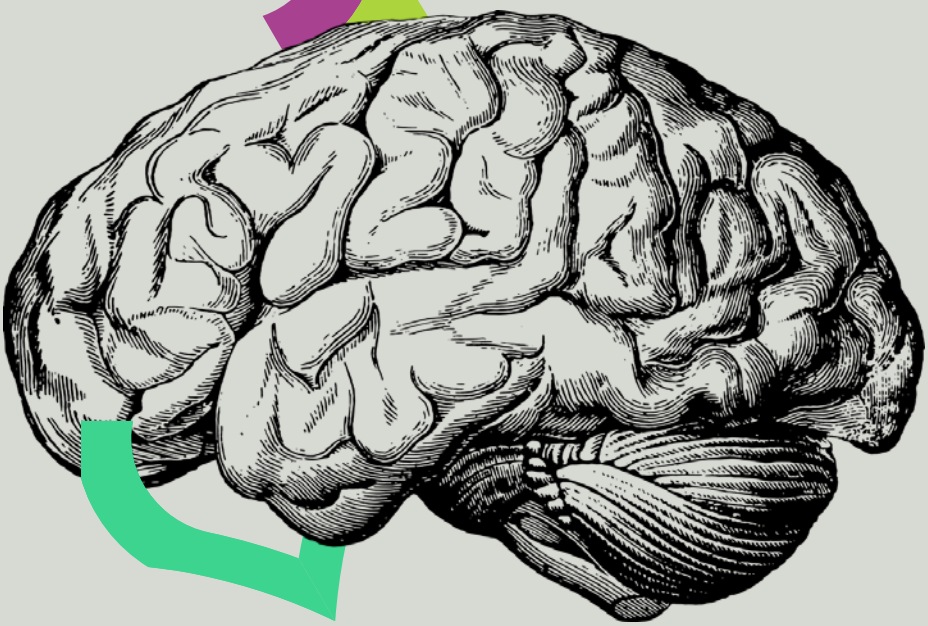


PRODUCT
IOE1

Erasmus+ 2019-1-ES01-KA204-065615 Project

Enrichment Toolkit, intellectual product (O1E1) from the Smart Art project

Teaching-learning for university students of Health Sciences

srlsmartart.eu srlsmartart srlsmartart smartartproject

UNIVERSIDAD DE BURGOS

Universidade do Minho

Universidad de Valladolid

Co-funded by the Erasmus+ Programme of the European Union

Universidad de Oviedo
Universidá d'Uviéu
University of Oviedo

BJÄLAND
DREAM THE FUTURE

PARAGON EUROPE
REALISING EXCELLENCE

SMART art

Authors:

Selection of graphical material and creation of sheets.
Dra. María Consuelo Sáiz Manzanares. Universidad de Burgos.
Pedagogical and instructional content, editing and layout.
Dra. María Consuelo Sáiz Manzanares. Universidad de Burgos. Dr. José Carlos Nuñez Pérez y Dra. Rebeca Cerezo Menendez. Universidad de Oviedo.
Dissemination and social media.
Dña. Sandra Rodríguez Arribas. Universidad de Burgos.
Supervision of layout.
Dr. Gonzalo Andres López. Universidad de Burgos.

Research Groups:

University of Burgos
PART: Dr. René Jesús Payo Hernanz, Dra. María José Zaparaín Yáñez.
ADMIRABLE: Dr. Carlos Pardo Aguilar.
DATAHES: Dra. María Consuelo Sáiz Manzanares, Dra. M. Camino Escolar Llamazares, Dra. Nuria Alonso Santander, Dña. Sandra Rodríguez Arribas.
GEOTER: Dr. Gonzalo Andrés López
iENERGIA: Dr. Fernando Aguilar Romero, Dra. Natalia Muñoz Rujas.

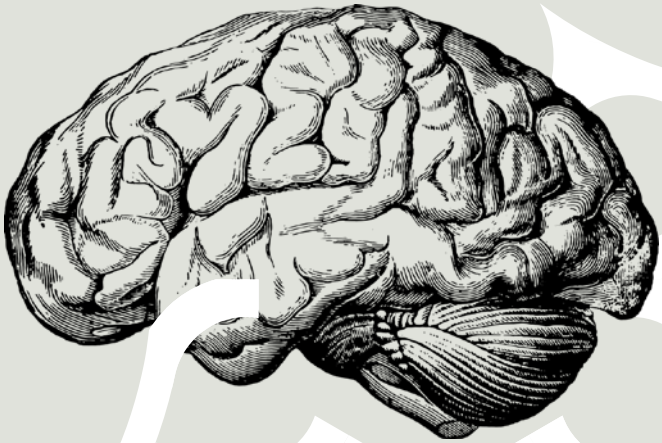
University of Oviedo
ADIR: Dr. José Carlos Nuñez Pérez, Dra. Rebeca Cerezo Menendez.

University of Minho
CIEd: Dr. Leandro Almeida, Dr. José Alberto Lencastre, Dra. Joana Casanova.

University of Valladolid
GIR179UVA: Dr. Miguel Ángel Carbonero Martín, Dr. Luis Jorge Martín Antón, Dr. Juan Antonio Valdivieso Burón.

Self-Regulated Learning in SmartArt reference 2019-1-ES01-KA204-095615, is co-financed by the European Union's Erasmus+ programme, line KA2 Strategic Partnerships-Adult Education. The content of the publication is the sole responsibility of the authors. Neither the European Commission nor the Spanish Service for the Internationalization of Education (SEPIE) is responsible for the use that may be made of the information disseminated herein

Co-funded by the Erasmus+ Programme of the European Union



Índice

Introduction

1

The materials presented here were developed within the Erasmus+ 2019-1-ES01-KA204-065615 project, financed by the European Union and coordinated by the University of Burgos in Spain. It also involved the participation of other partners from Spain (University of Oviedo, University of Valladolid and the company Bjaland), Portugal (Universidad do Minho) and Malta (the company Paragon). Our project lies within a framework of research into improving teaching and lasts for 36 months from 01/09/2019 to 31/08/22. The state of the art underlying it is society's advancement towards the use of **new forms of education** using **new technologies**. Nowadays, much learning is done in ***e-Learning*** or ***b-Learning*** environments. Facing this challenge requires **non-formal training online that facilitates learning for students of different ages**, making them functional and effective in terms of achieving learning results, encouraging interest, and **increasing motivation**.

In this context, the **SmartArt** project **aims to design an intelligent training environment**. More specifically, this guide works with **concepts related to neuropsychology** within a **self-regulated learning** design from the use of **hypermedia resources** including **continuous systematic assessment of the learning process**. The methodological guidelines are implemented in a **Virtual Learning Environment** (VLE). This document covers the development of the first **enrichment intellectual product (O1E1)** within the **SmartArt project**. In addition, this product and its technological implementation are openly accessible on the project website www.slrsmartart.com and includes access to an **interactive platform** on which the materials that will then be implemented can be used. These materials include **an avatar** that accompanies the learner on their learning journey, ensuring **personalized development** based on each learner's characteristics**, enhancing personalized learning**.

As indicated above, the objective in this case is to motivate learners of neuropsychology, particularly adults, by including **digitization tools** and **motivating learning techniques** such as **gamification and** the **inclusion of avatars.** This **regulates and facilitates learning by increasing motivation and advances in the learning.** These materials are focused on university students in the **Health Sciences branch**, particularly in the **discipline of neuropsychology**. All of the materials and the interaction in the VLE are **open access** and **free of charge**.

The objective of this enrichment intellectual product **(O1E1)** was pursued via the **creation of a virtual "SmartArt" classroom** that covers the fol-

lowing **specific objectives:** (a) to facilitate and improve access to learning neuropsychology and to increase the application of related courses adapted to university student education in virtual environments; (b) to engage adults in learning neuropsychology in virtual environments; (c) to simplify the assessment of university students' aptitudes and attitudes towards learning in virtual settings; (d) to facilitate the teaching process for neuropsychology teachers in virtual environments; and (e) to implement systematic monitoring and evaluation mechanisms for all involved (teachers and students).

The innovation of the product lies in the **methodology and technology** used, i.e. an intelligent training classroom in various disciplines that combines a **self-regulated learning** design based on the use of **hypermedia resources,** including **continuous, systematic evaluation of the learning process;** complemented by **motivation for** learning and increased learning from **intelligent mentoring systems**.

The partners involved in this project are Spanish (University of Oviedo, University of Valladolid and Bjaland company), Portuguese (University of Minho) and Maltese (the Paragon company). The project is coordinated by the University of Burgos.

University of Burgos members of the SmartArt project

Strategic partnership of the SmartArt project.

Theoretical Framework

2

This enrichment of the SmartArt Project intellectual product is based on **meaningful learning** approaches (Ausubel, 1968) within a **constructivist** methodology [Vygotsky (1962), Piaget (1975)]. These methodological approaches have been consolidated in recent decades in the field of education. One of the most important methodologies for achieving this inclusion is **Project-Based Learning (PBL)** (Kirschner, Sweller, & Clark, 2006). This type of teaching aims to **develop meaningful and personalized learning through the resolution of practical situations** (Sáiz, García-Osorio, Díez-Pastor, & Martín-Antón, 2019). It has been shown to be much more effective than learning from exclusively memory-based approaches. In addition, in recent years the inclusion of technological resources called **Advanced Learning *Technologies*** (ALT) have facilitated the implementation of this pedagogical approach on interactive platforms, called **Learning *Management Systems*** (LMS), and the use of resources called **Smart Tutoring** within the LMS gives the learner continuous guidance. These resources include avatars that help ***Self-Regulated Learning*** **(SRL)** and **process-oriented *feedback,*** not just products, (Hattie, 2013). All of this increases learner motivation (Azevedo, 2005; Zimmerman & Moylan, 2009).

Why target university students?

The SmartArt project aims to offer materials for various educational stages that assist in **effective learning** by including resources that apply **SRL, gamification**, and **avatars** which accompany and guide the learner in the learning process, facilitating understanding and hence **motivation** (Zimmerman & Moylan, 2009). These materials, accompanied by technological resources (interactive platform, VLE), can be used individually by users or can be used by teachers and educators as support in **their usual** teaching practice. Increasingly, different types of institutions (universities, regional and local bodies) offer training courses, aimed in this case at university students within the framework of regulated education in the knowledge branch in neuropsychology. This material, together with the SmartArt project VLE, is an important resource for **university student learning,** this is endorsed by the latest research in both **methodological and technological resources** (Sáiz, Marticorena, and Garcia-Osorio, 2020). The ultimate goal is **to facilitate high-quality, inclusive education,** which is easily accessible, and freely available to everyone, based on the premise of **sus-**

tainable education (Sáiz, Rodríguez, Marticorena, Zaparaín, and Cerezo, 2020).

These objectives are set out in the Erasmus+ Programme Guide (2020) as follows:

1

Improve the level of key skills and competences, taking into account in particular their relevance in the labour market and their contribution to the cohesion of society, in particular by increasing opportunities for mobility for learning reasons and strengthening cooperation between the world of education and training and the world of work.

2

Promote **improvements in quality, excellence in innovation and internationalization** in education and training institutions, in particular by enhancing transnational cooperation between education and training providers and other stakeholders.

3

Promote the emergence and **awareness of a European lifelong learning area** designed to complete national policy reforms and to support the modernization of education and training systems, in particular by promoting political cooperation and through better use of EU transparency and recognition tools and the dissemination of good practices.

4

Enhance the **international dimension of education and training,** in particular through cooperation between the programme and the institutions of partner countries in the field of VET and higher education, increasing the attractiveness of European higher education institutions and supporting EU external action, including their development objectives, by promoting mobility and cooperation between the programme and the higher education institutions of partner countries and building the skills envisaged in partner countries.

5

Improve language teaching and learning and promoting the EU's wide linguistic diversity and intercultural awareness.

Methodology used in the development of materials

The materials in the different topic units are based on the systematic use of ***feedback*** for both **conceptual and procedural content** and on the **evaluation of learning.** The strategies used to apply ***feedback*** are based on the use of **ALT resources** and **avatars** encouraging development of **SRL,** either in-person or automated in the **VLE.** The work is based on Hattie's studies (2013); Hattie and Timperley (2007). These authors differentiated between **process-oriented feedback** and product-oriented feedback, considering them both essential elements in a continuous process. Effective **process-oriented feedback** encourages **development of metacognitive strategies** and **SRL** processes. **Process-oriented feedback** and **SRL** respond to the following questions: **what, how, when, and where to learn.** SRL resources also provide learners with assistance in the learning process (Hattie, 2013):

1. Give students **clear explanations** about what they are expected to learn, also specifies and defines the **competencies** making up what is to be learned.
2. Provide students with **clear criteria** about what is meant by **successful learning.**
3. Guarantee teaching that **reduces the distance** between what students know and what they are expected to learn.
4. Ensure ***feedback*** in the steps aimed at reducing that distance.

In addition, using **SRL** ensures gradation of learning activities in a hierarchical order of difficulty by increasing the learner's **motivation** to continue learning. One tool that enhances this **sequencing** is the use of **feedback-based rubrics** (Saiz, Cuesta, Alegre, and Peñacoba, 2017).

Why use a ***Learning Management System***?

As mentioned earlier, in the last ten years the use of LMSs has been shown to be very effective in the teaching-learning process, especially in adults (Cerezo, Sánchez-Santillan, Paule-Ruiz, and Nuñez, 2016). LMSs allow the use of hypermedia resources that facilitate the development of the **teaching-learning process.** In addition, these resources guide **SRL** and allow the learner to **regulate their own learning** in a personalized way as they include **planning, monitoring, control,** and **regulation** which increases learner **motivation**. LMSs can include many of the **process**- and **rubric-oriented feedback processes and procedures** discussed in the previous section (Saiz, Marticorena, García-Osorio, and Díez-Pastor, 2017).

The ability to include hypermedia resources in LMSs makes it easier to implement **ALT** more extensively. These resources, automated in the development of **process-oriented feedback,** have been called **intelligent tutoring** systems, **Smart Tutoring,** or **MetaTutoring,** when implementing **metacognitive self-regulation** (Azevedo et al., 2013). The development of resources to check the learning itself is called **self-assessment.** Within these resources we can differentiate **questionnaires** and **crosswords** with **automated feedback on the** answers, and product-oriented **feedback** (Sáiz, García-Osorio, and Díez-Pastor, 2019). To design these activities in the LMS the educator or teacher should follow the steps in Table 1

Table 1. Design of learning activities (adapted from Sáiz, Arnaiz, & Escolar, 2020 p. 3).

ACTIVITY DESIGN	DESIGN MODULE	WHAT TO EVALUATE
What	What do I want to teach?	Learning goals
	What skills do I want learners to develop ?	Knowledge design
How	Designing learning tasks	Exams and tests to check learning achievements
Who	Who are the learning tasks aimed at? What's the learner like?	Prior knowledge
When and Where	Timeline of the development of learning tasks. Studying learning behaviours in students	Sequential graduation of learning task difficulty Process-oriented feedback planning

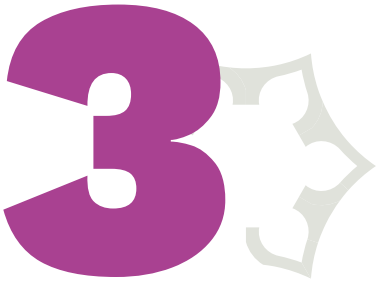
Why monitor the learning process?

Use of LMSs over the last ten years has been very effective in processes for **monitoring learning,** particularly in university environments (Cerezo, Sánchez-Santillan, Paule-Ruiz, and Nuñez, 2016). LMSs provide a record of the interaction of the different actors involved (students and teachers) during the teaching-learning process. This is important because it allows us to discover **each learner's learning behaviours** and **monitor how that learning progresses** at the beginning, while it is being done, and at the end. These records can be extracted and processed using a variety of statistical programs and data analysis systems (Python libraries, WEKA, etc.) that allow the application of **data mining techniques,** which facilitate the prediction and clustering of learner behavioural patterns, among other things. These results will make it easier for the teacher or educator to understand how their students learn and, depending on their profiles and **learning styles**, the teacher will be able to apply different resources and aids aimed at offering a **personalized learning response tailored to each student's specific learning needs** (Sáiz, Marticorena, & Garcia-Osorio, 2020).

Why personalize learning?

The **personalization of learning** is about the teacher adapting to each learners' pace of learning. This can seem very complicated in in-person learning environments, but is much more versatile **in non-face-to-face** settings that implement ALT and hypermedia resources in LMSs. This adaptation to each learner's characteristics and needs will increase learning successes, the cost-effective use of resources and ultimately **education sustainability** (Sáiz, García-Osorio, Díez-Pastor, Martín-Antón, 2019; Saiz, Rodriguez, Marticorena, Zaparaín, and Cerezo, 2020). In addition, **personalizing learning** using the resources described above is especially useful in **adult education** (Sáiz, Rodríguez, Marticorena, Zaparaín, and Cerezo, 2020). This form of teaching-learning is increasingly necessary, as the knowledge society is advancing rapidly, and **non-formal education offers** people **much-needed and accessible training** and **updating of skills.** That is why providing pedagogical materials and designs that facilitate successful learning is a government obligation, as is **the cost-effective use** and **sustainability** of those resources. In this context, the use of the procedures and resources already listed has been shown to be an effective practice for achieving **effective learning.** These objectives relate to the search for a sustainable society and are set out in The 2030 Agenda for Sustainable Development and the SDGs (for more information click here).

Research groups involved in the SmartArt strategic group



One of the strengths of the **SmartArt Project** is that members of **8 Research Groups** from different knowledge areas collaborate in it: Learning Psychology (ADIR, DATAHES, GIE179, GIPDAE), Educational Psychology (ADIR, DATAHES, GIE179, GIPDAE), Artificial Intelligence and Data Mining (DATAHES, ADMIRABLE), Educational Engineering (iENERGÍA), and History, Heritage and Geography (GEOTER, PART). Therefore, the **interdisciplinary nature** of the SmartArt project in those areas means that the project addresses aspects of educational methodology, learning strategies, data analysis from the use of data mining techniques, and artificial intelligence in the development of content, in this case, related to neuropsychology.

Research Grooups from the University of Burgos

ADMIRABLE Research Group
https://investigacion.ubu.es/grupos/1817/detalle

DATAHES Research Group
https://investigacion.ubu.es/grupos/1812/detalle

GEOTER Research Group
https://investigacion.ubu.es/grupos/1802/detalle

ENERGIA Research Group
https://investigacion.ubu.es/grupos/1826/detalle

PART Research Group
https://investigacion.ubu.es/grupos/1806/detalle

Research Groups from the University of Minho

CIEd Research Group
https://www.ie.uminho.pt/en/investigacao/Pages/CIEd.aspx

Research Groups from the University of Oviedo	ADIR Research Group **http://adir.grupos.uniovi.es/**
Research Groups from the University of Valladolid	GIE179 Research Group **http://www.giepsicologiaeducacion.es/integrantes_GIE.php**

Section summary

Lifelong education is the right of all citizens. It is, therefore, an obligation of the responsible authorities in each different country.

Technology and advances in educational instruction offer tools that will help educational leaders to respond to educational requirements in the various knowledge areas.

Pedagogical design together with innovative methodological and technological resources will facilitate various groups' access to learning and increase motivation for learning, which will help achieve effective learning.

Learning activities

4

4.1.
Neuropsychology in early years

What is its significance?

Knowledge of development in early years is an important challenge for health sciences students in various courses such as psychology, paediatrics, occupational therapy, paediatric nursing, etc.

Why study it?

Early treatment is directly related to prevention of potential problems, whether in primary prevention (before the problem arises) or secondary prevention (in the early stages of a problem).

How will we work on the subject

The subject of early years neuropsychology is divided into six topic units:

Unit 1. Neuropsychological development and measurement techniques.

Unit 2. Neuropsychological development and implications for children's learning processes ages 0-6 years old. Analysis protocol for disorders.

Unit 3. Primary and secondary reflexes.

Unit 4. Neuropsychological development: recognition of others in ages 0-6 years old.

Unit 5. Producing early stimulation programs for 0-3 year-olds.

Unit 6. Producing early stimulation programs in 3-6 year-olds.

General Goals

- Explain the most important development milestones in 0-6 year-olds.
- Explain current techniques for measuring neuropsychological development in 0-6 year-olds.
- Explain the relationship between neuropsychological development and the learning processes between ages 0-6 years old.
- Analyse neuropsychological development in various developmental disorders between ages 0-6 years old.
- Evaluate the knowledge acquired about neuropsychological development and learning processes in 0-6 year-olds.

Specific Goals

- Analyse the development of primary and secondary reflexes in the first and second years of life and their implications for development: consequences of disorders.
- Analyse the neuropsychological development in the recognition of others between the ages of 0-6 years old and the implications for development: consequences of disorders.
- Analyse the creation of early stimulation programs in 0-3 year-old children: precursors of the Theory of Mind.
- Analyse the creation of early stimulation programs in 3-6 year-old children.

Content

- Neuropsychological development and measurement techniques.
- Neuropsychological development and implications for the learning process in 0-6 year-olds. Protocol of analysis of disorders.
- Primary and secondary reflexes.
- Neuropsychological development: recognition of others in children aged 0-6 years old.
- Creation of early stimulation programs in 0-3 year-old children.
- Creation of early stimulation programs in 3-6 year-old children.

