interpreted as the process by which individuals develop the ability to observe, control and anticipate the behaviour of others. This capacity involves varying degrees of understanding, from the perceptual distinction of the characteristic features of emotional expressions, to the complex representation of intentions and beliefs (theory of mind). Social cognition involves reading affects, emotions and intentions; in addition to the characteristics that make people specifically different from objects. All of this is directed towards the understanding of a private or dispositional world. The sense of shared experience in terms of intersubjectivity (Trevarthen, 1989) implies a basic differentiation between self and others. The sense of shared experience ("empathy"), is a projective capacity for social understanding that is crucial for the understanding of others. Children develop social skills from a very early age, and people provide the infant with richer perceptual encounters than any other object in the environment.

3.2.2.2.3. Cognitive and language development in the pre-operational period.

During the pre-operational period (from approximately 24 months to 7 years of age) the child consolidates a series of skills initiated in the sensorimotor period (from approximately 0 to 24 months) while acquiring new skills. In this period children have already acquired the ability to represent, although development is not yet complete as they will need other systems of representation such as language. In this period there will be significant development of language and particularly insertion of language into the actions of the subject and of others. From the Vygotskian perspective, language is a privileged vehicle of cognition and allows the subject to use words to represent concepts, inter-conceptual relations and interactive sequences with both objects and people. This acquisition facilitates the child's transition from the world of experimentation to the world of deduction. In addition, the latest developmental research has highlighted another important acquisition during this period, the development of theory of mind (Woodruff, Premack and Kennel, 1978 ; Woodruff and Premack, 1979; Wimmer and Perner, 1983). The first authors to introduce this

concept were Woodruff and Premack (1979) in their work with non-human primates and later in work with humans (Wimmer and Perner, 1983). From this research, the mind could be defined as a set of desires, beliefs, emotions or intentions, with the interaction between them giving rise to mental states or mental representations (Astington, 2004). This is what is called metarepresentation, i.e. the ability to create representations about one's own representations and to infer representations about the representations of others, enabling the subject to develop hypothetico-deductive reasoning and therefore tools for learning and coping in real environments (Astington, 2004). The development of ToM is related to the development of language; these two aspects are directly related but not comparable (Rivière and Nuñez, 1996). The acquisition of language skills (morphosyntactic, semantic and especially pragmatic) enable the child to further develop conceptual systems of intentions, beliefs and desires, which is what is meant by ToM. It has been shown that the absence or inhibition of language can lead to not really understanding the world of representations of others. Many researchers believe that there is a critical phase in the acquisition of the ability to infer false beliefs for the development of a complex conceptual system, by means of which the subject can explain their own behaviour and that of others. This phase would be from 3 to 5 years of age (Rivière and Nuñez, 1996). Towards the age of three, the understanding of desires and beliefs will appear. However, children at this age will understand limited aspects of the desires and beliefs of others and their relationships with emotions (Bretherton, McNew and Beeghly-Smith, 1981; Wellman, 1995). By age 4 they will be able to begin to understand the false beliefs of others (Gómez, Sarriá, & Tamarit, 1993). Although the understanding of mental representation will still be partial, as well as the understanding that beliefs and desires are mental entities that are separate from reality. The development of the concept of mind must be understood in its double meaning of mental entity and mental activity. This is why psychologists chose situations of deception as the most suitable for determining whether a subject has developed theory of mind or not. Peskin (1992) differentiates three developmental timepoints in tacit deception. First, at around 3 years of age, children seem to have difficulties in successful deception. At a second stage around 4 years of age, children do not yet employ tacit deception strategies as such, although they may be able to produce them according to experience, and a third stage in which the child can use deception in a more fluid way. Thus, it seems that by the age of 5 ToM will have started its development in an evolutionarily "normal"