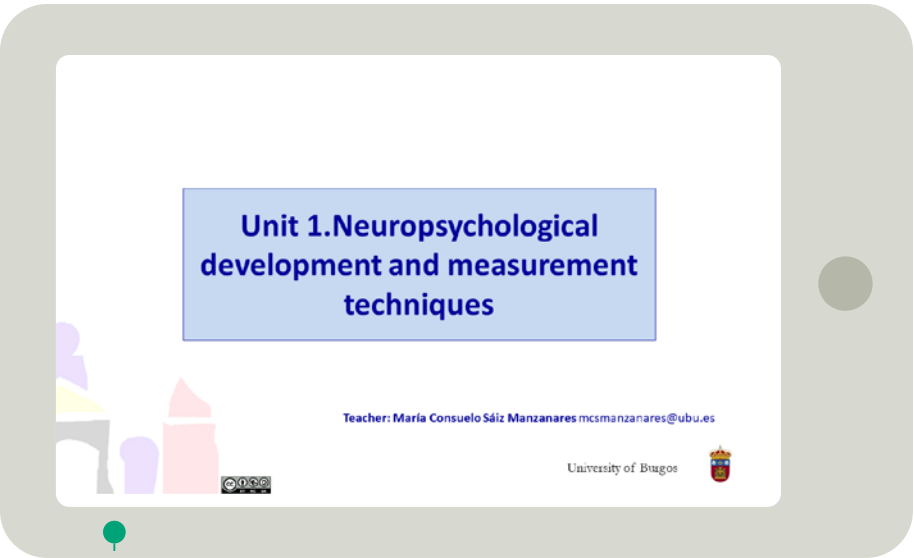
Evaluation criteria

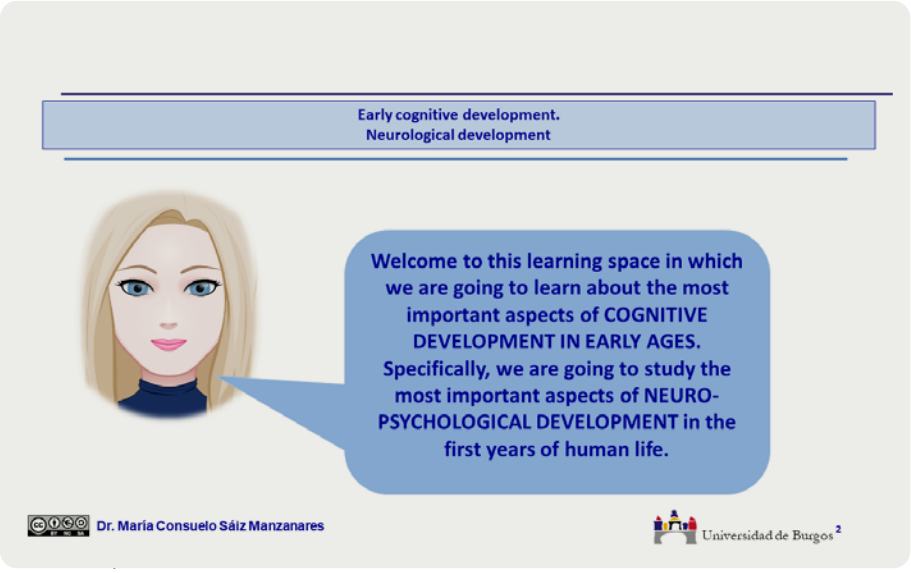
Before doing the activity, it is useful to know how much is already known about the topics to be covered. We recommend completing the following survey (Sáiz, 2018).

EVALUATION CRITERIA	ASSESSMENT SCALE				
1. I know about neuropsychological development in early ages (0-6 years).	1	2	3	4	5
2. I know about neurological measurement techniques in early years (0-6 years).	1	2	3	4	5
3. I know what primary and secondary reflexes are and how to measure them.	1	2	3	4	5
4. I know the techniques for assessing facial recognition in children (0-6 years).	1	2	3	4	5
5. I know how to prepare an early stimulation program for 0-3 year-olds.	1	2	3	4	5
6. I know how to prepare an early stimulation program for 3-6 year-olds.	1	2	3	4	5

4.2.
Unit 1
Neuropsychological development and measurement techniques.

Content





1

Early cognitive development.
Neurological development

Synaptic development

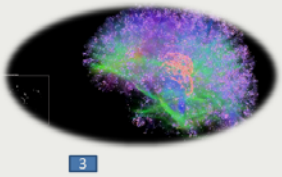
The human nervous system is made up of neurons. The neuron is a cell composed of a body or "soma" containing a nucleus, which includes the "Nissl bodies"; dendrites, an axon, which includes the nodes of Ranvier, myelin sheaths and nerve endings called "synaptic boutons".

1

Early cognitive development.
Neurological development

Synaptic development

2

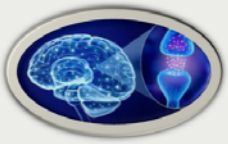


3

A synapse is the interconnection between two neurons, whether they are an association between a neuron and a receptor cell or between a neuron and an effector cell. In these contacts, the transmission of the nerve impulse occurs.

Early cognitive development.
Neurological development

Synaptic development



4

A nerve impulse is initiated by a chemical discharge that triggers a electrical current in the membrane of the presynaptic cell (sending cell). Once this nerve impulse reaches the end of the axon (the connection to the other cell), the neuron itself secretes a type of chemical compound (neurotransmitters) These include noradrenaline and acetylcholine, which are responsible for exciting or inhibiting the action of another cell called a postsynaptic cell (receptor cell).

Early cognitive development. Neurological development

Brain Functionality

5

6 Electroencephalography

1. Maturational development
2. Interactive specialisation
3. Learning strategies

?

8

Evoked potentials

7 Magnetic resonance imaging

M de Haan and M Martinos, University College London Institute of Child Health, London, UK. Brain Function

Early cognitive development. Neurological development

Tools	Description	In young children
Electroencephalography (EEG)	Electroencephalography (EEG) is a neurophysiological examination based on the recording of the brain's bioelectrical activity in basal conditions of rest, wakefulness or sleep, and during various activations using electroencephalography equipment.	EEG is often used with children as it is a non-invasive method.
Event related potentials (ERPs)	ERPs is the measurement of brain response as a direct result of a specific sensory, cognitive or motor event. It is any stereotyped electrophysiological response to a stimulus.	ERPs is often used with children as it is a non-invasive method.
Magnetic resonance imaging (MRI)	It is a non-invasive technique that uses the phenomenon of nuclear magnetic resonance to obtain information about the structure and composition of the body to be analysed. This information is processed by computers and transformed into images of the interior of what has been analysed.	MRI is very sensitive to movement, but may be acceptable if obtained in children during sleep.

Taken from Haan and Martinos (2008) p. 3

Early cognitive development. Neurological development

Tools	Description	In young children
Functional magnetic resonance imaging (fMRI)	fMRI measures brain activity by detecting associated changes in blood flow. When an area of the brain is in use, blood flow to that region also increases.	fMRI is very sensitive to movement and is not often used with children under 7 years of age.
Magnetic encephalography (MEG)	MEG is a non-invasive technique that records functional brain activity by capturing magnetic fields, making it possible to investigate the relationships between brain structures and their functions. The possibility of these recordings is determined by neuronal postsynaptic activity and by the synchronous activation of millions of neurons, which generates uniform, differentiated and localised brain activity, capable of being recorded by magnetometers located along the cranial convexity.	MEG is a fairly new technique that can be used with infants and children. It has been used to study sensory development in foetuses.

Taken from Haan and Martinos (2008) p. 3

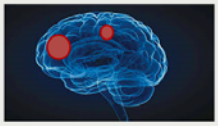
Early cognitive development. Neurological development

Tools	Description	In young children
Near-infrared spectroscopy (NIRS)	NIRS is a form of optical imaging that calculates changes in blood oxygenation and indirectly measures activity levels in different regions of the brain.	It is increasingly used in infants and young children as it is non-invasive and not greatly affected by movement.
Positron emission tomography (PET)	PET is a technique used in nuclear medicine. A radiopharmaceutical - a radioisotope bound to a drug - is injected into the body as a tracer. Gamma rays are emitted and detected by gamma cameras to form a three-dimensional image, similar to how an X-ray image is captured. PET scanners can incorporate a CT scanner and are known as PET-CT scanners. Images from the PET scanner can be reconstructed with a CT scan performed with a scanner during the same session.	It is not commonly used in children because the radioactive isotope has to be injected, making it an invasive technique.

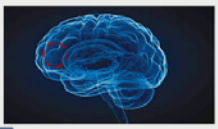
Taken from Haan and Martinos (2008) p. 3

Early cognitive development. Neurological development

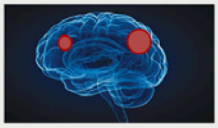
During a task, different areas of the brain are activated depending on the type of task and on the strategies needed do it.



DURING
(activation of frontal and prefrontal areas)



14 BEFORE



AFTER

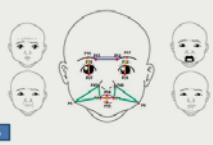
13

Early cognitive development. Neurological development

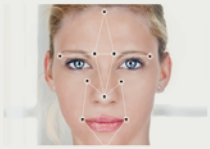
During development, frontal and prefrontal areas are activated in the development of *learning skills*.

Face processing

According to Haan and Martinos (2008) p. 230, following Morton and Johnson's theory, newborns have a preference for orienting faces that is determined by a subcortical system called "Conspec", this would be a reflex the newborn is born with, which orients faces in the first weeks of life. Later it will be accompanied by a visual input oriented to the face and slowly provide an input to the cortical system in the "Conlern". This initially functions as a general object processing visual system and with the help of "Conlern", would function as a specific cortical face processing system:
1) The areas involved would respond more specifically to faces.
2) The area responding to the faces will become more focal.



15



16

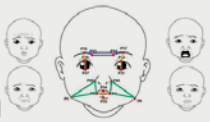
Taken from Haan and Martinos (2008)

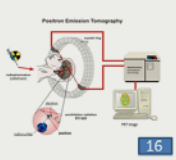
Early cognitive development. Neurological development

During development, frontal and prefrontal areas are activated in the development of learning skills.

Face processing

The instruments used for these analyses in adults (fMRI) do not seem particualry suited to study in children. The only system that is more advisable is PET (positron emission tomography).


15


17

16

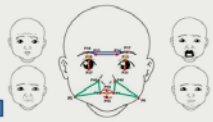
Early cognitive development. Neurological development

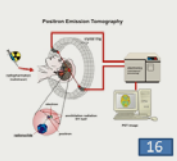
During development, frontal and prefrontal areas are activated in the development of learning skills.

Face processing

At around **two months** of age infants begin to focus on faces but also on other objects, there does not seem to be a specification in processing.
It speaks of a visual processing system from 6 to 9 months that coincides with the 6 and 9 month revolution, **human face processing strategy**.

Taken from Haan and Martinos (2008)


15


17


16

Early cognitive development. Neurological development

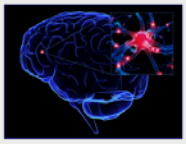
During development, frontal and prefrontal areas are activated in the development of learning skills.

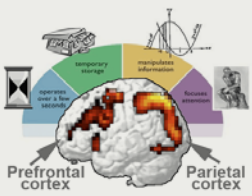
Working memory

The prefrontal cortex, a region in which high-level processing occurs, is slower to mature than other areas, and its functioning in neural activity is situated around the middle of the first year of life.

Taken from Haan and Martinos (2008)

18





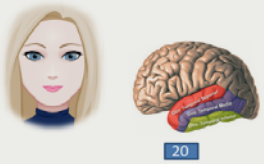
19

Early cognitive development. Neurological development

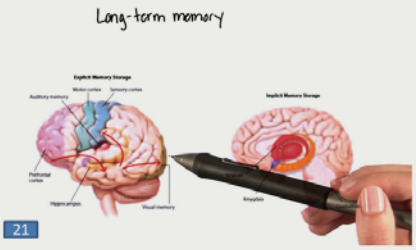
During development, frontal and prefrontal areas are activated in the development of learning skills.

Long Term Memory

The medial temporal lobe is located



20



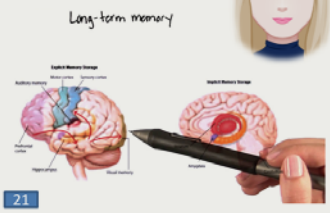
21

Early cognitive development. Neurological development

During development, frontal and prefrontal areas are activated in the development of learning skills.

Long Term Memory

Recent studies indicate that infants during the **first 3 months** begin to develop medial temporal lobe **memory systems** (MTLs). The period from **6 to 24 months** is referred to as the period of **recognition, storage, processing and recall of information.** All these advances are related to the revolution at six and nine months and the appearance of representation at around eighteen months: anticipatory behaviours and serial patterns of execution.



21

Early cognitive development. Neurological development

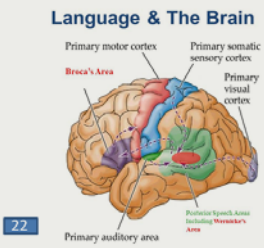
During development, frontal and prefrontal areas are activated in the development of learning skills.

Language

Broca's and Wernicke's area

Milestones

- 6-8 months
- 10-12 months
- three years



22

Early cognitive development. Neurological development

- By 22 weeks gestation, projections from the thalamus, basal forebrain and brainstem are occurring.
- Cortical layers mature in the perinatal period as well as transient synaptic contacts.
- Neocortical differentiation of areas corresponds to certain aspects of maturation: sensory, motor and cognitive.

M de Haan and M Martinos, University College London Institute of Child Health, London, UK. Brain Function

Prenatal

23

Perinatal

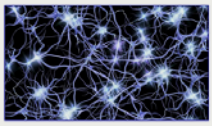
24

Early cognitive development. Neurological development

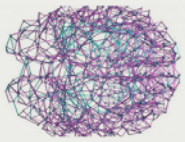
It appears that brain growth is not linear. The maximum growth rate occurs around the age of 6 years old, where the brain is approximately 95% of adult brain size, and this growth is due to:

- An increase in synapses and dendrites.
- The myelination process.
- The production of new neurons.

Fair and Schlaggar (2008)



25



26

Early cognitive development. Neurological development

- In terms of intra-cortical connections, there is substantial growth in synaptic contacts between 30 weeks and two years.
- There are discrepancies as to whether growth is homogeneous in this period in all areas or not.

Fair and Schlaggar (2008)

27

28

Early cognitive development. Neurological development

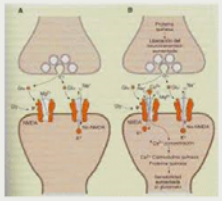
- At around 9 months, connections increase.
- The same hierarchical organisational structure is observed in the visual area as in the adult brain.

29

Fair and Schlaggar (2008)

30

Early cognitive development. Neurological development



- Different types of synapses are differentiated: excitatory and inhibitory connections (intracortical, thalamocortical, cortico-cortical including *feedforward*, compensatory signalling, and feedback).
- Different types of connections with different pathways are found.

31

Fair and Schlaggar (2008)

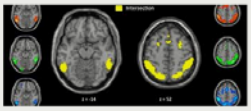
Early cognitive development. Neurological development

Brain Functionality

1. Maturational development
2. Interactive specialisation
3. Learning strategies

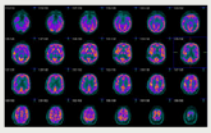
5

?



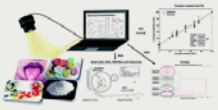
9

Functional Magnetic Resonance Imaging (fMRI)



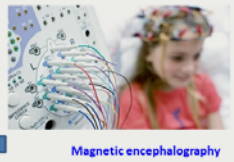
12

Positron emission tomography (PET)



11

Near infrared spectroscopy (NIRS)



10

Magnetic encephalography

Early cognitive development.
Neurological development

THANK YOU VERY MUCH FOR YOUR ATTENTION!!!!

Universidad de Burgos

Early cognitive development.
Neurological development

Now we are going to do a Crossword puzzle to check what we have learned

32

Universidad de Burgos 25

Early cognitive development.
Neurological development

Licence

Author: Dr. María Consuelo Sáiz Manzanares
Developmental and Educational Psychology Area
Faculty of Health Sciences
University of Burgos

Universidad de Burgos

1

Early cognitive development.
Neurological development

Bibliographical references

Benson, J.B., & Haith, M.M. (2008). *Encyclopedia of infant and early childhood development*. Amsterdam : Elsevier.
de Haan, M., & Martinos, M. (2008). Brain Function. En J.B. Benson & M.M Haith (Eds.), *Encyclopedia of infant and early childhood development* (pp. 225-236). Amsterdam : Elsevier.
Fair, D., & Schlaggar, B L. (2008). Brain Development. En J.B. Benson & M.M Haith (Eds.), *Encyclopedia of infant and early childhood development* (pp. 211-225). Amsterdam : Elsevier.
Fuster, J. Professor of Psychiatry, Emeritus, Distinguished Professor of Cognitive Neuroscience, UCLA Semel Institute for Neuroscience & Human Behavior, School of Medicine, University of California at Los Angeles. http://www.joaquinfuster.com/

Early cognitive development.
Neurological development

Images
Image 1. https://i.pinimg.com/236x/40/2f/92/402f92a0605443e8ef92fb891375dc54.jpg
Image 2. https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcRwrDAzpOsqk5fT3LT8PHfQ7lah2pTuveRmAw&usqp=CAU
Image 3. https://64.media.tumblr.com/b7b51648ff905da636db3e6cfaf287b2/tumblr_ov4128ZMJg1r6obhzo1_400.jpg
Image 4. https://www.cannabisn24.com/wp-content/uploads/2019/06/dopamina.jpg
Image 5. https://www.deguate.com/artman/uploads/51/smart-medible.jpg
Image 6. https://cdn3.weka-fachmedien.de/thumbs/media_uploads/images/1523516536-290-worzec61e.jpg.385x217.jpg
Image 7. https://image.shutterstock.com/image-photo/mri-magnetic-resonance-tomography-imaging-260nw-1751226356.jpg
Image 8.
https://static.wixstatic.com/media/d18f26_5c9d4367a28f44ca9a9dd2248ffcb206~mv2.jpg/v1/fill/w_420,h_734,al_c,q_80,usm_0.66_1.00_0.01/d18f26_5c9d4367a28f44ca9a9dd2248ffcb206~mv2.jpg
Image 9 https://campus.brainamics.es/qyf/wp8ga29pYnN_uploads/images_collection_4363/images_collection_final_list_4363.jpg
Image 10 https://www.escogetucarrera.com/wp-content/uploads/2020/09/carrera-de-neurologia-11.jpg
Image 11 https://lh3.googleusercontent.com/xutt1GkNRHVTMmz86iej5uPwYgQcRP0OBV0A5vCozZkAZfZqXkZcKMtQbQVsVVd4hPpX=s170
Image 12 https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.ge.com%2Fresearch%2Fproject%2Fpositron-emission-tomography-detectors&psig=AOvVaw3MktxkH11klBQioG5zocIR&ust=1613931766181000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCIj3jNyK-e4CFQAAAAAdAAAAABAD
https://revistadigital.inesem.es/educacion-sociedad/files/2019/02/light-bulb-3104355_960_720.jpg
Image 13 https://www.vilapress.cat/images/showid2/26691157w=1070
Image 14 http://agencia.fapesp.br/agencia-novo/imagens/noticia/20576.jpg
Image 15
https://images2.minutemediacdn.com/image/upload/c_fill,g_auto,h_740,w_1100/v1555385766/shape/mentalfloss/facialrecognition_header.jpg?itok=CVtfCjfC
Image 16 https://www.fz-juelich.de/SharedDocs/Bilder/INM/INM-4/EN/PET-Physik/WieFunktPet.jpg?__blob=normal
Image 17 https://sites.google.com/site/savthedatavnnms/home
Image 18 https://lh3.googleusercontent.com/EcASGHjyeOqWEuG0y6xMKN3qjLSn7L8qQ6tgYFzGBrWk2DaU8bHaHisHzv_PBeVCeYWn_3M=s111

Early cognitive development.
Neurological development

Images
Image 19
https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.emaze.com%2F%40AWWFIWLT&psig=AOvVaw07NkpxjXCAluc2eGmDGoli&ust=1613491346910000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCICR9ueh7O4CFQAAAAAdAAAAABAK
Image 20 https://3.bp.blogspot.com/-WorDm2JCEY4/W2Zii-wHPsI/AAAAAAAAATA/nZEX9KuwXYwrqAHEpWA8Db3_Nlq-SNCQACEwYBhgL/s1600/maxresdefault%2B%25281%2529.jpg
Image 21 https://www.google.com/url?sa=i&url=https%3A%2F%2Fmedium.com%2F%40leslielayman%2Ffavorite-board-books-7beb61dee667&psig=AOvVaw2xS0E8P7UINVv-gtlRi6O8&ust=1613491464257000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCOj2gp-i7O4CFQAAAAAdAAAAABAK
Image 22 https://lh3.googleusercontent.com/0EUq-okMoqDAtUR_MOD24KJSeihOKBvbUqjGMapCLJK663_glbzPfvwngU_RbNclMNmvPw=s170
Image 23 https://s3.bukalapak.com/img/3108837701/s-463-463/TERAPY_MUSIC_KHUSUS_BUAT_IBU_HAMIL__BAYI____ANAK_ANAK.jpg.webp
Image 24 https://miro.medium.com/max/2800/1*fN3JsCeF9JA_Ku2J_p4zVg.jpeg
Image 25 https://mindzilla.com/wp-content/uploads/2015/07/images_editorial_Neuroscience_07-july-2015_brain-network.jpg
Image 26 https://www.nyugat.hu//var/improxy/bW9ya1xDbGFzc2VzXEhtYWdlXFRodW1iXEZlRFBpY3R1emU_/p2/01/p20160719fe3beec6.jpg?m=1468927971
Image 27 http://2.bp.blogspot.com/-PP3d5-BbjqQ/UXe6l78z8qI/AAAAAAAAAJo/gG_Xzf528sk/s1600/telepati.jpg
Image 29 https://webstockreview.net/images/network-clipart-neural-network-2.png
Image 30 https://avatars.githubusercontent.com/u/40887089?s=400&v=4
Image 31 https://w3.ual.es/personal/pnieto/sinapsis_archivos/sinapstod.gif
Image 32 https://krot.info/uploads/posts/2021-01/1610236501_7-p-fon-skanvord-16.png

Testing knowledge from Unit 1.

Matching questions

a. Neuron	2. Nucleus
b. Soma	3. Nodes of Ranvier
c. Axon	4. Synaptic boutons
d. Myelin sheaths	1. Cell

Answers

a-1/b-2/c-3/d-4

True/False questions

1.

Synapses are produced by an interconnection with a receptor cell **(False)**

Feedback: synapses refer to the connection between two neurons, whether an association between a neuron and a receptor cell or between a neuron and an effector cell.

2.

A nerve impulse is initiated by a chemical discharge that triggers an electrical current between the sending and the receptor cells. Noradrenaline and acetylcholine are chemical compounds that excite or inhibit the postsynaptic cell **(True)**

Feedback: A nerve impulse is initiated by a chemical discharge that triggers an electrical current between the sending and the receptor cells. Noradrenaline and acetylcholine are chemical compounds that excite or inhibit the postsynaptic cell.

3.

Electroencephalography (EEG) is often used in neuropsychological exams in small children **(True)**

Feedback: Electroencephalography (EEG) is a neurophysiological examination based on the recording of the brain's bioelectrical activity in basal conditions of rest, wakefulness or sleep, and during various activations using electroencephalography equipment. EEG is often used with small children as it is a non-invasive method.

4.
Positron emission tomography (PET) is often used in neuropsychological examinations in small children **(False)**
Feedback: PET is a technique used in nuclear medicine. A radiopharmaceutical—a radioisotope bound to a drug—is injected into the body as a tracer. Gamma rays are emitted and detected by gamma cameras to form a three-dimensional image, similar to how an X-ray image is captured. PET scanners can incorporate a CT scanner and are known as PET-CT scanners. Images from the PET scanner can be reconstructed with a CT scan performed with a scanner during the same session. It is not commonly used in children because the radioactive isotope has to be injected, making it an invasive technique.

5.
During information processing while doing a task, the same brain areas are activated **(False)**
Feedback: During a task, different areas of the brain are activated depending on the type of task and on the strategies needed do it.

6.
Focusing attention begins around 9 months of age **(False)**
Feedback: At around two months of age, infants begin to focus on faces but also on other objects, there does not seem to be a specification in processing. It speaks of a visual processing system from 6 to 9 months that coincides with the 6 and 9 month revolution, human face processing strategy.

7.
High-level processing occurs in the frontal and prefrontal cortex, which are slower to mature than other areas of the brain **(True)**
Feedback: The prefrontal cortex, a region in which high-level processing occurs, is slower to mature than other areas, and its functioning in neural activity is situated around the middle of the first year of life.

8.
The development of memory systems in the medial temporal lobe begin at 6-20 months **(False)**
Feedback: Recent studies indicate that infants during the first 3 months begin to develop medial temporal lobe memory systems (MTLs). The period from 6 to 24 months is referred to as the period of recognition, storage, processing and recall of information. All these advances are related to the revolution at six and nine months and the appearance of representation at around eighteen months: anticipatory behaviours and serial patterns of execution.

9.
Brain growth is linear throughout human development **(False)**

Feedback: It appears that brain growth is not linear. The maximum growth rate occurs around the age of 6 years old, where the brain is approximately 95% of adult brain size, and this growth is due to an increase in synapses and dendrites, the myelination process, and the production of new neurons (Fair and Schlaggar, 2008).

10.
Different types of synapses can be differentiated (excitor and inhibitor) in connections (intracortical, thalamocortical, cortico-cortical including feedforward, compensatory signalling, and feedback). **(True)**
Feedback: Different types of synapses are differentiated:
excitatory and inhibitory connections (intracortical, thalamocortical, cortico-cortical including feedforward, compensatory signalling, and feedback). Different types of connections with different pathways are found (Fair & Schlaggar, 2008).

Crossword

Level 1

Question: a neuron is a
Answer: cell

Question: EEG is a neuro-physical exploration based on recording bioelectrical activity in the brain in base conditions of rest, wakefulness, or sleep and is a ... method
Answer: non-invasive

Question: neuronal interconnection is produced by transmission of
Answer: neurotransmitters

Question: neurons have ... endings
Answer: nerve

Level 2

Question: The most important neurotransmitters include acetylcholine and
Answer: noradrenaline

Question: the connection between a receptor neuron and an effector neuron is produced by the transmission of what kind of impulse
Answer: nerve

Question: the interconnection between two neurons is called a...

Answer: synapse
Question: the growing brain has about 95% of the characteristics of the adult human brain at approximately what age
Answer: 6 years

Level 3

Question: a technique that records functional brain activity via capturing magnetic fields, making it possible to examine the relationships between brain structures and their functions.
Answer: MEG

Question: an area of the brain where high-level processing occurs
Answer: the frontal cortex

Question: long-term memory is located in which lobe
Answer: medial temporal

Question: this measures brain activity detecting changes associated with blood flow. When an area of the brain is being used, the blood flow to that region increases.
Answer: FMRI

Question: a form of optical imaging that calculates changes in blood oxygenation and indirectly measures activity levels in different regions of the brain.
Answer: NIRS

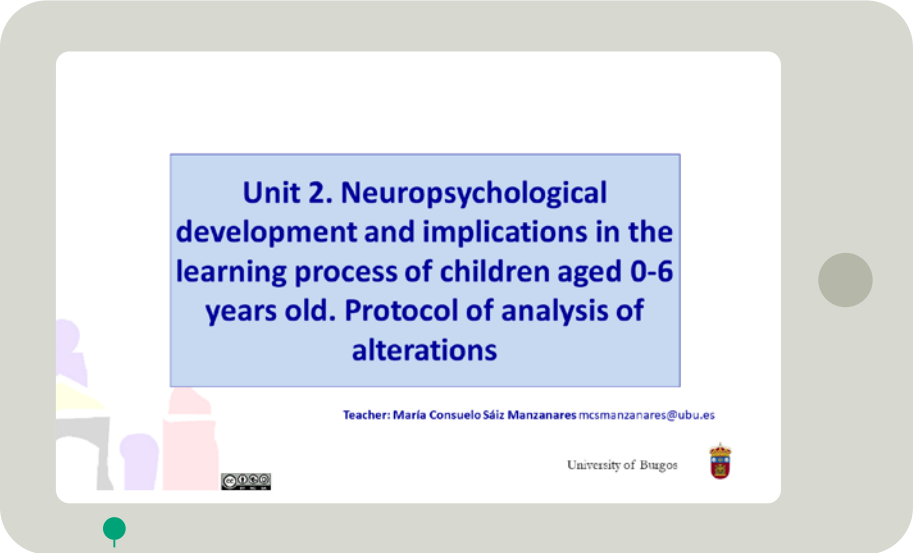
Question: a technique used in nuclear medicine. It uses a radiopharmaceutical.
Answer: PET

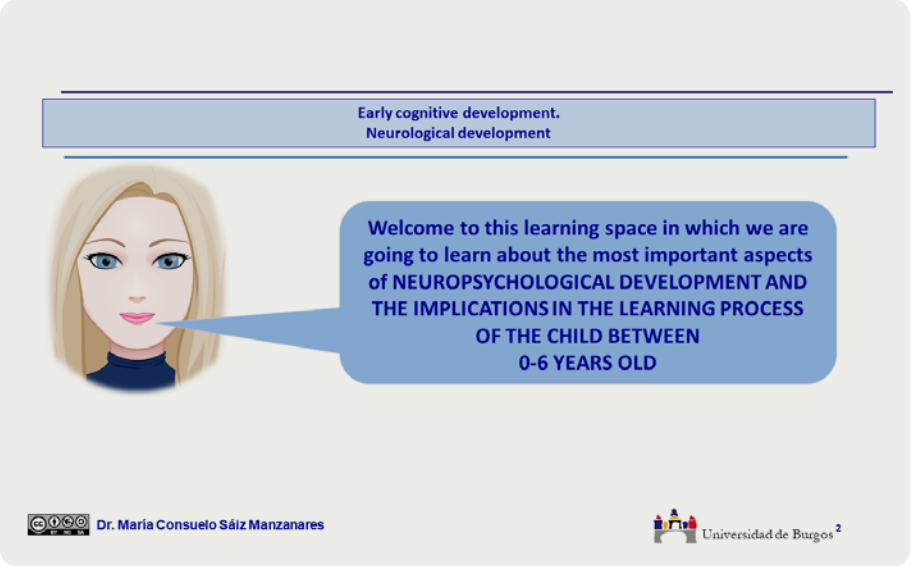
4.3.

Unit 2

Neuropsychological development and implications for the learning process in children aged 0-6 years old. Protocol of analysis of disorders

Content



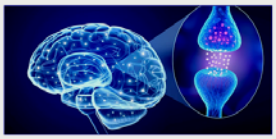


2

Early cognitive development.
Neurological development

Neuroplasticity

This is the brain's ability to self-organise in response to disturbances or deficits. However, the success of restoring the skill will depend on the area affected.



1

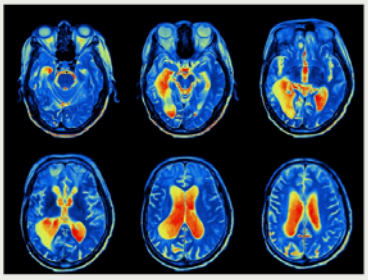
Fair and Schlaggar (2008). Washington University School of Medicine, St. Louis, MO, USA

Early cognitive development.
Neurological development

Neuroplasticity

The use of analysis techniques such as fMRI will allow us to:

- Make direct statistical comparisons.
- Choose appropriate comparison tasks.
- Compare execution between children and adults.
- Use appropriate statistical measures



Fair and Schlaggar (2008)

2

Washington University School of Medicine, St. Louis, MO, USA

Early cognitive development.
Neurological development

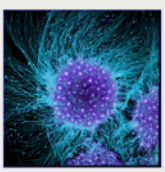
Critical periods

We can distinguish three critical periods

Critical moment: used by cell biologists to refer to a precise moment in cell division and differentiation.

Critical period: a specific period of time in which an event or experience has to occur for an effect to be produced.

Sensitive period: A more defined period of time in which an event or experience is more likely to have an effect.



3

D B Bailey, RTI International, Research Triangle Park, NC, USA
J-L Garie' py, The University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Early cognitive development.
Neurological development

Critical periods

Critical periods are located in

- 4-5 months
- 9 months
- 18 months
- 30-42 months

4

D B Bailey, RTI International, Research Triangle Park, NC, USA
J-L Garie' py, The University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

Early cognitive development.
Neurological development

We will learn about the developmental milestones during the first few months of life and their locations in the brain.

The social brain
Superior Temporal Sulcus (STS), the fusiform face area (FFA) and the orbito-central cortex.

5

Functionality
1. Detecting the gaze of the other
2. Detect the direction of attention on the same object that the other is looking at.
3. Joint attention patterns
4. Eye contact

Features
1) Lateral movement of the elements.
2) A brief preceding period of eye contact with an upright face.

Cognitive Neuroscience M H Johnson, University of London, London, UK

Early cognitive development.
Neurological development

The social brain

- **Frontal** and **prefrontal lobes** (1/3 of the cortical surface area in humans) are home to behaviours associated with **planning** and **executing action sequences**, maintaining action sequences for short periods of time, and the **ability to inhibit** responses that are appropriate in certain contexts.
- Relationship between the acquisition of certain behaviours and structural acquisitions.

6

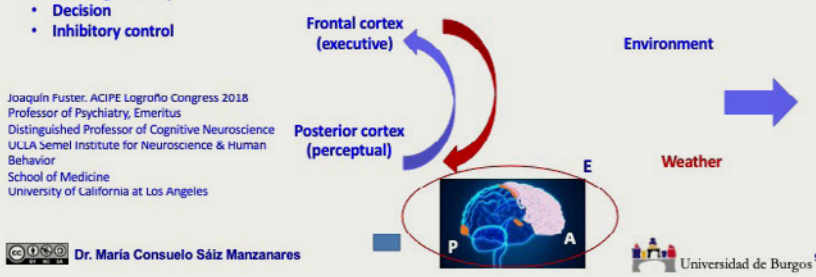
Cognitive Neuroscience
M H Johnson, University of London, London, UK

Early cognitive development.
Neurological development

Executive functions

- Planning
- Executive care
- Working memory
- Decision
- Inhibitory control

The perception-action cycle is the cybernetic cycle that links and adapts the organism to its environment during behaviour, language and reasoning.



Joaquín Fuster. ACIPE Logroño Congress 2018
Professor of Psychiatry, Emeritus
Distinguished Professor of Cognitive Neuroscience
UCLA Semel Institute for Neuroscience & Human Behavior
School of Medicine
University of California at Los Angeles

Early cognitive development.
Neurological development

Executive functions

In humans, the perception-action (PA) cycle is longer than in other species: their goals are months or years into the future.

In humans, several cycles can be active simultaneously, nested within each other.

In humans, the cycle involves other humans in their environment, and is thus modulated by two attributes of evolutionary memory: trust and affiliation.

In humans, the relevant repertoire of perceptions and actions is greatly expanded.

In humans, the sources of information leading to a decision within a PA cycle are multiplied.

Joaquín Fuster (2018)

Early cognitive development.
Neurological development

Executive functions

Early attention consists of facilitating the development of executive functions in order to increase the number, duration and category of PA cycles.

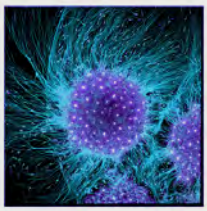
- **Planning:** The mental structure of a set of actions towards a goal.
- **Executive attention:** refers to selectively preparing executive systems for action.
- **Working memory:** This is the retention of information in short-term memory for a pending action.
- **Decision:** Refers to the execution of the chosen action.
- **Inhibitory control:** This consists of not paying attention to both internal and external interferences that prevent the chosen action from being carried out.

Joaquín Fuster (2018)

Early cognitive development.
Neurological development

Executive functions

Memory and **knowledge** reside in widely distributed, overlapping and interacting networks of **cortical neurons.**



3

4

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos 12

Early cognitive development.
Neurological development

We are now going to analyse how "normal" development can be altered in different pathologies. Specifically, we are going to learn about the alterations in cerebral palsy.

Joaquín Fuster, 2018

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos 13

Early cognitive development.
Neurological development

Risk factors for brain plasticity

Maternal factors
- Age < 20 years or > 35 years
- History of infertility
- Thyroid problems
- Diabetes

Problems in pregnancy
- Infections
- Pre-eclampsia
- Prolonged rupture of membranes
- Placental insufficiency

Child factors
- Prematurity
- Multiple gestation
- In vitro fertilisation

Neonatal morbidity and interventions
- Genetic factors
- Congenital malformations
- Hyperbilirubinaemia
- Placental infections
- Prolonged exposure to mechanical ventilation

Neonatal morbidity and interventions
- Hypocardia
- Neonatal hypoxia

In children
- Infections of the brain (bacterial meningitis, bacterial meningitis, and
- Viral encephalitis
- Vascular episodes
- Cerebral accidents

An example of analysis in Cerebral Palsy

Risk factors in cerebral palsy

Campbell, Hoon, Johnston, and Krieger (2008) p. 2
Institute, Baltimore, MD, USA

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos 14

Cognitive development

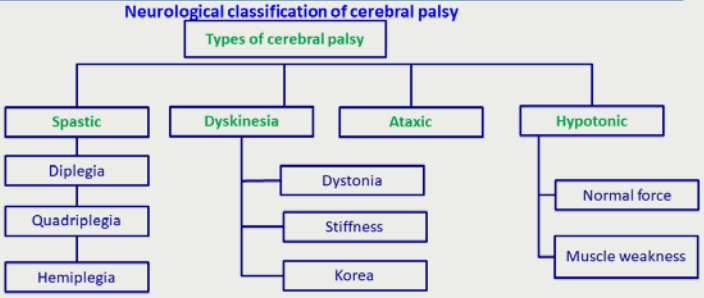
Early cognitive development. Neurological development

	Spasticity diplegia	Spasticity Quadriplegia	Hemiplegia	Extrapyramidal	Hypotonia/ataxia
Tone	Spasticity	Spasticity	Spasticity	Stiffness	Hypotonia
Extremity (upper limb - MS- and lower limb - IM-)	Integration	MS>MI	MS = MI	Unilateral	MS<MI
Movement disorders	Clonus, Spasms, walking on toes	Clonus, Spasms	Clonus, Spasms	Dystonia, chorea, athetosis	Ataxia
Speech/deglutition	Medium impact	Deterioration	Intact	Impairment or speech	Variable
Cognitive	Medium-moderate, learning disabilities	Moderate-severe	Intact or medium	Intact or moderate	Variable
Associated problems	Strabismus, orthopaedic problems	Orthopaedic problems, epilepsy	Epilepsy	Orthopaedic problems (genetic-metabolic disorders)	Undiagnosed (genetic-metabolic disorders)

Campbell, Hoon, Johnston, and Krieger (2008) p. 3 Institute, Baltimore, MD, USA

Early cognitive development. Neurological development

Neurological classification of cerebral palsy



Campbell, Hoon, Johnston, and Krieger (2008) p. 3
Institute, Baltimore, MD, USA

Early cognitive development. Neurological development

Bibliographical references

Bailey, D B., & Gariépy, J.L. (2008). Critical Periods. En J. B. Benson & M.M. Haith (Eds.), *Encyclopedia of infant and early childhood development (pp.* 322-332). Amsterdam: Elsevier.
Campbell, M.L., Hoon, A.H., & Johnston, M.V. (2008). Cerebral Palsy. En J. B. Benson & M.M. Haith (Eds.), *Encyclopedia of infant and early childhood development (pp.* 260-268). Amsterdam: Elsevier.
Fair, D., & Schlaggar, B L. (2008). Brain Development. En J. B. Benson & M.M. Haith (Eds.), *Encyclopedia of infant and early childhood development (pp.* 211-225). Amsterdam: Elsevier.
Johnson, M.H. (2008). Cognitive Neuroscience. En J. B. Benson & M.M. Haith (Eds.), *Encyclopedia of infant and early childhood development (pp.* 309-318). Amsterdam: Elsevier.

Early cognitive development. Neurological development

Images

Image 1. https://thehempoilbenefits.com/wp-content/uploads/2018/02/Endocannabinoids-1024x490.jpg
Image 2. https://metro.co.uk/wp-content/uploads/2019/03/SEI_56312729.jpg?quality=90&strip=all
Image 3. https://bespoleznyi.ru/uploads/2019/06/18/64/bespoleznyi_ru_p4mfma9ch_a.jpg
Image 4. https://lh3.googleusercontent.com/proxy/O7slOJUyIbgVpA6VifRKFGfz6hmwcetLDcr8UBjo6DFGSP8wi4WWiQ5lIfjO2AZqIH7sY6SXNI6UCCcrnEAu9_CsV1swAKqbx9NOMIPJb55mn8NPR3H0lXTI29X6nw98sA
Image 5. https://i2.bssl.es/unomasenlafamilia/2015/03/bebes-bilingues-miran-los-labios.jpg
Image 6. https://miro.medium.com/max/1400/1*uRf-u3t065LfvbUD-1AYhg.jpeg
Image 7. https://cdn.flintrehab.com/uploads/2019/10/1.1-Informaci%C3%B3n-ACV-tronco-cerebral.jpg
Imagen 8. https://krot.info/uploads/posts/2021-01/1610236501_7-p-fon-skanvord-16.png

Early cognitive development. Neurological development

THANK YOU VERY MUCH FOR YOUR ATTENTION!!!!

Early cognitive development. Neurological development

Now we are going to do a Crossword puzzle to check what we have learned

8

Testing knowledge from Unit 2.

Matching questions

a. Neuroplasticity	2. Self-organization
b. fMRI	3. Social brain
c. Superior Temporal Sulcus	4. Data analysis
d. Frontal Lobe	1. Planning

Answers

a-2/b-4/c-3/d-1

True/False questions

1.

In humans, the perception-action (PA) cycle is longer than in other species, their goals are months or years into the future **(True).**

Feedback: In humans, the perception-action (PA) cycle is longer than in other species, their goals are months or years into the future .

2

2.
In humans, cycles occur sequentially, one after another **(False).**
Feedback: In humans, several cycles can be active simultaneously, nested within each other.

3.
In humans, the sources of information leading to a decision within a PA cycle are multiplied **(True).**
Feedback: In humans, the sources of information leading to a decision within a perception-action (PA) cycle are multiplied.

4.
Executive attention refers to non-selectively preparing executive systems for action **(False).**
Feedback: Executive attention refers to selectively preparing executive systems for action.

5.
Inhibitory control consists of not paying attention to both internal and external interferences that prevent the chosen action from being carried out **(True).**
Feedback: Inhibitory control consists of not paying attention to both internal and external interferences that prevent the chosen action from being carried out.

6.
Planning refers to the mental structure of a set of actions towards a goal. **(True).**
Feedback: Planning refers to the mental structure of a set of actions towards a goal.

7.
Working memory is the retention of information in long-term memory for a pending action **(False).**
Feedback: Working memory is the retention of information in short-term memory for a pending action.

8.
Decision refers to the execution of the chosen action **(True).**
Feedback: Decision refers to the execution of the chosen action.

9.
One of the functions of the social brain is joint attention patterns **(True).**
Feedback: One of the functions of the social brain is joint attention patterns.

10.
A critical period is a specific period of time in which an event or experience is more likely to have an effect **(False).**
Feedback: Critical period: a specific period of time in which an event or experience has to occur for an effect to be produced.

Crosswords

Level 1

Question: the brain's ability to self-organize in response to disturbances or deficits
Answer: neuroplasticity.

Question: used by cell biologists to refer to a precise moment in cell division and differentiation.
Answer: critical moment.

Question: a specific period of time in which an event or experience has to occur for an effect to be produced.
Answer: critical period.