process that over the years will be refined with respect to its conceptual elements of power and recursion that can be observed in second-order ToM tasks. The development of ToM takes the form of solving different types of tasks. At an initial stage in the process of acquiring theory of mind, the child will be able to solve false belief tasks. In these tasks, a story is staged in which the main characters are two children, one of whom has an attractive object (e.g. a marble, a doll, a ball...) that they keep in a specific place (e.g. a box, a basket...). This child (whom we will call Juan) will leave and the other child (whom we will call Luis) will be left alone in the room, then Luis will take the object (marble, doll...) and will change where it is (put it in another box, in another basket...), then Juan will come back and we will ask the child of our experiment "Where will Juan look for the marble, (the doll...)? It is here that the experimental child must put themself in the place of the other child and differentiate between what they know has happened and what the protagonist actually knows. Later on, children will solve the second order task, in which they will have to infer the false belief of one subject about what another subject has. The experiment is similar to the previous one except that this time, as the first character, Juan, is leaving the room, he sees what is really happening through a window, so he will no longer have a false belief but a true belief. Now the questions that the child being tested are: "Where does Juan think the marble is?" (this question refers to a true belief) and "Where does Louis think Juan will look for the marble?" (this refers to a false belief). The second question involves a high degree of recursivity and is not answered correctly until at least 6 and a half years of age (Rivière and Nuñez 1996). Thus, the mind can be understood as a representational construct. Having a mind is equivalent to having representations and attributing mind implies attributing representations to others. Bearing in mind that intentional recursivity uses language on many occasions to try to modify the mental worlds of others. Thus, from this approach, ToM would be directly related to pragmatic skills and to the declarative function of language (Rivière and Nuñez, 1996; Happé, 1998). This capacity can be understood as an ability or set of cognitive skills that allow the interaction and communication processes between human beings and facilitate behaviours that are adaptive to the environment.

3.3. Outline of development in the sensorimotor period and strategies for early intervention.

Table 2 below presents an outline of the most representative acquisition milestones in the sensorimotor period (zero to approximately twenty-four months), as well as early intervention strategies to develop the behaviours and/or competencies.

Table 2. Developmental milestones in the sensorimotor period and early intervention strategies (adapted from Sáiz-Manzanares, 2000 p. 122-123).

Developmental ages and their relationship to the stages of the sensorimotor period.	**Sensorimotor intelligence**	**Cognitive intervention strategies**
Stage I (0-1 months)	- Development of reflexes. - Signs of accommodation of perceptual selection schemes (attunement to attachment figures). - Beginning of non-specific linkage.	- Develop visual tracking of objects. - Facilitate sucking-pausing relationships between mother and baby. - Enable breast-shaking or feeding-pause container relationships. - Implement rocking-pause relationships.
Stage II (1-4 months)	- Primary circular reactions. - First adaptations acquired. - First scheme co-ordinations. - Beginning of the social smile. - Emergence of primary intersubjectivity. - Start of proto-conversations.	- Develop sucking and grasping coordination. - To facilitate vision-hearing coordination. - To develop phonation-audition coordination. - Enabling the elicitation of social smiles. - Facilitating the development of primary intersubjective behaviours. - Implement the development of contingency awareness. - Develop circular games. - Facilitate the development of proto-conversational patterns between infant and nurturing figures.
Stage III (4-8 months)	- Secondary circular reactions. - Full coordination of vision and grasping. - Beginning of the means-ends differentiation. - Anticipatory behaviours.	- Facilitating the development of vision-impairment coordination. - Enable the development of the beginnings of means-end differentiation. - Facilitate the development of the search for partially hidden objects. - Enable the development of anticipatory behaviours.
Stage IV (8-12 months)	- Coordination of secondary schemes. - Pursuit of ends using others as means. - Reciprocal assimilation of means-ends. - Progressive differentiation of means-ends. - First acts of practical intelligence. - Occurrence of intentional behaviours. - Beginning of the development of proto-imperative behaviours.	- Facilitating the pursuit of ends by using other schemes as a means. - Search for completely hidden objects that have just been hidden. - Enable situations in which the child has to communicate and reinforce intentional communication behaviours. - Facilitate the development of proto-imperative behaviours.

Developmental ages and their relationship to the stages of the sensorimotor period.	Sensorimotor intelligence	Cognitive intervention strategies
Stage V (12-15 months)	- Circular tertiary reactions. - New media are discovered by experimentation and known patterns are differentiated.	- Facilitate the search for the object in different places where it can be hidden.
Stage VI (15-18 months)	- Use of new media by mental combination. - Occurrence of proto-declarative behaviours. - Object permanence. - Start of the performance.	- Present problem situations in which the child has to develop mental combination. - Facilitate situations in which the child has to develop proto-declarative behaviours. - Facilitate the search for objects in all locations. - Facilitate the development of representative behaviour.

3.4. Outline of development in the pre-operational period and strategies for early intervention.

Table 3 presents an overview of the cognitive characteristics of the pre-operational period and Table 4 presents an outline of the most representative acquisition milestones in the pre-operational period (approximately 2-6 years), as well as early intervention strategies to develop those behaviours and/or competences.