Question: A more defined period of time in which an event or experience is more likely to have an effect
Answer: sensitive period

Level 2

Question: The social brain is located in the
Answer: Superior Temporal Sulcus

Question: planning and executing action sequences are located in the
Answer: frontal lobe

Question: the mental structure of a set of actions towards a goal is
Answer: planning

Level 3

Question: this refers to selectively preparing executive systems for action.
Answer: executive attention:

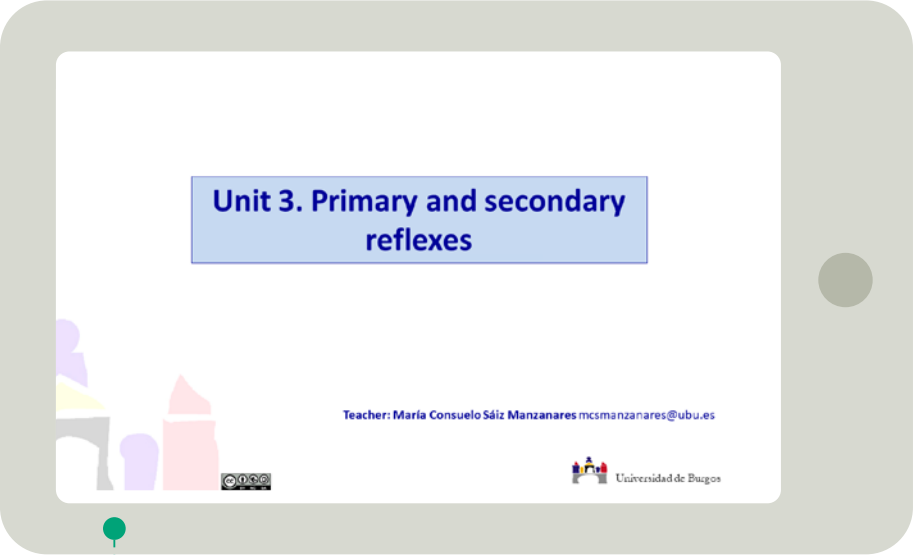
Question: this is the retention of information in short-term memory for a pending action.
Answer: Working memory

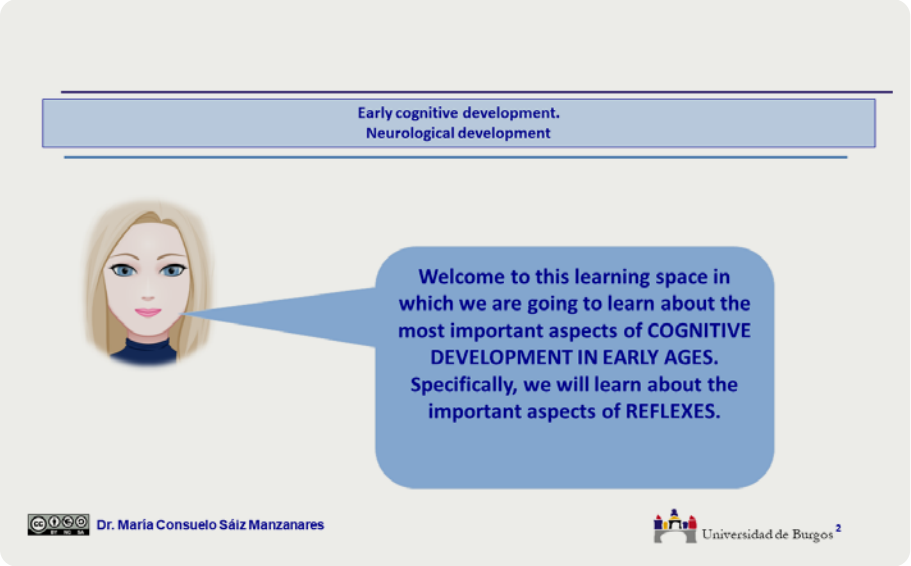
Question: This consists of not paying attention to both internal and external interferences that prevent the chosen action from being carried out.
Answer: Inhibitory control

2

4.4.
Unit 3
Primary and secondary reflexes.

Content





3

Early cognitive development. Reflexes

DEVELOPMENTAL NEUROLOGY

A **reflex** is defined as an **involuntary** motor secretory or vascular **response.** elicited **after** a **stimulus.** The response may be conscious or unconscious.

1

Taken from Pedroso (2008) p. 2

Early cognitive development. Reflexes

DEVELOPMENTAL NEUROLOGY

It is important to know the state of **muscle tone "a state of permanent tension of the muscles, of essentially reflex origin, variable. Muscle tone's fundamental mission deals with the adjustment of local postures and general activity, and it is possible to semiologically distinguish different properties".**

Barraquer Bordas (taken from Cabrera and Sánchez, 1987 p. 26).

2

Early cognitive development. Reflexes

DEVELOPMENTAL NEUROLOGY

Fluctuations in muscle tone are very marked during the **first year of life.** In the first trimester of life there is a marked level of tonicity so that arms and legs remain flexed and are difficult to extend, the hands are closed, the thumb remains outside the other fingers and the head is rotated to one side.

3

Early cognitive development. Reflexes

DEVELOPMENTAL NEUROLOGY

During the second trimester the tension decreases and the baby is more flexible to movements, the hands open frequently, the head remains for long periods in the **midline** and the baby can flex or extend their limbs.

4

5

Early cognitive development. Reflexes

DEVELOPMENTAL NEUROLOGY

During the fourth trimester, muscle flexibility increases and, for example, the baby can bring their feet to their mouth without difficulty.

6

During the first months of the second year, the extensibility of the limbs decreases and stabilises, providing the child with a suitable tone for the acquisition of later motor skills.

7

Early cognitive development. Reflexes

REFLEX SCANNING

It is essential for the study of the baby at risk. Analyzing reflexes allows us to see the current neurological status of the baby and also to make predictions on the assessment of psychomotor development.

Reflexes are "automatic reactions triggered by stimuli that impress various receptors. They tend to favour the adaptation of the individual to the environment. Rooted in the phylogeny, they come from a biological past and accompany the human being during the first age, some of them during the whole life". Coriat (taken from Cabrera and Sanchez, 1987 p. 27).

Early cognitive development. Reflexes

REFLECTS

Primary or archaic reflexes are those that are present in the baby at birth. They appear as responses to a given stimulus.

8

Secondary reflexes appear during the first months of life.

Early cognitive development. Reflexes

PRIMARY OR ARCHAIC REFLEXES

Cervical tonic-asymmetric reflex, present until approximately three months of age. This is the tendency of the child to keep the head rotated to one side, at the same time as the arm and leg corresponding to the side on which the head is turned and the limbs on the opposite side remain flexed.

It is important as it initiates the baby's perception of the existence of the hand.

10

Early cognitive development. Reflexes

PRIMARY OR ARCHAIC REFLEXES

The absence of the cervical tonic-asymmetrical reflex, implies developmental disorders and the persistence thereof beyond the established age implies **brain injury**.

10

Taken from Pedroso (2008) p. 3

Early cognitive development. Reflexes

PRIMARY OR ARCHAIC REFLEXES

Palmar grasp reflex, which also disappears at around three months of age and is linked to the knowledge of the hand as a part of the body. It consists of closing the hand when the baby's palm is stimulated by pressure from an object.

11

12

This automatism is so strong that it allows the child to be lifted from its support plane and suspended by the thumbs.

Early cognitive development. Reflexes

PRIMARY OR ARCHAIC REFLEXES

Palmar pressure reflex, persistence of the reflex beyond 3-4 months implies pathology. However, in highly stimulated and precocious children, reflex pressure and voluntary pressure may coexist simultaneously.

Early cognitive development. Reflexes

REFLECTS

Sucking reflex, sucking behaviour when an object rubs against the lips is related to the four cardinal points reflex that persists until two months of age and consists of the fact that if pressure is applied near the infant's mouth, the infant moves the corner of the mouth and the head towards the side where the pressure is felt.

This reflex facilitates feeding and is absent or very weakened in children with neurological disorders.

13

Early cognitive development. Reflexes

PRIMARY OR ARCHAIC REFLEXES

Stance and gait reflex, the child is held upright with its feet in contact with a surface, held under the arms and observed to straighten and rest momentarily on the surface and if the upper part of the body is imprinted with a slight rocking motion, the baby alternately moves one foot forward and the other forward in a manner similar to walking.

14

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos

Early cognitive development. Reflexes

PRIMARY OR ARCHAIC REFLEXES

Both of these reflexes usually disappear after two to three months of life, although some authors think that they should be stimulated after this period.

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos

Early cognitive development. Reflexes

PRIMARY OR ARCHAIC REFLEXES

The **plantar grasp reflex** has a similar function to the palmar grasp reflex. It can be triggered by rubbing the inside of the toe with a pencil, then the five toes flex until they press against the stimulus, which they can hold for a short period of time.

15

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos

Early cognitive development. Reflexes

PRIMARY OR ARCHAIC REFLEXES

The **plantar grasp reflex** lasts until approximately nine months of age and its disappearance is related to the infant's neuromotor maturation and degree of control over their lower limbs.

16

Dr. María Consuelo Sáiz Manzanares

Early cognitive development. Reflexes

PRIMARY OR ARCHAIC REFLEXES

Ocular reflexes:

Palpebral reflex: This is a defensive movement that consists of closing the eyelids when an intense light suddenly appears.

17

Wrist eye reflex: Persists from birth until approximately the first month, it is an automatism prior to ocular fixation and disappears when ocular fixation appears.

18

Dr. María Consuelo Sáiz Manzanares

Early cognitive development. Reflexes

SECONDARY REFLEXES

These appear during the first months of life.

Landau reflex, occurs at approximately four months of age and persists until the last trimester of the first year. It is observed by suspending the child in a dorsal position. The trunk then straightens, the head rises and the feet and arms extend. If the infant's head is then held in a flexed position, the trunk curves in the same direction and the arms and legs are also flexed.

19

Dr. María Consuelo Sáiz Manzanares

Early cognitive development. Reflexes

SECONDARY REFLEXES

They appear during the first months of life.

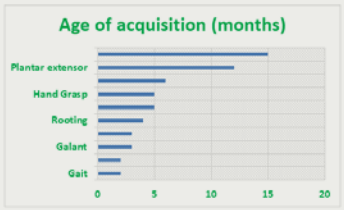
The **parachute reflex** is a reaction to balance that emerges at around six months of age and implies a high degree of neurological maturation in the child. It can be observed by holding the child by the sides, in the ventral position, and tilting it sharply towards a surface, the baby then extends its arms towards this surface as if to protect itself from impact. This reflex persists throughout life.

20

21

Early cognitive development. Reflexes

Development of primary reflexes



Development of primitive reflexes Taken from Pedroso (2008) p. 9

Early cognitive development. Reflexes

SECONDARY REFLEXES

Posterior lateral stance reflex, two automatisms that appear shortly after the parachute reflex and will accompany the baby throughout life.

Lateral support reflex: consists of propping one of the hands in the lateral direction when the child is at risk of losing their balance in this direction.

Posterior support reflex: hands instinctively reach back for the plane of support. when the child has been pushed sharply in this direction.

Early cognitive development. Reflexes

APGAR TEST

- Muscle tone.
- Breathing effort.
- Heart rate.
- Reflections.
- Skin colour.

22

Dr. María Consuelo Sáiz Manzanares

Early cognitive development. Reflexes

APGAR TEST

Each parameter is assigned a score between 0 and 2 points, and adding the five scores together gives the test result (maximum of 10).

The test is performed at one minute, five minutes (and occasionally every five minutes up to 20 minutes of birth if the score up to five minutes is less than seven).

The score at one minute assesses the newborn's level of tolerance to the birth process and possible distress. The five-minute score assesses the newborn's level of adaptability to the environment and their ability to recover.

A newborn with a lower score at the first minute than at the fifth minute has normal results and this does not suggest developmental abnormality.

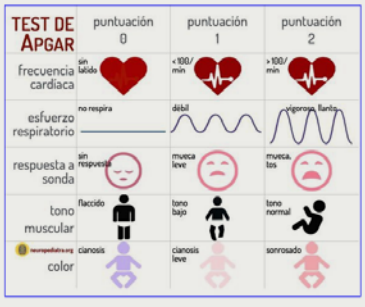
https://medlineplus.gov/spanish/ency/article/003402.htm

23

Dr. María Consuelo Sáiz Manzanares

Early cognitive development. Reflexes

APGAR TEST



24

Dr. María Consuelo Sáiz Manzanares

Early cognitive development. Neurological development

THANK YOU VERY MUCH FOR YOUR ATTENTION!!!!

Early cognitive development. Neurological development

Now we are going to do a Crossword puzzle to check what we have learned

25

Early cognitive development. Reflexes

Bibliographical references

Benson, J.B., & Haith, M.M. (2008). *Encyclopedia of infant and early childhood development*. Amsterdam: Elsevier. Cabrera, M.C. & Sánchez, C. (1987). *La estimulación precoz: un enfoque práctico*. Madrid: Siglo XXI. Fair, D., & Schlaggar, B L. Brain Development. En J.B. Benson & M.M Haith (Eds.), *Encyclopedia of infant and early childhood development (pp.* 211-225). Amsterdam: Elsevier.
Pedroso, F.S. (2008). Reflexes. En J.B. Benson & M.M. Haith (Eds.), *Encyclopedia of infant and early childhood development (pp.* 11-23). Amsterdam: Elsevier.

Early cognitive development.
Neurological development

Images
Image 1. http://1.bp.blogspot.com/-C-QzczWfuP4/UYqJH-QvmtI/AAAAAAAAAKc/IlWGKOwfM2I/s1600/reflejo+rotuliano.png
Imagen 2. https://1442012989.rsc.cdn77.org/documents/640,480,true,mid10644471.news
Image 3. https://asset.kompas.com/crops/aFzuJ1IpdyO3mL1W9oH9TI9kCqQ=/0x0:0x0/750x500/data/photo/2013/10/07/1915541catsbabyi1p.jpg
Image 4. https://www.cocukistiyorum.com/wp-content/uploads/2014/07/bebekpco-728x410.jpg
Image 5. https://parentalis.com/wp-content/uploads/2018/01/musica-bebe-1000x768.jpg
Image 6. https://escualaprendizajecreativoamivera.files.wordpress.com/2014/12/bebe_pie.jpg?w=350&h=200&crop=1
Image 7. https://www.todopapas.com//images/cms_2011/tpp/BEBES/ponerse-pie1.jpg
Image 8. https://3.bp.blogspot.com/-Cd18cI289bc/Wu-ug6Kqz3I/AAAAAAAAAX0/eLo0x5ri71McrEp3bttX_6U2E8fy5jy1QCLcBGAs/s1600/reflejos-arcaicos-psicomotricidad-5-638.jpg
Imagen 9. https://bi.im-g.pl/im/1e/01/15/z22027038Q,5-miesiac-zycia-dziecka-to-czas-pierwszych-zabkow-.jpg
Image 10. https://crecerensalud.com/wp-content/uploads/2015/11/20151113-2.jpg
Image 11. https://3.imimg.com/data3/SL/PG/GLADMIN-10869679/mmmmm-250x250.png
Image 12. https://www.lentata.com/image_cache/b/7/f/0/f/b7f0f2dea11b018cde6c9bc7b2b5562d011c214d.jpeg?v3
Imagen 13. https://www.iatropedia.gr/wp-content/uploads/2015/11/157e1a28640391c6df60495980d964c1-1200x796.jpg
Image 14.
https://image.jimcdn.com/app/cms/image/transf/dimension=233x1024:format=jpg/path/s7f4b4bf552cc0012/image/i4fd9a321b60df2ee/version/1542792004/marche-automatique-r%C3%A9flexe-archa%C3%AFque.jpg
Image 15. https://audiologiaondas.com/wp-content/uploads/2016/10/tmr.jpg
Image 16. https://www.elespectador.com/resizer/0jI72pezpaiz2c6kJRs_LPNkHws=/657x0/arc-anglerfish-arc2-prod-elespectador.s3.amazonaws.com/public/NLGV4L2QSJABHOHRYM45L5WOTA.jpg
Image 17. https://i.ytimg.com/vi/lytmI7mmYVg/2.jpg

Early cognitive development.
Neurological development

Unfiltered images by licence
Image 18. http://4.bp.blogspot.com/-yUazVpa0FVs/VVn5DSonzFI/AAAAAAAAAGE/h7r8JwxtYkM/s1600/2794692_640px.jpg
Imagen 19. https://pbs.twimg.com/profile_images/2272353489/9l50w3ca2v8qnhma40hw_400x400.jpeg
Image 20. https://kidbooms.ru/wp-content/uploads/1/c/e/1ce0b7be581734c744b06baaaadb0e16.jpe
Image 21. https://i.ytimg.com/vi/-mNkXmqUj1o/hqdefault.jpg
Image 22. https://i.pinimg.com/originals/02/b3/1e/02b31e3475e8beeedf453be0b4a0478e.jpg
Image. 23. https://docplayer.es/docs-images/81/82350214/images/62-0.jpg
Imagen 24. https://i.pinimg.com/474x/8e/e9/18/8ee918d7b6f0fa480088925005f16ad5.jpg
Image 25. Image 8. https://krot.info/uploads/posts/2021-01/1610236501_7-p-fon-skanvord-16.png

Early cognitive development. Reflexes

Licence

Author: Dr. María Consuelo Sáiz Manzanares
Developmental and Educational Psychology Area
Faculty of Health Sciences
University of Burgos

Testing knowledge from Unit 3.

Matching questions

a. Reflex — 2. Self-organization
b. Muscle tone — 3. Birth
c. Primary reflex — 4. Tension
d. Sucking reflex — 5. Two months
e. Cervical tonic reflex — 1. Three months

Answers

a-3/b-4/c-3/d-5/e

True/False questions

1.
The sucking reflex is related to the four cardinal points reflex that persists until two months of age and consists of the fact that if pressure is applied near the infant's mouth, the infant moves the corner of the mouth and the head towards the side where the pressure is felt (**True).**
Feedback: The sucking reflex is related to the four cardinal points reflex that persists until two months of age and consists of the fact that if pressure is applied near the infant's mouth, the infant moves the corner of the mouth and the head towards the side where the pressure is felt. This reflex facilitates feeding and is absent or very weakened in children with neurological disorders.

2.
Stance and gait reflexes both usually disappear at around six months of life **(False).**
Feedback: Stance and gait reflexes both usually disappear after two to three months of life, although some authors think that they should be stimulated after this period.

3.
The plantar grasp reflex lasts until approximately nine months of age and its disappearance is related to the infant's neuromotor maturation and degree of control over their lower limbs **(True).**
Feedback: The plantar grasp reflex lasts until approximately nine months of age and its disappearance is related to the infant's neuromotor maturation and degree of control over their lower limbs.

4.
The wrist eye reflex persists from birth until approximately the first month, it is an automatism prior to ocular fixation and disappears when ocular fixation appears **(True).**

Feedback: The wrist eye reflex persists from birth until approximately the first month, it is an automatism prior to ocular fixation and disappears when ocular fixation appears.

5.

The Landau reflex occurs at approximately four months of age and persists until the last trimester of the second year **(False).**

Feedback: The Landau reflex occurs at approximately four months of age and persists until the last trimester of the first year. It is observed by suspending the child in a dorsal position. The trunk then straightens, the head rises, and the feet and arms extend. If the infant's head is then held in a flexed position, the trunk curves in the same direction and the arms and legs are also flexed.

6.

The parachute reflex is a reaction to balance that emerges at around six months of age and implies a high degree of neurological maturation in the child **(True).**

Feedback: The parachute reflex, a secondary reflex, is a reaction to balance that emerges at around six months of age and implies a high degree of neurological maturation in the child. It can be observed by holding the child by the sides, in the ventral position, and tilting it sharply towards a surface, the baby then extends its arms towards this surface as if to protect itself from impact. This reflex persists throughout life.

7.

In the APGAR test, the score at one minute assesses the new-born's level of tolerance to the birth process and possible distress. The five-minute score assesses the new-born's level of adaptability to the environment and their ability to recover **(True).**

Feedback: In the APGAR test, the score at one minute assesses the new-born's level of tolerance to the birth process and possible distress. The five-minute score assesses the new-born's level of adaptability to the environment and their ability to recover

8.

In the APGAR test, A new-born with a lower score at the first minute than at the fifth minute has results which suggest developmental abnormality **(False).**

Feedback: In the APGAR test, a new-born with a lower score at the first minute than at the fifth minute has normal results and this does not suggest developmental abnormality.

Crosswords

Level 1

Question: a state of permanent tension of the muscles, of essentially reflex origin. Its fundamental mission deals with the adjustment of local posture and general activity
Answer: tone

Question: these are automatic reactions triggered by stimuli that impress various receptors. They tend to favour the adaptation of the individual to the environment.
Answer: reflexes.

Question: These are present in the baby at birth. They appear as responses to a given stimulus.
Answer: primary reflexes

Question: these appear during the first few months of life.
Answer: secondary reflexes.

Level 2

Question: this is a reflex that is present until approximately three months of age.
Answer: cervical

Question: this is a reflex which also disappears at around three months of age and is linked to the knowledge of the hand as a part of the body.
Answer: Palmar grasp

Question: a reflex through which the child keeps themselves upright with their feet in contact with a surface.
Answer: gait

Question: a reflex that is related to knowledge of the foot as part of the body.
Answer: plantar grasp

Level 3

Question: a reflex that consists of closing the eyelids when an intense light suddenly appears.
Answer: palpebral

Question: a reflex which is observed by suspending the child in a dorsal position. The trunk then straightens, the head rises and the feet and arms extend.
Answer: Landau

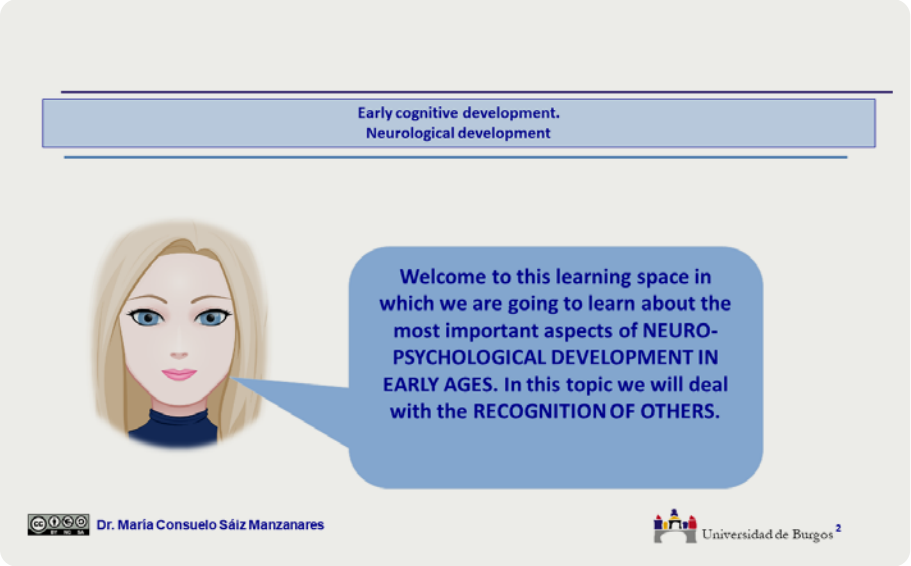
Question: a secondary reflex that is a reaction to
Answer: balance

Question: a support reflex which consists of popping one of the hands in the lateral direction when the child is at risk of losing their balance in this direction.
Answer: lateral

Question: a support reflex where hands instinctively reach back for the plane of support when the child has been pushed sharply in this direction
Answer: posterior

4.5.
Unit 4
Neuro-psychological development: Recognition of others at ages 0-6 years.

Content



4

Early cognitive development.
Neurological development

Facial recognition

Facial recognition involves:

- **Vector** information **processing**
- Comparison of this information with other information already stored in order to make a **match.**
- It seems that from the first weeks of life, the human baby prefers stimuli from **human faces** to non-human and **moving faces** to static faces**.**
- And at around **three months** they prefer the faces of their **attachment figures** and the type of face in their immediate surroundings. 1

O Pascalis and D J Kelly (2018)
The University of Sheffield, Sheffield, UK

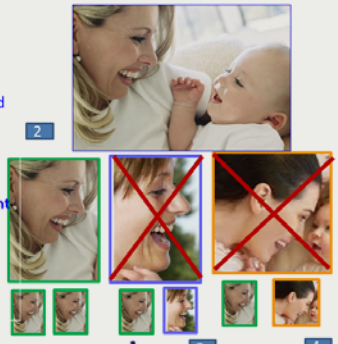
Universidad de Burgos 3

Early cognitive development.
Neurological development

Facial recognition

Facial recognition involves

- **Vector** information **processing**
- Comparison of this information with other information already stored in order to make a **match.**
- It seems that from the first weeks of life, the human baby prefers stimuli from **human faces** to non-human and **moving faces** to static faces**.**
- And at around **three months** they prefer the faces of their **attachment figures** and the type of face in their immediate surroundings.



O Pascalis and D J Kelly (2018)
The University of Sheffield, Sheffield, UK

Universidad de Burgos 4

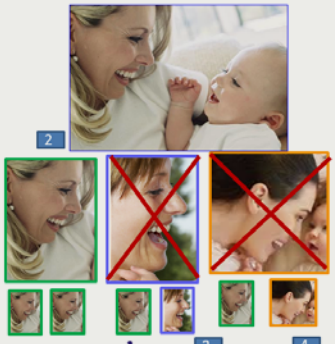
Early cognitive development.
Neurological development

Facial recognition

Facial recognition involves

Step 1: Sensory memory (iconic and echoic)
Step 2: Working memory (reiteration and transfer)
Step 3: Short-term memory (clusters)
Step 4: Long-term memory.

O Pascalis and D J Kelly (2018)
The University of Sheffield, Sheffield, UK



Universidad de Burgos 5

Early cognitive development. Neurological development

Facial recognition

Facial recognition can have phases of recognition complexity:

- Days
- One month
- Three months

.....

O Pascalis and D J Kelly (2018)
The University of Sheffield, Sheffield, UK

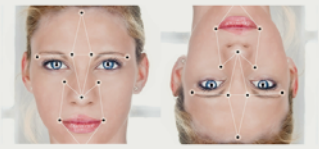
5

Early cognitive development. Neurological development

Facial recognition

Inverted face recognition

- At **six months they process** the **eyes** but the mouth seems to be part of the whole face.
- At around **seven months,** it appears that babies can process the **inverted** face in a similar way to adults.
- At **ten months** babies can **process the face** with major and minor changes (eyes, mouth).



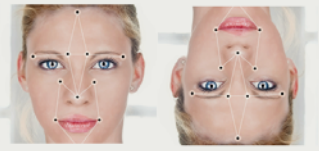
6

O Pascalis and D J Kelly (2018)
The University of Sheffield, Sheffield, UK

Early cognitive development. Neurological development

Facial recognition

- It appears that there are different types of facial image processing at different stages of development.
- There are theories about the existence of a prototype for processing the human face from birth.
- This prototype would be refined over the course of development with the acquisition of different perceptual and cognitive skills at different stages.



6

Early cognitive development. Neurological development

Bibliographical references

Benson, J.B., & Haith, M.M. (2008). Encyclopedia of infant and early childhood development. Amsterdam: Elsevier.
Campbell, M L.,Hoon, A H., & Johnston, M.V. (2008). Cerebral Palsy. En J.B. Benson & M.M Haith (Eds.), *Encyclopedia of infant and early childhood development (pp.* 260-268). Amsterdam: Elsevier.
Fair, D., & Schlaggar, B L. (2008). Brain Development. En J.B. Benson & M.M Haith (Eds.), *Encyclopedia of infant and early childhood development (pp.* 211-225). Amsterdam: Elsevier.
Johnson, M.H. (2008). Cognitive Neuroscience. En D. Fair & B.L. Schlaggar (Eds.), *Encyclopedia of infant and early childhood development (pp.* 309-318). Amsterdam: Elsevier.
Robinson, J. (2008). Empathy and Prosocial Behavior. En D. Fair & B.L. Schlaggar (Eds.), *Encyclopedia of infant and early childhood development (pp.* 441-450). Amsterdam: Elsevier.

Early cognitive development. Neurological development

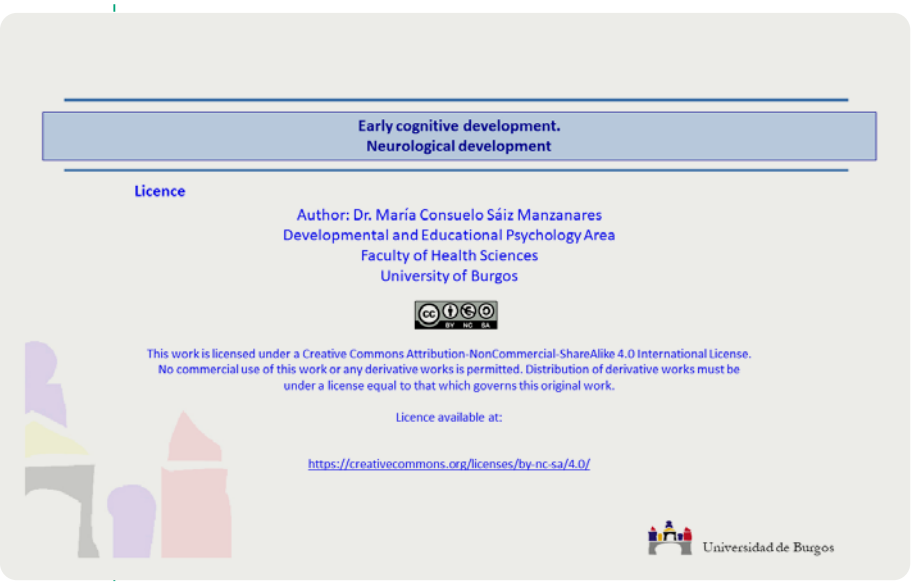
Images

Image 1. https://s.yimg.com/ny/api/res/1.2/6bm13Sufs9Sid5F1D4WgRg--/YXBwaWQ9aGlnaGxhbmRlcjt3PTIwMDA7aD05NDM-/https://s.yimg.com/os/creatr-images/2019-11/e26ab250-0884-11ea-bffd-133a8dd13ee8
Image 2. https://renklihobi.com/wp-content/uploads/2012/08/anne-sutu.jpg
Image 3. http://www.papasehijos.com/wp-content/uploads/2012/01/mam%C3%A1-y-beb%C3%A9.jpg
Imagen 4. https://i.shgcdn.com/6b2f5e03-a8ad-4b69-a36b-47b4439235a6/-/format/auto/-/preview/3000x3000/-/quality/lighter/
Image 5. https://m.bles.com/wp-content/uploads/2019/05/google.jpg
Image 6. https://www.latercera.com/resizer/ICzY8nuXmY8PyKktuVMEcOQL9Yc=/375x250/smart/arc-anglerfish-arc2-prod-copesa.s3.amazonaws.com/public/NBHCHCHNPZUNFBHJU4QECGHEKHEM.jpg
Image 7. https://krot.info/uploads/posts/2021-01/1610236501_7-p-fon-skanvord-16.png

Early cognitive development. Neurological development

THANK YOU VERY MUCH FOR YOUR ATTENTION!!!!


Early cognitive development.
Neurological development
Now we are going to do a Crossword puzzle to check what we have learned
7
Dr. María Consuelo Sáiz Manzanares
Universidad de Burgos 12


Early cognitive development.
Neurological development
Licence
Author: Dr. María Consuelo Sáiz Manzanares
Developmental and Educational Psychology Area
Faculty of Health Sciences
University of Burgos
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.
No commercial use of this work or any derivative works is permitted. Distribution of derivative works must be under a license equal to that which governs this original work.
Licence available at:
https://creativecommons.org/licenses/by-nc-sa/4.0/
Universidad de Burgos

4

Testing knowledge from Unit 4.

Matching questions

a. Recognition	1. Attachment
b. Recognition of figures	2. Facial
c. Inverted recognition	3. Movement
d. Human faces	4. Seven months

Answers

a-2/b-1/c-4/d-3

True/False questions

1.
Facial recognition involves vector information processing **(True).**
Feedback: Facial recognition involves vector information processing.

2.
Human babies prefer non-moving faces **(False).**
Feedback: from the first weeks of life, the human baby prefers stimuli from human faces to non-human and moving faces to static faces.

3.
At around three months, they recognize their attachment figures **(True).**
Feedback: At around three months, they recognize their attachment figures.

4.
Facial recognition involves sensory memory **(True).**
Feedback: Facial recognition involves sensory memory (iconic and echoic), working memory (reiteration and transfer), short-term memory (clusters), and long-term memory.

5.
Facial recognition can have phases of recognition complexity: days, one month, and three months **(True).**
Feedback: Facial recognition can have phases of recognition complexity: days, one month, and three months.

6.
At around six months, babies can process the inverted face in a similar way to adults **(False).**
Feedback: At around seven months, babies can process the inverted face in a similar way to adults.

4

7.
At six months, babies can process the eyes, but the mouth seems to be part of the whole face **(True).**
Feedback: At six months, babies can process the eyes, but the mouth seems to be part of the whole face.

8.
At ten months babies can process the face with major and minor changes in the eyes and mouth **(True).**
Feedback: At ten months babies can process the face with major and minor changes in the eyes and mouth.

9.
There is only one theory that explains facial image processing in human babies **(False).**
Feedback: It appears that there are different types of facial image processing at different stages of development.

10.
The child's facial image processing would be refined over the course of development with the acquisition of different perceptual and cognitive skills at different stages **(True).**
Feedback: The child's facial image processing would be refined over the course of development with the acquisition of different perceptual and cognitive skills at different stages.

Crosswords

Level 1

Question: facial recognition requires .... processing
Answer: vector.

Question: facial recognition occurs when a mental comparison is made between the image seen and images already stored in ... memory
Answer: long term

Question: human babies prefer human faces to non-...
Answer: human

Question: human babies prefer faces that are
Answer: moving

Level 2

Question: at what age (months) can human babies process inverted faces in a similar way to adult humans
Answer: seven

Question: at how many months can human babies process a face with major and minor changes
Answer: ten

Question: at how many months can babies process eyes but cannot differentiate the other parts of the face
Answer: six

Level 3

Question: facial image processing varies according to the ... stage.
Answer: developmental

Question: facial image processing depends on the development of different ... skills
Answer: perceptual

Question: facial image processing depends on the development of different ... skills
Answer: cognitive

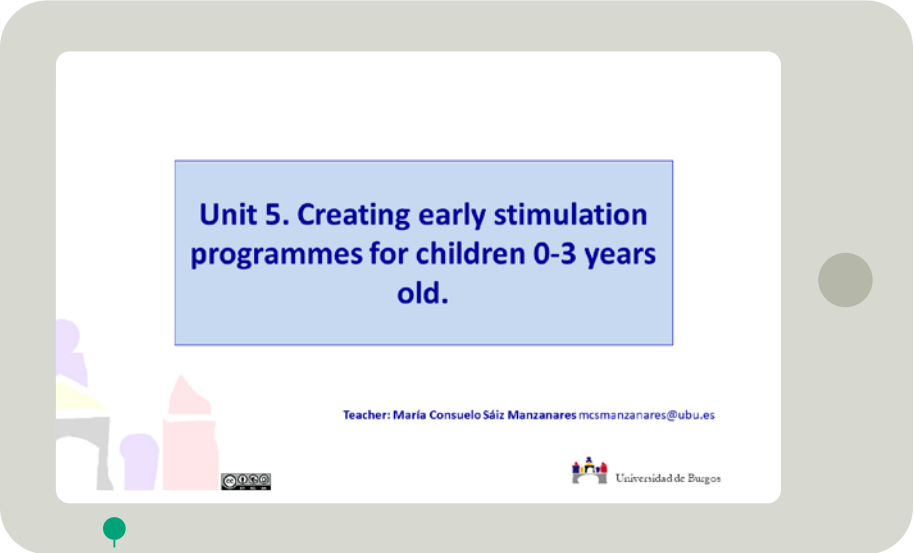
Question: working memory refers to
Answer: transfer

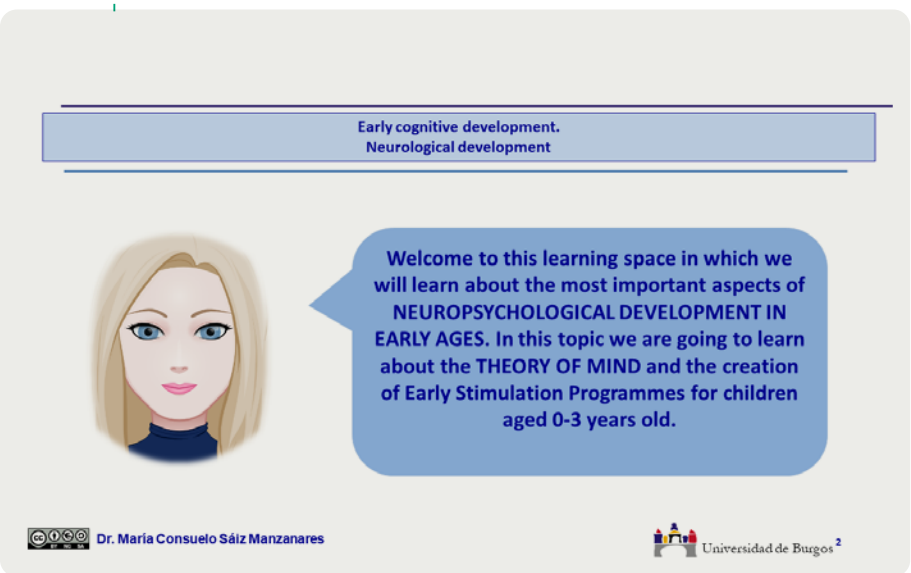
Question: Sensory memory refers to iconic and ... perception
Answer: echoic

4

4.6.
Unit 5
Creation of early stimulation programs for 0-3 year-olds.

Content

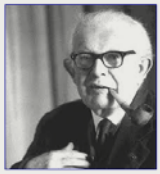




5

Early cognitive development.
Evolutionary development

Advances in developmental **psychology**, based on **Piaget**'s theory of development and including the use of **technology**, have allowed the study of human development in all areas through the use of increasingly precise techniques and procedures. All of this has led to **advancing the ages of acquisition** of some of the Piagetian constructs.


1


2

Jean Piaget

Universidad de Burgos

Early cognitive development.
Evolutionary development

PRECURSORS OF THEORY OF MIND

- At the end of the **sensorimotor period**, children begin to **develop representation**.
- However, its genesis is many months earlier.
- From 8 to 12 months **triangular relationships** are established between the **child**, **adults** and **objects**.


3


4

Universidad de Burgos

Early cognitive development.
Evolutionary development

TRIANGULAR REACTIONS

From **eight to twelve months**, relationships between the child, adults and objects are established.


5


6


7

Universidad de Burgos

Early cognitive development.
Evolutionary development

TRIANGULAR REACTIONS

From eight to twelve months, relationships between the child, adults and objects are established.

- **Communicative actions** include **patterns of joint attention** before, during or after the execution of a gesture. The child seeks **eye contact** with the adult (Rivière. 1997).

8

Early cognitive development.
Evolutionary development

TRIANGULAR REACTIONS

9

7

Gestural communication

Gestures can be used either to make requests for objects to others (**proto-imperative**) or to show situations (**proto-declarative**). The difference between the two types of gestures lies in the fact that the latter consider the person as the object of interaction and not only as a means of achievement. Therefore, **pre-linguistic intentional communication** seems to indicate that there is some kind of understanding of the mental processes of others. These early communicative behaviours would be the initial manifestations of **Theory of Mind** (ToM) (Wellman. 1993).

Early cognitive development.
Evolutionary development

TRIANGULAR REACTIONS

10

- **Protodeclarative gestures** are understood as **more complex communicative behaviours** than protoimperative gestures, as they require **metarepresentational abilities.** The **behaviours of mentally sharing** a situation with another involve being aware that the other has a **mind** that can share that situation with **one's own mind**, which involves **second-order representations** or **representations** of the mental experiences of others and therefore a **more complex cognitive** understanding (Gómez, Sarriá and Tamarit. 1993).

Early cognitive development.
Evolutionary development

INTERSUBJECTIVITY

Trevarthen (1982; 1989) differentiated between **primary intersubjectivity**, face-to-face reactions with nurturing figures in which infants would manifest different expressions and would develop from two to four or five months and **secondary intersubjectivity**, the child's deliberate motivation to share interests and experiences with other people and would be manifested around the first year of life.

11

Early cognitive development.
Evolutionary development

PRIMARY INTERSUBJECTIVITY

- Face-to-face reactions with parenting figures in which infants would show different expressions and would develop from **two** to **four or five months of age**.

12

13

14

Early cognitive development.
Evolutionary development

SECONDARY INTERSUBJECTIVITY

- Deliberate motivation of the child to share interests and experiences with others and would manifest itself around the **first year of life**.

15

16

17

Early cognitive development.
Evolutionary development

Theory of mind: precursors
Social perception in infancy (from 8 months of age)
Characteristics of behaviours and skills
Imitation
Diada smile and vocalisation
Joint attention
Follow the signals and the looks of others.
Discriminating between animate and inanimate objects
Discriminating goals from movements
Knowledge of other people's states of mind

Astington & Dack (2008) p. 6

18

19

Early cognitive development.
Evolutionary development

Theory of mind precursors
Awareness of mental state (18 months to 3 years)
Characteristics of behaviours and skills
Differentiation between mental and actual state of affairs
Symbolic play
Awareness of intentions, desires and emotions
Desire based on reasoning
Awareness and perception of knowledge acquisition
Mental use of mental states

Astington & Dack (2008) p. 7

19

20

Early cognitive development.
Evolutionary development

SYMBOLIC PLAY

- **Symbolic play** is considered a precursor to **Theory of Mind**, and its acquisition begins at the end of the second year, at the same time as the development of other **representational** skills begins.
- Thus the link between the development of **prodeclaratives**, **symbolic play** and **Theory of Mind is** most likely the ability to have **meta-representations** (Leslie, 1987; Leslie and Happé, 1989; Gómez, Sarriá and Tamarit, 1993).

21

Early cognitive development.
Evolutionary development

SYMBOLIC PLAY

- **Symbolic** play begins in **early childhood** between the ages of **eighteen and thirty-six months**. At around **eighteen months,** children will be able to understand significantly better what is asked for with a **symbolic gesture** than with the use of a miniature object referent. However, they will show confusion between the symbol and the referent.

22

Universidad de Burgos

Early cognitive development.
Evolutionary development

MANIFESTATIONS OF SEMIOTIC FUNCTION AT THE END OF THE SENSORIMOTOR PERIOD

- The main manifestations of **semiotic function** that have been identified at the end of the **sensorimotor period** are **deferred imitation, symbolic play, drawing** and **language** (Delval, 1996).

23

24

25

Universidad de Burgos

Early cognitive development.
Evolutionary development

MANIFESTATIONS OF SEMIOTIC FUNCTION AT THE END OF THE SENSORIMOTOR PERIOD

26

Drawing

27

Symbolic play

28

Deferred imitation

Representation requires some degree of **self-reflection** on the relationship between the **symbol** (signifier) and the **object represented** (signified) Carlson & Zelazo (2008)

Universidad de Burgos

Early cognitive development.
Evolutionary development

And **language** is perhaps the most elaborate form of representation in terms of complexity and the one that enables the greatest interpersonal and cognitive development. Recall that **Vygotsky** (1985) understood language as a **privileged vehicle of cognition.**

29

30

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos

Early cognitive development.
Evolutionary development

31

THERAPEUTIC IMPLICATIONS

Sáiz. M.C. & Román. J.M. (2011). *Estiment. Stimulation in Early Childhood*. Madrid: CEPE.

UNIT 18. ABILITY TO DEVELOP PROTO-IMPERATIVE BEHAVIOURS

Objective: to facilitate the development of proto-imperative behaviours.

Task: when the child is hungry or thirsty, or wants a toy, the adult will not give it to the child when they sense the child's desire, but will encourage the child to develop asking behaviours, developing the communicative intention towards the adult.

Materials: bottle, biscuits, objects that are motivating for the child.

Generalisation activities: take advantage of all the usual situations in which the child wants something. It will not be given until they develop some kind of communicative behaviour towards adults. When the child does so, social reinforcement will be given.

Sáiz. M.C., & Román. J.M. (2011). p. 80. Reproduced with permission of the authors.

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos

Early cognitive development.
Evolutionary development

32

THERAPEUTIC IMPLICATIONS

Sáiz. M.C. & Román. J.M. (2011). *Estiment. Stimulation in Early Childhood*. Madrid: CEPE.

UNIT 19. ABILITY TO DEVELOP PROTODECLARATIVE BEHAVIOURS

Objective: to facilitate the development of prodeclarative behaviours.

Task: facilitate situations in which the child has to share with the adult a situation that they want to communicate. For example, place a merry-go-round near them that spins and emits combined flashes of light. The child can point to show the adult how the carousel spins and projects different colours on the ceiling. The adult will show interest in the phenomenon and will also verbalise the process, accompanying the communicative interaction, always reinforcing the child's behaviour at the end by saying "how nice, I really liked it, when you see another nice thing, show it to me. OK?".

Materials: motivating toys (carousels of light, dolls that emit light and sound, fit together, etc...).

Generalisation activities: take advantage of all the usual situations in which the child wants to show something to the adult, to share it with them. When they do so, they will always be socially reinforced for it.

Sáiz. M.C., & Román. J.M. (2011). p.82. Reproduced with permission of the authors.

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos

Early cognitive development.
Evolutionary development

33

Sáiz. M.C., & Román. J.M. (2011). p. 86. Reproduced with permission of the authors.