Table 3. Cognitive characteristics of the preoperative period according to Piaget (1952).

Juxtaposition	The child cannot make a logical account of an event or situation. He/she gives an account without causal relations.
Syncretism	Non-deductive reasoning. The child establishes relationships from unproven subjective schemes.
Perceptual appearance	The child is dominated by the external features of objects. Cannot make inferences from unobservable features.
Egocentrism	Confusion between self and non-self. The child takes his immediate perception as absolute and does not adapt it to the point of view of others.
Focus	The child focuses on only one aspect of the situation or one point of view.
States/transformations	The child hoes not relate the initial and final states of a process.
Irreversibility	You cannot mentally redo a process from the end to the beginning.
Transductive reasoning	The child establishes immediate associative connections between situations, from the particular to the particular.

Table 4. Developmental milestones in the pre-operative period and early intervention strategies

Developmental ages and their relation to the stages of the pre-operational period	**Practical intelligence**	**Cognitive intervention strategies**
From 2 to 3 1/5 or 4 years old	- Appearance of the symbolic function and beginning of the internalisation of action schemas in representation. - Appearance of symbolic function in different acquisitions: language, symbolic play, deferred imitation, beginnings of internalised imitation. - Initial plane of representation (difficulty in non-immediate space, non-present time and in carrying out causal actions).	- Facilitating role-play situations, e.g. games with puppets and marionettes. - Use language regulation from modelling and moulding in fiction games, in drawing activities. - Include pictograms sequentially representing the parts in the execution of an action. Such pictograms may be on cards or included on tables, table-top or mobile devices.
From 4 to 5 1/5 years old	- Representative organisation in static configurations	- Through games show the child how the processes of transformation of substance, quantity, etc. are carried out. Step by step and have them carry them out themselves in order to internalise the action schemes.
From 5 years 1/5 to 7 or 8 years old	- Intermediate phase between conservation and non-conservation. - The child achieves semi-reversible properties. - Semi-logical phase	- Show the child through games how the processes of transformation of substance, quantity, etc. are carried out. Step by step and have them carry them out themselves so that they can internalise the action schemes. Carry out the sequences from start to finish and from finish to start so that the child can mentally acquire the reversibility of the processes.

Summary

This module has presented a brief review of human cognitive development, analysing the most representative developmental theories to explain it. It should be pointed out that development, especially in the first part of the sensorimotor period, is overall development that includes perceptual as well as motor and communication development. Two important milestones were distinguished during this time, namely the two-month and nine-month revolutions. At twelve months, a new revolution takes place which is related to motor independence (standing and walking), as well as the beginning of language development. The latter is directly related to the ability to represent and later the ability to meta-represent. These are prerequisites for metacognitive development, which will be consolidated in the pre-operational period and which are related to the development of planning, hypothetic-deductive thinking and language. All of these facilitate the acquisition of problem-solving strategies

beyond the here and now and the consequent development of the mind in what has been called the ToM.

Glossary

Intentional action: behaviour or behaviours performed with an objective or plan to achieve something.

Accommodation: the baby's tendency to modify its own actions in order to assimilate more objects and situations those it has already mastered or knows.

Mental activity: the cognitive and/or metacognitive processes that take place during information processing aimed at solving tasks or problems, or which occurs during one's own reflection on mental states or situations.

Conversational attitude: the tendency towards communication with other people and sometimes objects to which the interlocutor has given an animated component.

Affections: feelings about people or things, these can be positive or negative.

Assimilation: the ability to incorporate objects or actions into existing structures.

Self-perception: the ability to become aware of one's own perceptions.

False belief: the incorrect cognitive perception of a situation originating in the real world.

True belief: the correct cognitive perception of a situation originating in the real world.

Mental entity: a mental state or mental property. Mental states may include perception, experience of pain, belief, desire, intention, emotion and memory.

Equilibration: in Piagetian terminology, this is a process of restructuring, of homeostasis with respect to the processes of assimilation and accommodation.

Emotion: a feeling that appears when the person reacts to the environment, the emotion generates an affective state (positive or negative) that is accompanied by physical changes, as the emotion generates physiological changes.

Empathy: the ability to put oneself in another person's place in a given circumstance or situation.

Declarative gestures: signals in the form of gestures that the subject makes to communicate their desire to interactively share a situation, object, etc.

Intentions: thought directed to an end, intentional implies consciousness.

Primary intersubjectivity: according to Trevarthen (1989) this refers to the coordination between self and other from correspondences of form, synchrony and intensity. For example, around five months of life, the development of the social smile.