THERAPEUTIC IMPLICATIONS

Sáiz. M.C. & Román. J.M. (2011). *Estiment. Stimulation in Early Childhood*. Madrid: CEPE.

UNIT 20. DEVELOPING SECONDARY INTER-SUBJECTIVITY SKILLS

Objective: to facilitate the development of secondary intersubjective behaviours.

Task: facilitate triadic behavioural situations.

Materials: small-scale toys that are motivating for the child.

Generalisation activities: take advantage of the play situations that the child develops autonomously to go through the language regulating the steps of planned execution, as well as the elaboration of the complexity of the game.

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos

Early cognitive development.
Evolutionary development

34

THERAPEUTIC IMPLICATIONS

Marchesi. A. (1987). *El desarrollo cognitivo y lingüístico de los niños sordos*. Madrid: Alianza.

DEVELOPMENT OF THE DECENTRALISATION DIMENSION

Objective: To facilitate the decentralisation dimension.

Tasks:

- Enable the child to interact with toys (dolls and toys that help the child to reproduce everyday contextual situations), **modelling** and **shaping of** play situations by the adult.
- Let the child initiate interactions; if necessary, **model** situational patterns of decentring through overt verbal language as a behaviour regulating agent's actions.

Materials: small-scale toys that are motivating for the child.

Generalisation activities: take advantage of the play situations that the child develops autonomously to go through the language regulating the steps of planned execution, as well as the elaboration of the complexity of the game.

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos

Early cognitive development.
Evolutionary development

35

THERAPEUTIC IMPLICATIONS

Marchesi. A. (1987). *El desarrollo cognitivo y lingüístico de los niños sordos*. Madrid: Alianza.

DEVELOPMENT OF THE OBJECT SUBSTITUTION DIMENSION

Objective: to facilitate the object substitution dimension.

Tasks:

- Facilitate the child's interaction with toys in order to initiate possible functional substitutions, **modelling** the action using objects that have some relation to the objects they substitute.
- To enable the child to make non-functional substitutions, to **model** the action by using objects in the substitution that are not similar to the objects they are substituting.

Materials: small-scale toys that are motivating for the child.

Generalisation activities: take advantage of the play situations that the child develops autonomously to go through the language regulating the steps of planned execution, as well as the elaboration of the complexity of the game.

Dr. María Consuelo Sáiz Manzanares

Universidad de Burgos

Early cognitive development. Evolutionary development

36

THERAPEUTIC IMPLICATIONS

Marchesi. A. (1987). *El desarrollo cognitivo y lingüístico de los niños sordos*. Madrid: Alianza.

DEVELOPMENT OF THE PLANNING DIMENSION

Objective: to facilitate the planning dimension.

Tasks: modelling and shaping situations that facilitate the elicitation of an intentionality towards play. Use language as a regulator of the actions that are carried out.

Materials: small-scale toys that are motivating for the child.

Generalisation activities: take advantage of the play situations that the child develops autonomously in order to use language to regulate the steps of planned execution and the elaboration of the complexity of the game.

Desarrollo cognitivo en edades tempranas. Desarrollo evolutivo

36

THERAPEUTIC IMPLICATIONS

Marchesi. A. (1987). *El desarrollo cognitivo y lingüístico de los niños sordos*. Madrid: Alianza.

DEVELOPMENT OF THE INTEGRATION DIMENSION

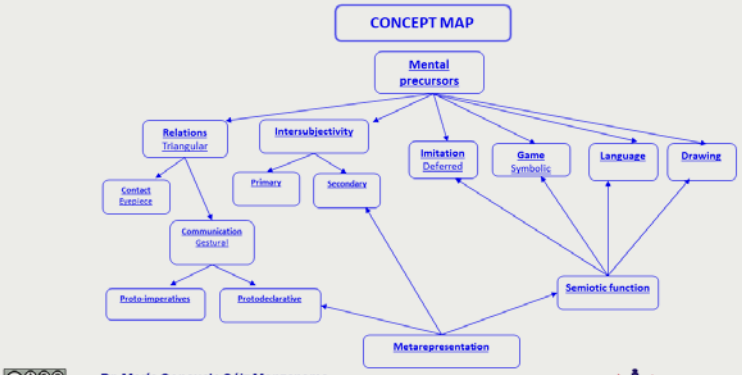
Objective: to facilitate the dimension of integration.

Tasks: modelling and shaping situations that facilitate the elicitation of more elaborate game situations by progressively increasing the difficulty of organisation and sequencing.

Materials: small-scale toys that are motivating for the child.

Generalisation activities: take advantage of the play situations that the child develops autonomously in order to use language to regulate the steps of planned execution and the elaboration of the complexity of the game.

Early cognitive development. Evolutionary development



Early cognitive development.
Evolutionary development

Bibliographical references

Astington, J.W & Dack, L.A. (2008). Theory of Mind. En D. Fair & B.L. Schlaggar (Eds.), *Encyclopedia of infant and early childhood development (pp.* 343-356). Amsterdam: Elsevier.

Carlson, S.M., & Zelazo, P.D. (2008). Symbolic Thought. En M.M. Haith & J.B. Benson (Eds.), *Encyclopedia of infant and early childhood development (pp.* 288-297). Amsterdam: Elsevier.

Gómez. A., Viguer. P., & Cantero. M.J. (2003). *Intervención Temprana: Desarrollo Óptimo de 0 a 6 años*. Madrid: Pirámide.

Marchesi. A. (1987). *El desarrollo cognitivo y lingüístico de los niños sordos*. Madrid: Alianza.

Polonio-López. B., Castellanos Ortega. M.C., & Viana Moldes. I. (2008). *Terapia Ocupacional en la Infancia: Teoría y Práctica*. Madrid: Panamericana.

Rivière. A. (2000). *Selected works* (V. I. V. II and VIII). Madrid: Alianza.

Sáiz. M.C., & Román, J.M. (2011). *Mentalistic Stimulation in Early Childhood*. Madrid: CEPE.

Sáiz. M.C., & Román, J.M. (2012). Early stimulation in a pupil with Down Syndrome. *Audición y Lenguaje, 97*, 14-21.

Sáiz. M.C., & Payo, R.J. (2012). *Developmental Psychology in Early Childhood*. Burgos: Servicio de Publicaciones de la Universidad de Burgos.

Web

Retrieved from http://www.youtube.com/watch?v=_ObogcEJGIM 12 December 2015

Retrieved from http://www.youtube.com/watch?v=eaevHXkR0Nk 12 December 2015

Retrieved from http://www.youtube.com/watch?v=BjM89C6k_5o 12 December 2015

Retrieved from http://www.youtube.com/watch?v=2GPqlNAMWPc 12 December 2015

Early cognitive development.
Evolutionary development

List of images

Image 1. https://docplayer.es/docs-images/92/110111553/images/2-0.jpg
Image 2. https://i1.wp.com/bajopalabra.com.mx/wp-content/uploads/2018/02/Google-predice-enfermedades-escaneando-ojos_1055_402.jpg?resize=750%2C375&ssl=1
Image 3. https://2.bp.blogspot.com/-uKbXMCms4p8/WAMmndhvBUI/AAAAAAAABVE/RyjrguCWqC4SkCWilGuYb-NfERGvWUSWACEw/s1600/imitaciones-del-bebe_reference.jpg
Image 4. https://www.meyeucon360.com/upload/News/tuoi-mam-non/day-con/toan_hoc_cho_be_theo_tung_do_tuoi.jpg
Image 5. https://emujer.mx/wp-content/uploads/2016/07/sobre-estimulacion-temprana01-1024x710.jpg
Image 6. https://lh3.googleusercontent.com/AMihbGqsSOXM_uGVwV4Hs0K0sz8WAEjXWCMsm0ion0Fia29BpzFb-7-fokKslwdmtCWBvYg=s130
Image 7. https://portalvhdsd558mdg9zkkbn.blob.core.windows.net/jouonsmalin/Detruire_reconstruire3.jpg
Image 8. https://3.bp.blogspot.com/-pIfmgReTnn8/UdHtidRhgYI/AAAAAAAAW0U/PG9C3JSsAts/s550/550_334_18163.jpg
Imagen 9. https://st3.depositphotos.com/12039448/15126/i/600/depositphotos_151260052-stock-photo-mother-holding-baby.jpg
Image 10. https://apollo-virginia.akamaized.net/v1/files/5xuue78z3fo72-PE/image
Image 11. https://www.fmdos.cl/wp-content/uploads/2016/06/Bebe-imitando-2-1024x637.jpg
Image 12. https://4.bp.blogspot.com/-tMxY-jZYEVw/WW4IKI059MI/AAAAAAAA6xU/rOY_8B21aDwIMBTvNGcL04CgwK-2XvkzgCLcBGAs/s1600/dreamstime_xl_2607278.jpg
Imagen 13. https://images.immediate.co.uk/production/volatile/sites/28/2019/02/new-zealand-bans-weird-baby-names_25175-df6ae9e.jpg?quality=90&resize=768,574
Imagen 14.
https://i.guim.co.uk/img/media/c97db9be34103ff8d565c4794c2bcd79268952ac/0_130_3888_2333/master/3888.jpg?width=1200&quality=85&auto=format&fit=max&s=add8a53c8dc01a160bfa8e7b66d337eb

Early cognitive development.
Evolutionary development

List of images

Imagen 15. https://bebesequinho.com/wp-content/uploads/2019/12/Melhores-brinquedos-para-beb%C3%AAs-de-6-a-12-meses-1-1.jpg
Image 16. https://mibebeyyo.elmundo.es/images/bebes2/ensenar-a-leer_article_card.webp
Image 17. http://dorgio.mn/uploads/2016/02/e4814b02c5a45f73a1d021924260ed35.jpg
Image 18. https://thumbs.dreamstime.com/b/el-beb%C3%A9-elegante-con-los-vidrios-tiene-una-idea-57110885.jpg
Imagen 19. https://us.123rf.com/450wm/macniak/macniak1402/macniak140200159/26100473-ein-portr%C3%A4t-einer-sch%C3%B6nen-frau-die-eine-idee-%C3%BCber-wei%C3%9Fem-hintergrund.jpg?ver=6
Imagen 20. https://i.pinimg.com/originals/de/a1/75/dea1757d7d9ff237449771e0858bb397.jpg
Image 21. https://parentalis.com/wp-content/uploads/2018/11/juego_simbolico_joc_simbolic.jpg
Image 22.
https://www.colombiaaprende.edu.co/sites/default/files/files_public/styles/img_530_320/public/imagenes_agenda/shutterstock_130944353.jpg?itok=cpl0hQfm
Imagen 23. https://static8.depositphotos.com/1337688/814/i/600/depositphotos_8144255-stock-photo-waiting-for-muse.jpg
Image 24. https://lh3.googleusercontent.com/proxy/VS2pprVbnltPjtYxbl6UxLOqc-85SWcc0XQMRhH6feLdQg8Mwx4aYda5wBEP3CVhzsgueHh0vMHcxA7p810GyyiEwvZe4wRVu7bxcdN1oQC6Wwb8MowvYw
Image 25. https://cdn.shopify.com/s/files/1/0431/8821/products/RocketBaby-gioco-feltro-abbigliamento44_1800x.jpg?v=1569152404
Image 26. https://www.fondazionemonzabrianza.org/wp-content/uploads/2020/06/call1-2020-scaled.jpg
Image 27. https://www.asociacionsanjose.org/wp-content/uploads/2016/10/juego-medicos.jpg
Image 28. https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcTHmV4rd7mHVk_35YWJmjrZM9aqIhHFRrww1Q&usqp=CAU

Early cognitive development.
Evolutionary development

List of images

Imagen 29.
https://static.wixstatic.com/media/4a3b80_48837b6f6d594f64b1bf33f61fd770d8~mv2.jpg/v1/fill/w_1000,h_750,al_c,q_90/4a3b80_48837b6f6d594f64b1bf33f61fd770d8~mv2.webp
Image 30. https://www.bayardeducacion.com/wp-content/uploads/2021/01/13773-espiritu-montessori.jpg
Image 31. https://polki.pl/foto/4_3_LARGE/grozna-substancja-w-glowkach-lalek-2394782.jpg
Image 35. https://2.bp.blogspot.com/-ix6dx43jrNA/WTRPArrnqxI/AAAAAAAAAC8/e2BHqj0XJCUQsVoBOfrQ_sslkeseg2hFwCLcB/s1600/juego-simb%25C3%25B3lico.png
Imagen 36. https://i.pinimg.com/originals/d1/9e/b7/d19eb73609b749ec62732fe35213253b.jpg
Image 37. https://krot.info/uploads/posts/2021-01/1610236501_7-p-fon-skanvord-16.png

Universidad de Burgos

Early cognitive development.
Neurological development

THANK YOU VERY MUCH FOR YOUR ATTENTION!!!!

Universidad de Burgos

Early cognitive development.
Neurological development

Now we are going to do a Crossword puzzle to check what we have learned

37

Universidad de Burgos 32

5

Early cognitive development.
Evolutionary development

Licence

Author: Dr. María Consuelo Sáiz Manzanares
Developmental and Educational Psychology Area
Faculty of Health Sciences
University of Burgos

5

Testing knowledge from Unit 5.

Matching questions

a. Triangular relations	1. Patterns of joint attention
b. Communicative actions	2. Asking
c. Proto-imperative	3. 8 to 12 months
d. Proto-declarative	4. Sharing

Answers

a-3/b-1/c-2/d-4

True/False questions

1.

Symbolic play is a precursor to Theory of Mind, and its acquisition begins at the end of the second year **(True).**

Feedback: Symbolic play is considered a precursor to Theory of Mind, and its acquisition begins at the end of the second year, at the same time as other representational skills begin to develop.

2.

Meta-representation is the ability to make mental representations. The processes that use meta-representation are all those that need symbolism (protodeclarative, symbolic play, drawing, language, ToM...) **(True).**

Feedback: Meta-representation is the ability to make mental representations. The processes that use meta-representation are all those that need symbolism (protodeclarative, symbolic play, drawing, language, ToM...).

3.

Secondary intersubjectivity in human babies refers to their face-to-face reactions with parenting figures in which infants would show different expressions and would develop from two to four or five months of age **(False).**

Feedback: Primary intersubjectivity in human babies refers to their face-to-face reactions with parenting figures in which infants would show different expressions and would develop from two to four or five months of age

4.

Secondary intersubjectivity is the deliberate motivation of the child to share interests and experiences with others and would manifest itself around the first year of life **(True).**

Feedback: Secondary intersubjectivity is the deliberate motivation of the child to share interests and experiences with others and would manifest itself around the first year of life.

5.
Proto-imperative gestures involve complex communicative behaviours which require second-order meta-representational skills that involve a more complex cognitive understanding **(False).**
Feedback: proto-declarative gestures involve complex communicative behaviours which require second-order meta-representational skills that involve a more complex cognitive understanding.

6.
Symbolic play is a considered a precursor of ToM (Theory of Mind), it begins to be acquired at the end of the second year and has different dimensions (Decentering, Object Substitution, Integration and Planning) **(True).**
Feedback: Symbolic play is a considered a precursor of ToM (Theory of Mind), it begins to be acquired at the end of the second year and has different dimensions (Decentering, Object Substitution, Integration and Planning)

7.
Language is considered the most elaborate form of representation in terms of complexity as it means cognitive, interpersonal, and metarepresentational development **(True).**
Feedback: Language is considered the most elaborate form of representation in terms of complexity as it means cognitive, interpersonal, and metarepresentational development. According to Vygotsky "language is a privileged vehicle of cognition".

8.
Representation does not require self-reflection on the relationship between the symbol (signifier) and the object represented (signified) **(False)**.
Feedback: Representation requires some degree of self-reflection on the relationship between the symbol (signifier) and the object represented (signified).

9.
The main manifestations of semiotic function that have been identified at the end of the pre-operational period are deferred imitation, symbolic play, drawing and language **(False).**
Feedback: The main manifestations of semiotic function that have been identified at the end of the sensorimotor period are deferred imitation, symbolic play, drawing and language.

10.
Symbolic play begins in early childhood between the ages of eighteen and thirty-six months. At around eighteen months, children will be able to understand significantly better what is asked for with a symbolic gesture than with the use of a miniature object referent. However, they will show confusion between the symbol and the referent **(True).**

Feedback: Symbolic play begins in early childhood between the ages of eighteen and thirty-six months. At around eighteen months, children will be able to understand significantly better what is asked for with a symbolic gesture than with the use of a miniature object referent. However, they will show confusion between the symbol and the referent (True).

Crosswords

Level 1

Question: After how many months does triangulation begin
Answer: eight

Question: Communicative actions include patterns of joint attention before, during or after the interaction where the child seeks...
Answer: eye contact

Question: Gestures used to make requests of others are called
Answer: proto-imperative.

Question: Gestures used to share situations with others are called
Answer: proto-declarative

Level 2

Question: Proto-declarative gestures mean behaviour of mentally sharing a ...
Answer: situation

Question: Babies' imitative reactions to adults' gestures are called ... intersubjectivity.
Answer: primary

Question: Children's deliberate motivation to share situations with others is called ... intersubjectivity
Answer: secondary

Question: Symbolic play is a precursor of Theory of ...
Answer: Mind

Question: Symbolic play begins at around eighteen months and is consolidated at
Answer: thirty-six

Question: The main manifestations of semiotic function are deferred imitation, symbolic play, drawing and language, and have been identified at the end of the ... period
Answer: sensorimotor

Level 3

Question: The most elaborate form of representation, as it allows greater interpersonal and cognitive development is
Answer: language

Question: In symbolic play, the progressive advance from everyday actions to actions seen in others is called
Answer: decentralization

Question: In symbolic play, the progressive decontextualization of the functions of an object is called
Answer: substitution

Question: In symbolic play, the level of structural complexity of the game is called
Answer: integration

Question: In symbolic play, the progressive decontextualization of functions of an object is called ...
Answer: substitution

Question: In symbolic play, the progressive advance from the here and now to more elaborate games is called
Answer: planning

4.7.
Unit 6
Creation of early stimulation programs for 3-6 year-olds.

Content

6

Cognitive development at early ages.
Evolutionary development

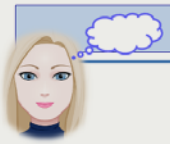
During the **preoperational period** the child consolidates a series of skills initiated in the **sensorimotor period while** acquiring new ones. As we have seen, at the end of this period, the child has acquired the **ability to represent**. However, development is not complete as the child will need other systems of representation, such as **language,** in order to consolidate the skills.

1 

2 

3 

Cognitive development at early ages.
Evolutionary development



4 

The **pre-operational period** was so called by Piaget because the child is not yet able to carry out **mental operations**, understood as a set of actions organized in systems that are dependent on each other. Within this period, one of the achievements is the **construction of invariants**. The child learns that an object remains the same even if different transformations occur on it and therefore maintains its identity (**acquisition of the identity of objects**). Already in the **sensorimotor period** the child has acquired **object permanence**, which basically implies the **construction of invariants.** The invariants that will be taken into account during the **pre-operational period** will still be simple and will be more concerned with qualitative than quantitative aspects (Delval, 1996).

Cognitive development at early ages.
Evolutionary development

- At the same time that they acquire the notion of **identity of objects**, they develop **relationships of functional dependence**, which implies that some events are associated with others and that a modification in the first one produces a change in the next one. As in the case of the concept of invariant, the acquisitions are more of a qualitative type (Delval, 1996).

5 

6 

Cognitive development at early ages. Evolutionary development

The acquisition of Theory of Mind in the pre-operational period.

Previously we have described how there is a relationship between the development of **metarepresentational skills** in different areas: **fiction play, language acquisition,** especially **semantic** and **pragmatic functions**, and **Theory of Mind**.

The first to introduce the concept of **Theory of Mind** were Premack and Woodruff (1978) in their work with non-human primates and later Wimmer and Perner (1983) would use it in their work with humans. The **mind** can be defined as a set of **desires, beliefs, emotions and intentions** whose **interaction** would form so-called **mental states** or **mental representations.**

Cognitive development at early ages. Evolutionary development

Metal states such as **beliefs** or **desires** are representations that mediate the interaction of the human subject in the environment, they are also called **intentional states**. Such states have a **propositional content** that implies the development of **predictive** and **causal** thinking.

7

8

Cognitive development at early ages. Evolutionary development

One of the most significant achievements in this period is the development of **language** and above all its insertion into the subject's own actions and those of others. In **Vygotskian** terms, language is a **privileged vehicle of cognition** that will allow the subject to open up to the world of knowledge with an important tool. This acquisition will facilitate the child's passage from the world of **experimentation** to the world of **deduction.** However, from the Piagetian point of view, thought still has to make important conquests, among which the **Theory of Mind** stands out. In the **sensorimotor period the** precursors have been described and now we are going to see how it continues to develop during the **preoperational period.**

9

10

Cognitive development at early ages.
Evolutionary development

- The **mind** would have the capacity to represent **mental states** (Astington, 1998), this would be one of the qualities that would differentiate the human species. The ability to have **meta-representations**, that is, the ability to create **representations** about one's own **representations** and to **infer representations** about the possible representations of **others. This helps human beings to make relationships with reality** (Astington, 1998).

11

Cognitive development at early ages.
Evolutionary development

Language and the **development of Theory of Mind** are two directly related aspects, although as Rivière and Nuñez (1996) point out, this does not mean that they are homologous systems, but it is a fact that the acquisition of **linguistic skills** will enable a greater understanding of **conceptual systems of intentions, beliefs and desires** (which is what is understood by **Theory of Mind**). The absence of language or the inhibition of language can lead to not really understanding the **world of representations of others**.

12

Cognitive development at early ages.
Evolutionary development

Children may understand **mental representation** in a partial way and understand that **beliefs** and **desires** are **mental entities** that are separate from reality. As they evolve in their **concept of mind** they will discover **representation** in its double sense of **mental entity** and **mental activity**. That is to say, the *mind* will be able to develop **beliefs** about the beliefs of others and differentiate them from its own, and it will also have the ability to predict something based on these **attributed beliefs** and differentiate them from its own. That is why psychologists chose situations of **deception** as the most appropriate to see whether or not a subject has developed **Theory of Mind**.

Cognitive development at early ages.
Evolutionary development

According to Rivière and Nuñez (1996), following the studies of Perkins and Smith (1987), they differentiate three evolutionary moments in **tacit deception. First,** at around **three years of age,** children seem to have difficulties in using it. At a **second point,** around **four years of** age, they still do not use tacit deception strategies as such, although they can produce them according to experience, and at a **third point** between **five and six years of age** deception is used more fluently.

Thus, it seems that by the age of five the **Theory of Mind** has developed in an evolutionarily "normal" process that over the years will be perfected with respect to its conceptual elements of **power** and **recursion** that is manifested in tasks that involve **second order skills**: the child must infer the **false belief** of a subject about what another subject has, that is to say, represent a representation about another representation.

Universidad de Burgos

Examples of intentional states	
Type of mental state (attitude)	**Propositional content (What it is about)**
Belief	The cake is in the cupboard
Desire	I'm hungry for cake
Intention	Open the cupboard

Two basic types of intentional states	
Beliefs	**Wishes and Intentions**
True or False	Compliant or non-compliant
Caused by world events	Bringing about change in the world
They change to fit the world	The world has to change to adapt to them

The Development of Theory of Mind		
Period	**Age Range**	**Development**
Childhood	Birth-18 months	Social and perceptive
Toddlers	18 months-3 years	Awareness of mental states
Preschoolers	4-5 years	Metarepresentation
Schooling	6 years old	Recursion and interpretation

Astington & Dack (2008) p. 4 & 5

Universidad de Burgos

Theory of mind in the later preschool period	Theory of mind in the later preschool period
Meta-representational Skills, 4-5 years old	**Recursion and interpretation skills, 6 years old**
Characteristics of behaviors and skills	***Characteristics of behaviors and skills***
Understanding of false belief in "self" and others	Understanding 1st and 2nd Order Theory of Mind
Understanding disappointment	Reorganizing and interpreting diversity
Differentiate between appearance and reality	Understand indirect language, e.g. irony and metaphor
Understanding of knowledge acquisition aspects	Awareness of lies, missteps and persuasion
Differentiate between desire and intention	Use and understanding of the terms "mental states".
Understanding causal intent	Understand referential inference, ambiguity and opacity.
Understanding Emotion-Based Beliefs	Self-awareness and introspection

Astington & Dack (2008) p. 8 & 9

Universidad de Burgos

Cognitive development at early ages.
Evolutionary development

These aspects are concretized in the resolution of different types of tasks. At the **first point in the** process of acquiring the **Theory of Mind** the child will be able to solve **false belief** tasks. In these tasks a story is staged in which the protagonists are two children, one of whom has an attractive object (for example, a marble, a doll...) that he/she keeps in a specific place (for example, a box, a basket...). At a certain moment this child (whom we will call David) will leave and the other child (whom we will call Carlos) will be left alone in the room, then Carlos will take the object (marble, doll...) and will change its place (put it in another box, in another basket...), then David will come back and we will ask the child of our experiment "Where is David going to look for the marble, (the doll...)? It is here when he has to put himself in the place of the other and differentiate between what he knows that happened and what David really knows.

Universidad de Burgos

Cognitive development at early ages.
Evolutionary development

Later on they will be presented **second order tasks** to solve, in which the child will have to infer the **false belief** of a subject about what another subject has. The experiment is similar to the previous one with the difference that the first character, David, on leaving the room can see through a window what is really happening and then he no longer has a **false belief** about what has happened but a **true belief**. Now the questions asked of the experimental child are, "Where does David think the marble is?" (this question implies **true belief**) and another "Where does Charles think David will look for the marble?" (a question that implies **false belief**). This last question implies a high degree of **recursivity** and is answered correctly by the children at around six and a half years of age (Rivière and Nuñez 1996).

Universidad de Burgos

Cognitive development at early ages.
Evolutionary development

In conclusion we can say that *the* **mind** can be understood as a construct that is itself **representational**. Therefore, having a **mind** is equivalent to having **representations** and **attributing mind** implies **attributing representations** to others. Thus, the **intentional recursivity** of subjects uses **language on** many occasions to try to modify the **mental worlds** of others. From this approach, **Theory of Mind** would be directly related to the **pragmatic skills** that allow forms of interaction and communication from a **declarative function** (Rivière and Nuñez, 1996; Happé, 1998). This capacity can be understood as an **ability** or set of **cognitive abilities** that will allow the development of interaction and communication processes among human beings and facilitate the development of adaptive behaviors to the environment according to their acquisition dynamics.

Universidad de Burgos

Cognitive development at early ages.
Evolutionary development

First Order Theory of Mind Test

Sara has a basket and Ana has a cardboard box.

Sara puts a marble in the basket and leaves.

Ana, who has seen it, changes the marble from the basket to the box.

When Sara returns "where will she look for the marble?"

Frith, U (1998). Autismo. Madrid: Alianza.

Universidad de Burgos

Cognitive development at early ages.
Evolutionary development

How to create an Early Stimulation Program for 3-6 year-olds

Design of the intervention program

- **Unit Objectives**
- **Unit assessment indicators**
- **Work tasks in the unit**
- **Materials needed to work on the unit**
- **Unit generalization activities**

Universidad de Burgos

Cognitive development at early ages.
Evolutionary development

Lines of cognitive intervention on preoperative development

At this point we still have a challenge to meet, which would be to point out lines of intervention to facilitate **cognitive, metacognitive, language and social interaction development** at this age. For this purpose, we have developed a *Cognitive Intervention Program for young children* (Sáiz & Román, 1996), which includes important aspects of **cognitive intervention related to** the development of:

- The basic prerequisites for learning.
- Skills to develop planning thinking (means-ends strategies).
- Skills to develop self-evaluative thinking.
- Skills to develop consequential thinking.
- Skills to develop alternative thinking.
- Identification of emotions.

Universidad de Burgos

Cognitive development at early ages. Evolutionary development

Lines of cognitive intervention on preoperative development

By way of summary, in Table I we indicate the most representative acquisitions in the **preoperational period** as well as some of their limitations (Delval, 1996) and note possible intervention strategies (Sáiz and Román, 1996).

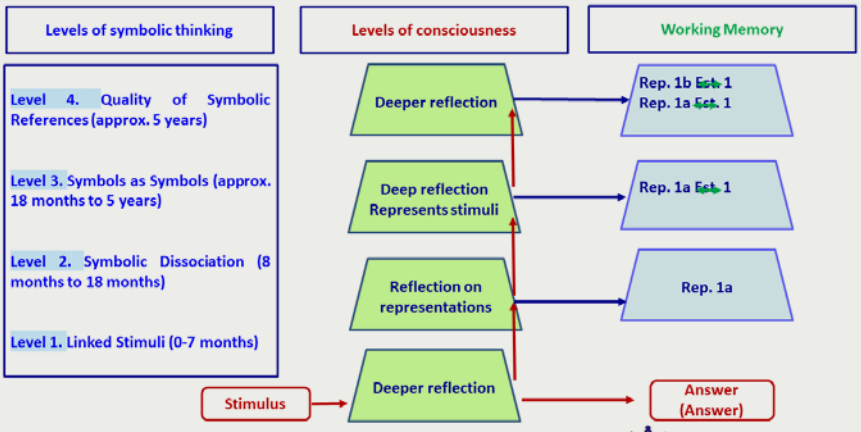
Universidad de Burgos

Cognitive development at early ages. Evolutionary development

Table I: Dimensions of Sáiz's Symbolic Play in Gómez, A., Viguer, P., & Cantero, M.J. (2003). *Intervención Temprana: Desarrollo Óptimo de 0 a 6 años.* Madrid: Pirámide. pp. 128-129.

Pre-operative acquisitions	Cognitive intervention strategies
Ability to represent by means of differentiated signifiers, the ability to represent that began in the sensorimotor period is developing.	- Facilitate the development of the capacity of representation (through the use of language, drawing, deferred imitation, the improvement of symbolic play and in general of all the skills of representation). The adult will act as we have already pointed out in other sections, modelling and moulding the child's actions and will also reinforce the child's attempts at execution, however small they may be.
- Ability to communicate through language: informative function: transmitting/receiving information through language. Self-regulation function of one's own behavior through language. function of regulating the behavior of others through language.	- To promote the use of language in the child both to ask for and to transmit information. - The adult will model their actions by regulating their behaviors through their own language (Meichenbaum's self-instructional training is used here). - The adult will first shape the child's actions through their own language and will then try to make the child regulate their own actions through their language (see Cognitive training program, Sáiz & Román, 1996).

Universidad de Burgos



Carlson & Zelazo (2008) p. 2

Universidad de Burgos

Cognitive development at early ages. Evolutionary development

Table I: Dimensions of Sáiz's Symbolic Play in Gómez, A., Viguer, P., & Cantero, M.J. (2003). *Intervención Temprana: Desarrollo Óptimo de 0 a 6 años.* Madrid: Pirámide. pp. 128-129.

Pre-operative acquisitions	Cognitive intervention strategies
- Ability to use language to explain the events of everyday life. - Understanding of entities and functions (acquisition of invariants and regularities of a qualitative nature). Identities. An object remains the same even if it undergoes some transformations (as long as the transformations are qualitative). Functions: Functional dependence is developing (a modification in one situation produces a modification in the second and so on, attends to qualitative transformations).	- Work from the tangible, providing the child with multiple experiences that help them better understand the variations that occur in the objects and fundamentally the process of transformation both in the formation of identities and in the development of functional dependence.
- Differentiation between appearance and reality. - Elaboration of the theory of mind.	- Work on the development of the processes. - To facilitate the development of the theory of mind, making possible fictional and dramatized situations that help the child to get out of the centering processes, to put themselves in the other's place and to take different perspectives or points of view into consideration.

Universidad de Burgos

Cognitive development at early ages. Evolutionary development

Table I: Dimensions of Sáiz's Symbolic Play in Gómez, A., Viguer, P., & Cantero, M.J. (2003). *Intervención Temprana: Desarrollo Óptimo de 0 a 6 años.* Madrid: Pirámide. pp. 128-129.

Beginning of acquisitions and learning that must be perfected in the preoperative period.	Cognitive intervention strategies
- Initiates the development of problem-solving strategies, although they have difficulties simultaneously considering several aspects of the same situation). - They still have difficulty in understanding that an object can belong to two classes at the same time. - They have difficulty understanding processes and tend to see elements in isolation. - They have difficulty developing generalization processes.	- To facilitate the development of problem-solving processes* by enabling the child to tangibly deal with several aspects of the same situation simultaneously. - Using problem-solving strategies* the adult will play games in which the child can see that an object can belong to two or more categories at the same time (categorization processes). - Place special emphasis on the child observing and understanding the process and not just the outcome of a problem or situation. - Facilitate the development of the processes of generalization* of learning. See Cognitive training program for young children (Sáiz & Román, 1996).

Universidad de Burgos

Cognitive development at early ages. Evolutionary development

Developmental differences

- Attention problems
- Comprehension problems
- Language development problems
- Problems in the development of means-end, consequential, predictive thinking ...
- Problems in the development of symbolic play
- Type of social and family stimulation context
- Problems in social skills

Universidad de Burgos

Cognitive development at early ages. Evolutionary development

Theory of Mind explanatory theories	
Theories	**Features**
Theory-Theory	Children construct theory of mind through processes of theorizing.
Simulation-Theory	Children pretend to be others based on their experience.
Modularity Theory	Theory of Mind (ToM) depends on the maturation of an innate module for ToM.
Social-constructivist theories	ToM is a collaborative and linguistic construction mediated by social interaction.
Theories of dominance	ToM depends on a general developmental domain related to executive functions.

Astington & Dack (2008) p. 13

Cognitive development at early ages. Evolutionary development

Type of associated pathologies

- Autism Spectrum Disorder
- Sensory impairments (hearing, visual)
- Intellectual disability
- Behavioral Problems (Attention Deficit Disorder with and without activity)

Cognitive development at early ages. Evolutionary development

Bibliographic References

APA (2014). *Diagnostic and statistical manual of mental disorders*. Madrid: panamericana.

Carbonero, M.A., Sáiz, M.C., & Román, J.M. (2013). Effect of a metacognitive training program of mentalist skills. *Psicothema*, *25*(1), 31-37. https://doi10.7334/psicothema2011.192.

Carlson, S.M., & Zelazo, P.D. (2008). Symbolic Thought. In M.M. Haith & J.B. Benson (Eds.), *Encyclopedia of infant and early childhood development* (pp. 288-297). Amsterdam: Elsevier.

Sáiz, M.C., Carbonero, M.A., & Flores, V. (2010). Analysis of processing in traditionally cognitive and theory of mind tasks in 4- and 5-year-old children. *Psicothema*, *22*(4), 772-777.

Sáiz, M.C. (2003). Cognitive intervention in young children. In A. Gómez, P. Viguer and M.J Cantero (Eds.), *Intervención Temprana: Desarrollo óptimo de 0 a 6 años* (pp.117-133). Madrid: Pirámide.

Sáiz, M.C. (2017). Analysis of proto-mentalistic skills in Autism Spectrum Disorder: a proposal for assessment and intervention. *Audición y Lenguaje*, *118*(VI), 36-54.

Sáiz, M.C., Alonso, J., & Román, J.M. (2010). Development of "mentalistic strategies" in young children: between family and school. In J. Gázquez & M.C Linares (Eds.), *La Convivencia Escolar: Aspectos Psicológicos y Educativos* (pp. 473-480). Granada: GEU.

Sáiz, M.C., & Carbonero, M.A. (2017). Metacognitive Precursors: An Analysis in Children with Different Disabilities. *Brain Science*, *7*(136), 1-14. https://.doi.org/10.3390/brainsci7100136.

Sáiz, M.C., Carbonero, M.A., & Flores, V. (2010). Analysis of processing in traditionally cognitive and theory of mind tasks in 4- and 5-year-old children. *Psicothema*, *22*(4), 772-777.

Sáiz, M.C., Carbonero, M.Á., & Flores, V. (2014). Precursors of Theory of Mind in children with disabilities. *Cadmo*, *2014*(1), 25-37. https://doi10.3280/CAD2014-001004.

Cognitive development at early ages.
Evolutionary development

Bibliographic References

Sáiz, M.C., Carbonero, M. Á., & Román, J. M. (2012). Research and teacher training in the classroom: development of proto-mentalistic skills in nursery school students with special educational needs. *Interuniversity Electronic Journal of Teacher Education*, *15*(1), 27-36 27.

Sáiz, M.C., Carbonero, M. Á., & Román, J. M. (2014). Learning self-regulation skills in 5- to 7-year-old children. *Universitas Psychologica*, *13*(1), 369-380. doi: 10.11144/Javeriana.UPSY13-1.ahan.

Sáiz, M.C., & Guijo, V. (2009). Development of the prerequisites of social cognition in 0-1 year old children. *International Journal of Developmental and Education Psychology*, *1*(1), 19-27.

Sáiz, M.C., & Guijo, V. (2010). Competences and metacognitive strategies in Early Childhood Education: A path towards the development of Problem Solving procedures. *International Journal of Developmental and Education Psychology*, *1*(2), 497-511.

Sáiz, M.C., Flores, V., & Román. (2010). Metacognition and "learning to learn" competence in Early Childhood Education: A proposal to facilitate inclusion. *Interuniversity Electronic Journal of Teacher Education*, *13*(4). 123-130.

Sáiz, M.C., & Payo, R.J. (2012). *Psychology of Early Childhood Development: A Teaching Project adapted to the European Higher Education Area.* Burgos: Servicio de Publicaciones de la Universidad de Burgos.

Sáiz, M.C., & Román, J.M. (2011a). *Mentalistic stimulation in early childhood.* Madrid: CEPE.

Sáiz, M.C., Román, J.M., (2011b). Metacognitive training and problem solving strategies in children aged 5 to 7 years. *International Journal of Psychological Research*, *4*(2), 9-19.

Sáiz, M.C., & Román, J.M. (2012). Early stimulation in a student with Down syndrome. *Audición y Lenguaje*, *97*, 14-21.

Cognitive development at early ages.
Evolutionary development

Images

Image 1. https://www.lalalukids.com/files/ckeditor/motivovat%20k%20prvym%20slovam/prve-slova-11.jpg
Imagen 2. https://eldemocrata.com/wp-content/uploads/2020/09/img_mrius_20200224-145151_imagenes_lv_terceros_cerebro_infantil-kId-U47867688324706M-992x558@LaVanguardia-Web-780x470.jpg
Image 3. https://i2.wp.com/www.conmishijos.com/assets/posts/13000/13472-por-que-a-tu-hija-le-gusta-jugar-con-munecas.jpg
Image 4. https://www.superprof.co/img-fb-1967881.jpg
Image 5. https://sites.google.com/site/didacticaespecialdelamat/_/rsrc/1530741827284/a-planificacion-en-el-area-de-matemati/b-etapas-en-el-proceso-de-aprendizaje-en-las-matematicas/juegos_indi.jpg?height=149&width=200
Image 6. https://images.jifo.co/56424845_1585014520464.png
Image 7.
https://images.cointelegraph.com/images/1434_aHR0cHM6Ly9pbWFnZXMuY29pbnRlbGVncmFwaC5jb20vaW1hZ2VzLzc0MF9hSFlwY0hNNkx5OXpNeTVqYjJsdWRHVnNaV2R5WVhCb0xtTnZiUzl6ZEc5eVlXZGxMM1Z3Ykc5aFpITXZkbWxsZHk5bVpEVTJNVEU1WkRZd1lUaG1NbUl5TmpnME1EQTNaR0kwTW1SaE1XVmhaUzVxY0djPS5qcGc=.jpg
Image 8. https://us.123rf.com/450wm/stuartphoto/stuartphoto1403/stuartphoto140300868/26961058-causer-des-effets-d-orientation-signification-cons%C3%A9quence-d-action-ou-de-r%C3%A9action.jpg?ver=6
Image 9. https://files.speakerdeck.com/presentations/f3ad46817dfd45c9acff5fe773fcb3de/slide_40.jpg
Image 10.
https://lh3.googleusercontent.com/proxy/zuEZJ_l90DcNzIDRV_mnHAQX_uW5x3V8lBdUyn2Zowg Ce9wO5jusxauKXdeNmEXeAwhyrCpsrZz5NAlWzc2Ulfy3_gVz5Ks8e5ruSH6YcdMARCVZso0shBw9VgiOjBK2-AD0KXDOcTMmBwPwzfZvronOsX8xmnXnZ00bzw
Image 11. http://4.bp.blogspot.com/-Xsqe2De8x2U/UJS8Fur88PI/AAAAAAAAAEM/a5UGkiR54YM/s280/images.jpg
Imagen 12. https://i.pinimg.com/originals/b4/7e/38/b47e389b27ff36fdf8f6b9e06b50199e.jpg
Image 13. https://docplayer.hu/docs-images/92/110847963/images/11-2.jpg

Cognitive development at early ages.
Neurological development

THANK YOU VERY MUCH FOR YOUR ATTENTION!!!!!


Cognitive development at early ages.
Neurological development
Now we are going to do a Crossword puzzle to check what we have learned
13
© Dr. María Consuelo Sáiz Manzanares
Universidad de Burgos 33


Cognitive development at early ages.
Evolutionary development
License
Author: Dr. María Consuelo Sáiz Manzanares
Area of Developmental and Educational Psychology
Faculty of Health Sciences
University of Burgos
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.
No commercial use of this work or any derivative works is permitted. Distribution of derivative works must be under a license equal to that which governs this original work.
License available in:
https://creativecommons.org/licenses/by-nc-sa/4.0/
Universidad de Burgos

Checking knowledge from unit 6.

Matching questions

a. Preoperational	2. Construction of invariants
b. Fiction play	3. Theory of Mind
c. Pragmatic	4. Sensorimotor
d. Propositional	1. Prediction

Answers

a-2/b-4/c-3/d-1

True/False questions

1.

The capacity of representation is consolidated in the preoperational period **(True).**

Feedback: During the preoperational period the child consolidates a series of skills initiated in the sensorimotor period while acquiring new ones. As we have seen, at the end of this period, the child has acquired the ability to represent. However, development is not complete as the child will need other systems of representation, such as language, in order to consolidate the skills.

2.

During the preoperational period, the child acquires the capacity to carry out operations **(False).**

Feedback: in the preoperational period, the child is not able to carry out mental operations but one of the achievements is the construction of invariants.

3.

During the preoperational period, the child will acquire the notion of the identity of objects **(True).**

Feedback: During the preoperational period, the child will acquire the notion of the identity of objects, which implies relationships of functional independence.

4.

The Theory of Mind is fundamentally related to the syntactic function of language **(False).**

Feedback: The Theory of Mind is particularly related to the semantic and pragmatic functions

5.

Mental states such as beliefs and desires are representations that mediate the interaction of human subjects in the environment, they are also called intentional states **(True).**

Feedback: Metal states such as beliefs or desires are representations that mediate the interaction of the human subject in the environment, they are also called intentional states. Such states have a propositional content that implies the development of predictive and causal thinking.

6.

Theory of Mind and language are a single process **(False).**

Feedback: Language and the development of Theory of Mind are two directly related aspects, although as Rivière and Nuñez (1996) point out, this does not mean that they are homologous systems, but it is a fact that the acquisition of linguistic skills will enable a greater understanding of conceptual systems of intentions, beliefs and desires (which is what is understood by Theory of Mind). The absence of language or the inhibition of language can lead to not really understanding the world of representations of others.

7.

At the first point in the process of acquisition of the Theory of Mind, the child can solve false belief tasks **(True).**

Feedback: These aspects are concretized in the resolution of different types of tasks. At the first point in the process of acquiring the Theory of Mind the child will be able to solve false belief tasks. In these tasks a story is staged in which the protagonists are two children, one of whom has an attractive object (for example, a marble, a doll...) that they keep in a specific place (for example, a box, a basket...). At a certain moment this child (whom we will call David) will leave and the other child (whom we will call Carlos) will be left alone in the room, then Carlos will take the object (marble, doll...) and will change its place (put it in another box, in another basket...), then David will come back and we will ask the child of our experiment "Where is David going to look for the marble, (the doll...)? It is here when the child has to put themselves in the place of the other and differentiate between what they know that happened and what David really knows.

8.