Secondary intersubjectivity: according to Trevarthen (1989), this is the ability to share feelings with "the other" or "others". Secondary intersubjectivity develops from nine to twelve months with the beginning of symbolic functioning. Trevarthen (1989) defines a developmental sequence from proto-conversation (primary intersubjectivity), play to finally cooperative awareness of persons and objects (secondary intersubjectivity).

Frontal cortical lobe: a sector of the cerebral cortex that is phylogenetically modern and is only specifically detected in highly evolved vertebrates, in hominids and specifically in *homo sapiens*. The prefrontal lobes are home to higher-order executive functions, including attention, planning, sequencing and behavioural reorientation. The frontal lobes are heavily involved in motivation and behaviour. These lobes have important connections with the rest of the brain areas.

Microchanges: changes that occur within a phase.

Macro changes: changes that occur in the passage from one phase to another.

Metarepresentation: the ability to think or reflect on one's own representations, and requires a high degree of analysis.

Mental operation: operations that take place in the cognitive and metacognitive environment and are related to reasoning processes, specifically hypothetico-deductive.

Joint attention patterns: processes of attention between two people with respect to an action or situation. In human development these behaviours appear at around four months of age. This concept is related to the development of social smiling, primary intersubjectivity and proto-conversations.

Cross-modal perception: perception from the inclusion of information through various channels (auditory, visual, and tactile) and their interrelation in the processing of an object, situation or person.

Sensorimotor period: according to Piaget's theory (1952), this is the period of evolutionary development from approximately 0 to 24 months, when the development of representation and the beginnings of metarepresentation appear and the preoperational period begins.

Object permanence: the ability to know that an object exists even if it is not seen. According to Piaget (1952), acquisition would begin at around nine months, although current developmental theories indicate that acquisition is earlier, although the motor action of executing the search for the hidden object would correspond to this developmental age.

Behavioural plasticity: changes in behaviour or routines.

Pragmatics: the function of language that refers to the social or contextual use of language.

Early Childhood: UNESCO defines early childhood as the period from birth to eight years of age. Link

Protoconversations: the onset of conversational patterns prior to language acquisition.

Primary circular reactions: according to Piagetian theory, these refer to infant's thought processes related to different events that contain a pattern of realisation

(following an object), actions on one's own body or that of others. They are the precursor to intentionality. They develop from one month to four months.

Secondary circular reactions: according to Piagetian theory, these refer to the infant's thought processes about different events that contain at least two patterns of behaviour. They are directly related to oculo-manual coordination, the beginning of means-ends differentiation and anticipatory behaviours. As well as the acquisition of the precursors of object permanence, these develop from the fourth month to eight months.

Tertiary circular reactions: according to Piagetian theory, they refer to the coordination of mental schemes, the search for means to an end and the progressive differentiation of means and ends. They are related to the first acts of practical intelligence and intentionality. Their chronology is from eight to twelve months.

Recursivity: according to Riviére and Nuñez (1996), this is related to the ability to have intentional mental states. It is related to type I functions, according to Bennett (1976), these structures are necessary to perform declarative or ostensive linguistic functions (i.e. transmission of propositional knowledge between minds). In humans, ostensive functions can be found at the end of the second year of life, although the development of ToM does not occur until at least the age of six.

Triadic or triangular relationships: relationships between the adult, the baby and an object.

Feelings: affective states provoked by an emotion towards people, objects or situations.

Social smile: the baby's smile that goes beyond that produced by physiological causes of satisfaction (food, sleep) and is aimed at seeking interaction with others. It begins at the end of the second month and is reached around the fourth month.

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Resources

Web

Developmental calendar from 0 to 18 months poster	https://bit.ly/3HyVoLy
Developmental Guidance from birth to 6 years	https://bit.ly/3xDBAlN
Diagnostic organisation for early care	https://bit.ly/3MYx47b
Early intervention	https://bit.ly/3xGj9wD
Technical recommendations for the development of early care	https://bit.ly/3xAM70Z
Ensuring Early Childhood Care in Europe in Spanish.	https://bit.ly/3OsGusL
EU Recommendations of the European Child Guarantee	https://bit.ly/3ycRC7T
The first news about your child with a disability	https://bit.ly/3HyjnuB
Sensory impairment in the autistic spectrum. Spanish Association of Autism Professionals (AETAPI) 2021	https://bit.ly/3OaFgCz

Information on disability	https://bit.ly/3xCgyUK