The second point in the process of acquiring the Theory of Mind is related to second-order tasks **(True).**

Feedback: Later on they will be presented second order tasks to solve, in which the child will have to infer the false belief of a subject about what another subject has. The experiment is similar to the previous one with the difference that the first character, David, on leaving the room can see through a window what is really happening and then he no longer has a false belief about what has happened but a true belief. Now the questions asked of the child are, "Where does David think the marble is?" (this question implies true belief) and another "Where does Charles think David will look for the marble?" (a question that implies false belief). This last question implies a high degree of recursiveness and is answered correctly by

the children at around six and a half years of age (Rivière and Nuñez 1996).

9.
The Theory of Mind is directly related to declarative language skills which are in turn related to pragmatic skills **(True).**
Feedback: In conclusion we can say that the mind can be understood as a construct that is itself representational. Therefore, having a mind is equivalent to having representations and attributing mind implies attributing representations to others. Thus, the intentional recursiveness of subjects uses language on many occasions to try to modify the mental worlds of others. From this approach, Theory of Mind would be directly related to the pragmatic skills that allow forms of interaction and communication from a declarative function (Rivière and Nuñez, 1996; Happé, 1998). This capacity can be understood as an ability or set of cognitive abilities that will allow the development of interaction and communication processes between human beings and facilitate the development of adaptive behaviours to the environment according to their acquisition dynamics.

10.
Development of the Theory of Mind is affected in various problems such as Autism Spectrum Disorder, severe or profound hearing impairments, intellectual disability, and some behavioural problems such as ADHD **(True).**
Feedback: Development of the Theory of Mind is affected in various problems such as Autism Spectrum Disorder, severe or profound hearing impairments, intellectual disability, and some behavioural problems such as ADHD.

Crosswords

Level 1

Question: object permanence is acquired during the ... period
Answer: sensorimotor

Question: the construction of invariants is developed during the ... period
Answer: preoperational

Question: object identity implies relationships of ... dependency
Answer: functional

Question: the mind can be defined as a set of desires, beliefs, emotions, and
Answer: intentions

Question: the ability to have representations about representations is called
Answer: Meta-representation

Level 2

Question: what concept is the Theory of Mind particularly associated with
Answer: language

Question: at what age (in years) is the first time there is tacit deception
Answer: three

Question: second order Theory of Mind is particularly associated with the skill of
Answer: recursiveness

Question: first order Theory of Mind is directly linked to ... belief
Answer: false

Question: second order theory of Mind is directly linked to ... belief
Answer: true

Level 3

Question: Theory of Mind is related to ... skills
Answer: pragmatic

Question: Theory of Mind would be related to the ... function
Answer: declarative

Question: during the preoperational period, the child can represent by means of
Answer: signifiers

Question: during the preoperational period, the child uses language to self-regulate their own ...
Answer: behaviour

Question: during the preoperational period, the child finds it difficult to do processes of ...
Answer: generalization

4.8.
Evaluation procedures

What to evaluate?

The materials presented here about neuropsychology in early ages can be used in regulated or unregulated learning processes, i.e. they can be used in teaching university students studying for official qualifications or for educational activities that are not aimed at official certification. In either case, the assessment of both conceptual and procedural competences is essential. These assessments may be external, done by those responsible for the training activity, internal, by the learners themselves (**self-assessment**), or both (**combined assessment**).

How to evaluate?

There are various forms of evaluation related to quantitative and qualitative procedures. Both are necessary and currently the most innovative pedagogical methods use both within so-called mixed evaluation methods (Saiz, School, and Rodríguez-Medina, 2019). Therefore, both will be used in this work. The evaluation rubrics for learners' skills are provided in Appendix 1. They provide quantitative and qualitative evaluation criteria.

When to evaluate?

Research in evaluation and educational didactics (Saiz, Escolar, and Rodríguez-Medina, 2019) recommends the use of three assessment timepoints: before the start of the training activity, during the activity and after completion of the activity. These evaluation records will provide information about the learners' progress (**summative evaluation**) and the progression of the training throughout the process (**formative evaluation**). Both types of evaluation are necessary and complementary.

Why evaluate?

Learning is evaluated in order to understand how the teaching-learning process occurred and, based on the results, to examine the strengths and weaknesses of the process. This data will provide the teacher and the learner with tools for reflection on their own practice and in the light of that reflection, will allow them to make any necessary improvements within a process of continuous improvement.

The evaluation rubrics are presented in appendix 1. These rubrics were developed following the Bloom Taxonomy for the digital age (for more information click here).

4.9.
Generalization activities

In every learning process it is advisable to include activities that complement those performed during the learning process in order to reinforce the content covered. These activities complement the training and activate the processes of generalization of what has been learned. This drives more effective, secure learning.

Further information

Unit 1. Neuropsychological development and measurement techniques in early ages (0-6 years old)

Benson, J.B., & Haith, M.M. (2008). *Encyclopaedia of infant and early childhood development*. Amsterdam : Elsevier.

de Haan, M., & Martinos, M. (2008). Brain Function. En J.B. Benson & M.M Haith (Eds.), *Encyclopedia of infant and early childhood development* (pp. 225-236). Amsterdam: Elsevier.

Fair, D., & Schlaggar, B L. (2008). Brain Development. En J.B. Benson & M.M Haith (Eds.), *Encyclopedia of infant and early childhood development* (pp. 211-225). Amsterdam : Elsevier.

Fuster, J. Professor of Psychiatry, Emeritus, Distinguished Professor of Cognitive Neuroscience, UCLA Semel Institute for Neuroscience & Human Behavior, School of Medicine, University of California at Los Angeles. http://www.joaquinfuster.com/

Unit 2. Neuropsychological development and implications for children's learning processes ages 0-6 years old. Analysis protocol for disorders.

Bailey, D B., & Gariépy, J.L. (2008). Critical Periods. En J. B. Benson & M.M. Haith (Eds.), *Encyclopedia of infant and early childhood development* (pp. 322-332). Amsterdam: Elsevier.

Campbell, M.L., Hoon, A.H., & Johnston, M.V. (2008). Cerebral Palsy. En J. B. Benson & M.M. Haith (Eds.), *Encyclopedia of infant and early childhood development* (pp. 260-268). Amsterdam: Elsevier.

Fair, D., & Schlaggar, B L. (2008). Brain Development. En J. B. Benson & M.M. Haith (Eds.), *Encyclopedia of infant and early childhood development* (pp. 211-225). Amsterdam: Elsevier.

Johnson, M.H. (2008). Cognitive Neuroscience. En J. B. Benson & M.M. Haith (Eds.), *Encyclopedia of infant and early childhood development* (pp. 309-318). Amsterdam: Elsevier.

Unit 3. Primary and secondary reflexes.

Benson, J.B., & Haith, M.M. (2008). *Encyclopedia of infant and early childhood development*. Amsterdam: Elsevier. Recurso online

Cabrera, M.C.& Sánchez, C. (1987). *La estimulación precoz: un enfoque práctico*. Madrid: Siglo XXI.

Fair, D., & Schlaggar, B L. Brain Development. En J.B. Benson & M.M Haith (Eds.), *Encyclopedia of infant and early childhood development* (pp. 211-225). Amsterdam: Elsevier.

Pedroso, F.S. (2008). Reflexes. En J.B. Benson & M.M. Haith (Eds.), *Encyclopedia of infant and early childhood development* (pp. 11-23). Amsterdam: Elsevier.

Unit 4. Neuropsychological development: recognition of others in ages 0-6 years old.

Benson, J.B., & Haith, M.M. (2008). *Encyclopedia of infant and early childhood development*. Amsterdam: Elsevier.

Campbell, M L., Hoon, A H., & Johnston, M.V. (2008). Cerebral Palsy. En J.B. Benson & M.M Haith (Eds.), *Encyclopedia of infant and early childhood development* (pp. 260-268). Amsterdam: Elsevier.

Fair, D., & Schlaggar, B L. Brain Development. (2008). En J.B. Benson & M.M Haith (eds.), *Encyclopedia of infant and early childhood development* (pp. 211-225). Amsterdam: Elsevier.

Johnson, M.H. (2008). Cognitive Neuroscience. En D. Fair & B.L. Schlaggar (Eds.), *Encyclopedia of infant and early childhood development* (pp. 309-318). Amsterdam: Elsevier.

Robinson, J. (2008). Empathy and Prosocial Behavior. En D. Fair & B.L. Schlaggar (Eds.), *Encyclopedia of infant and early childhood development* (pp. 441-450). Amsterdam: Elsevier.

Unit 5. Creating programs for early stimulation in 0-3 year-olds.

Astington, J.W & Dack, L.A. (2008). Theory of Mind. En D. Fair & B.L. Schlaggar (Eds.), *Encyclopedia of infant and early childhood development* (pp. 343-356). Amsterdam: Elsevier.

Carlson, S.M., & Zelazo, P.D. (2008). Symbolic Thought. En M.M. Haith & J.B. Benson (Eds.), *Encyclopedia of infant and early childhood development* (pp. 288-297). Amsterdam: Elsevier.

Gómez. A., Viguer. P., & Cantero. M.J. (2003). *Intervención Temprana: Desarrollo Óptimo de 0 a 6 años*. Madrid: Pirámide.

Marchesi. A. (1987). *El desarrollo cognitivo y lingüístico de los niños sordos*. Madrid: Alianza.

Polonio-López. B., Castellanos Ortega. M.C., & Viana Moldes. I. (2008). *Terapia Ocupacional en la Infancia: Teoría y Práctica*. Madrid: Panamericana.

Rivière. A. (2000). *Obras escogidas (V. I. V. II y VIII)*. Madrid: Alianza.

Sáiz. M.C., & Román, J.M. (2011). *Estimulación Mentalista en la Primera Infancia*. Madrid: CEPE.

Sáiz. M.C., & Román, J.M. (2012). Estimulación Temprana en una alumna con Síndrome de Down. *Audición y Lenguaje*, *97*, 14-21.

Sáiz. M.C., & Payo, R.J. (2012). *Psicología del desarrollo en la Primera Infancia*. Burgos: Servicio de Publicaciones de la Universidad de Burgos.

Web

Recuperado de http://www.youtube.com/watch?v=_ObogcEJGIM 12 diciembre de 2015

Recuperado de http://www.youtube.com/watch?v=eaevHXkR0Nk 12 diciembre de 2015

Recuperado de http://www.youtube.com/watch?v=BjM89C6k_5o 12 diciembre de 2015

Recuperado de http://www.youtube.com/watch?v=2GPqlNAMWPc 12 diciembre de 2015

Unit 6. Producing programs for early stimulation in 3-6 year-olds.

APA (2014). *Manual diagnóstico y estadístico de los trastornos mentales*. Madrid: panamericana.

Carbonero, M.A., Sáiz, M.C., & Román, J.M. (2013). Effect of a metacognitive training program of mentalist skills. *Psicothema*, *25*(1), 31-37. https://doi10.7334/psicothema2011.192

Carlson, S.M., & Zelazo, P.D. (2008). Symbolic Thought. En M.M. Haith & J.B. Benson (Eds.), *Encyclopedia of infant and early childhood development* (pp. 288-297). Amsterdam: Elsevier.

Sáiz, M.C., Carbonero, M.A., & Flores, V. (2010). Análisis del procesamiento en tareas tradicionalmente cognitivas y de teoría de la mente en niños de 4 y 5 años. *Psicothema*, *22*(4), 772-777.

Sáiz, M.C. (2003). Intervención cognitiva en niños pequeños. En A. Gómez, P. Viguer y M.J Cantero (Eds.), *Intervención Temprana: Desarrollo óptimo de 0 a 6 años* (pp.117-133). Madrid: Pirámide.

Sáiz, M.C. (2017). Análisis de las habilidades proto-mentalistas en el Trastorno del Espectro Autista: una propuesta de evaluación e intervención. *Audición y Lenguaje*, *118*, (VI), 36-54.

Sáiz, M.C., Alonso, J., & Román, J.M. (2010). Desarrollo de "estrategias mentalistas" en niños pequeños: entre la familia y la escuela. En J. Gázquez y M.C Linares (Eds.), *La Convivencia Escolar: Aspectos Psicológicos y Educativos* (pp. 473-480). Granada: GEU.

Sáiz, M.C., & Carbonero, M.A. (2017). Metacognitive Precursors: An Analysis in Children with Different Disabilities. *Brain Science*, *7*(136), 1-14. https://.doi.org/10.3390/brainsci7100136.

Sáiz, M.C., Carbonero, M.A., & Flores, V. (2010). Análisis del procesamiento en tareas tradicionalmente cognitivas y de teoría de la mente en niños de 4 y 5 años. *Psicothema*, *22*(4), 772-777.

Sáiz, M.C., Carbonero, M.Á., & Flores, V. (2014). Precursores de la Teoría de la Mente en niños con discapacidad. *Cadmo*, 25-37. https://doi10.3280/CAD2014-001004.

Sáiz, M.C., Carbonero, M. Á., & Román, J. M. (2012). Investigación y formación de profesorado en el aula: desarrollo de habilidades proto-mentalistas en alumnos de escuela infantil con necesidades educativas especiales. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, *15*(1), 27-36 27.

Sáiz, M.C., Carbonero, M. Á., & Román, J. M. (2014). Aprendizaje de habilidades de autorregulación en niños de 5 a 7 años. *Universitas Psychologica*, *13*(1), 369-380. doi: 10.11144/Javeriana.UPSY13-1.ahan

Sáiz, M.C., & Guijo, V. (2009). Desarrollo de los prerrequisitos de la social cognición en niños de 0-1 año. Internacional Journal of Developmental and *Education Psychology*, *1*(1), 19-27.

Sáiz, M.C., & Guijo, V. (2010). Competencias y estrategias metacognitivas en Educación Infantil: Un camino hacia el desarrollo de procedimientos de Resolución de problemas. *Internacional Journal of Developmental and Education Psychology*, *1*(2), 497-511.

Sáiz, M.C., Flores, V., & Román. (2010). Metacognición y competencia de "aprender a aprender" en Educación Infantil: Una propuesta para facilitar la inclusión. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, *13*(4). 123-130.

Sáiz, M.C., & Payo, R.J. (2012). *Psicología del desarrollo de la Primera Infancia: Un Proyecto Docente adaptado al Espacio Europeo de Educación Superior*. Burgos: Servicio de Publicaciones de la Universidad de Burgos.

Sáiz, M.C., & Román, J.M. (2011a). *Estimulación mentalista en la Primera Infancia*. Madrid: CEPE.

Sáiz, M.C., Román, J.M., (2011b). Entrenamiento metacognitivo y estrategias de Resolución de problemas en niños de 5 a 7 años. *International Journal of Psychological Research*, *4*(2), 9-19.

Sáiz, M.C., & Román, J.M. (2012). Estimulación Temprana en una alumna con Síndrome de Down. *Audición y Lenguaje*, *97*, 14-21.

Section summary

3

Six topic units for learning the concepts of neuropsychology in early ages (0-6 years old)

Conclusions

5

This enrichment intellectual product (01E1) from the European SmartArt project offers university teachers of health sciences materials that have been created by an interdisciplinary group of participating members in the project who belong to research groups. These materials are also implemented on the project website https://srlsmartart.eu/inicio on an open access virtual interactive platform (VLE). The information presented in this document and the VLE and project website will no doubt be of great interest to teachers and students in this knowledge area. Its usefulness will be tested in subsequent studies which will be presented as evaluation reports about its usefulness and will identify improvement opportunities as part of a process of continual improvement.

Bibliographic references

Ausubel, D. P. (1968). *Educational Psychology: A Cognitive View*. New York: Holt, Rinehart and Winston.

Azevedo, R. (2005). Using hypermedia as a metacognitive tool for enhancing student learning? The role of self-Regulated learning. *Educ. Psychol*, *40*, 199–209. https://doi.org/10.1207/s15326985ep4004_2

Azevedo, R., Harley, J., Trevors, G., Duffy, M., Feyzi-Behnagh, R., Bouchet, F., & Landis, R. (2013). Using trace data to examine the complex roles of cognitive, metacognitive, and emotional self-regulatory processes during learning with multi-agent systems. En R. Azevedo & V. Aleven (Eds.), *International handbook of metacognition and learning technologies* (pp. 427-449). Amsterdam: Springer.

Cerezo, R., Sánchez-Santillan, M., Paule-Ruiz, M. P., and Nuñez, J. C. (2016). Students' LMS interaction patterns and their relationship with achievement: a case study in higher education. *Comput. Educ*, *96*, 42–54. https://doi.org/ 10.1016/j.compedu.2016.02.006

Comisión Europea. (2000). ERASMUS+ Guía del programa. Recuperado de http://sepie.es/doc/convocatoria/2020/erasmus_programme_guide_2020_v2_es.pdf

Hattie, J. (2013). Calibration and confidence: Where to next? *Learn Instr*, *24*, 62–66. https://doi.org/10.1016/j.learninstruc.2012.05.009

Hattie, J., and Timperley, H. (2007). The power of feedback. *Rev. Educ. Res*, *77*, 81–112. https://doi.org/10.3102/003465430298487

Kirschner, P.A., Sweller, J., & Clark, R.E. (2006). Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching. *Educational Psychologist*, *41*(2), 75-86. https://doi.org/10.1207/s15326985ep4102_1

Piaget, J. (1975). *L´equilibration des structures cognitives: Problème central du développement*. Paris: PUF.

Oficina de Publicaciones de la Unión Europea (2010). *Proyecto Europa 2030: retos y oportUnites. Informe del Consejo Europeo del Grupo de reflexión sobre el futuro en 2030*. Recuperado de https://www.consilium.europa.eu/media/30761/qc3210249esc.pdf

Sáiz, M.C. (2018). *E-Project Based Learning in occupational therapy: an application in the subject "Estimulación Temprana"*. Burgos: Servicio de Publicaciones de la Universidad de Burgos.

Sáiz, M.C., Cuesta, I.I., Alegre, J.M., & Peñacoba, L. (2017). Effects of Different Types of Rubric-Based Feedback on Learning Outcomes. *Frontiers in Education, 2*(34), 1-12. https://doi.org/10.3389/feduc.2017.00034

Sáiz, M.C., Escolar, M.C., & Arnaiz, Á. (2020). Effectiveness of Blended Learning in Nursing Education. *Int. J. Environ. Res. Public Health*, *17*(5), 1-15. https://doi.org/10.3390/ijerph17051589

Sáiz, M.C., Escolar, M.C., & Rodríguez-Medina. (2019). *Investigación cualitativa. Aplicación de métodos mixtos y de técnicas de minería de datos*. Burgos: Servicio de Publicaciones de la Universidad de Burgos

Sáiz, M.C., García-Osorio, C.I., Díez-Pastor, J.F., Martín-Antón, L.J. (2019). Will personalized e-Learning increase deep Learning in Higher Education? *Discovery and Delivery Information*, *47*(1), 53-63. https://doi.org/10.1108/IDD-08-2018-0039

Sáiz, M.C., García-Osorio, C.I., & Díez-Pastor. (2019). Differential efficacy of the resources used in B-Learning environments. *Psicothema*, *31*(2), 170-178. https://doi.org/10.7334/psicothema2018.330

Sáiz, M.C., Queiruga-Dios, M.Á., García-Osorio, C.I., Montero, E., Rodríguez, J. (2019). Observation of Metacognitive Skills in Natural Environments: A Longitudinal Study With Mixed Methods. *Frontiers in Psychology*, *10*(2398), 1-13. https://doi.org/10.3389/fpsyg.2019.02398

Sáiz, M.C., Marticorena, R., & Garcia-Osorio, C.I. (2020). Monitoring Students at the University: Design and Application of a Moodle Plugin. *Applied Science*, *10*(10), 1-18. https://doi.org/10.3390/app10103469

Sáiz, M.C., Marticorena, R., García-Osorio, C.I., & Díez-Pastor, J.F. (2017). How Do B-Learning and Learning Patterns Influence Learning Outcomes? *Frontiers in Psychology*, *8*(745), 1-13. https://doi.org/10.3389/fpsyg.2017.00745

Sáiz, M.C., Marticorena, R., Garcia-Osorio, C.I., & Díez-Pastor, J.F. (2019). Differential efficacy of the resources used in B-Learning environments. *Psicothema*, *31*(2), 170-178. https://doi.org/10.7334/psicothema2018.330

Sáiz, M.C., Marticorena, R., Garcia-Osorio, C.I., & Díez-Pastor, J.F. (2019). Does the use of Learning Management Systems with Hypermedia mean improved student learning outcomes? *Frontiers in Psychology*, *10*(88), 1-14. https://doi.org/10.3389/fpsyg.2019.00088

Sáiz, M.C., Queiruga-Dios, M.Á., García-Osorio, C.I., Montero, E., Rodríguez, J. (2019). Observation of Metacognitive Skills in Natural Environments: A Longitudinal Study With Mixed Methods. *Frontiers in Psychology*, *10*(2398), 1-13. https://doi.org/10.3389/fpsyg.2019.02398

Sáiz, M.C., Rodríguez, J.J., Marticorena, R., Zaparaín, M.J., & Cerezo, R. (2020). Lifelong Learning from Sustainable Education: An Analysis with Eye Tracking and Data Mining Techniques. *Sustainability*, *12*(5), 1970, 1-18. https://doi.org/10.3390/su12051970

Vygotsky, L. (1962). *Thought and Language*. New York: John Wiley.

Taub, M., & Azevedo, R. (2019). How does prior knowledge influence eye fixations and sequences of cognitive and metacognitive SRL processes during learning with an intelligent tutoring system? *Int. J. Artif. Intell. Educ*, *29*, 1–28.

Zimmerman, B.J., & Moylan, A. (2009). Self-regulation: Where metacognition and motivation intersect. En Hacker, D.J., Graesser, A.C., Eds.), *Handbook Metacognition Educ* (pp. 299–315). New York, NY, USA: Routledge.

Image references

Unit 1.

Image 1. https://bit.ly/3k58THH
Image 2. https://bit.ly/3giLKAx
Image 3. https://bit.ly/3mmr7Hz
Image 4. https://bit.ly/3k6ND4b
Image 5. https://bit.ly/2Wa8Ou4
Image 6. https://bit.ly/3z73k1G
Image 7. https://bit.ly/3D24m19
Image 8. https://bit.ly/3k6psDc
Image 9. https://bit.ly/3iWcU1H
Image 10. https://bit.ly/37TOuzL
Image 11. https://bit.ly/3j28YwE
Image 12. https://bit.ly/3yWLn5T
Image 13. https://bit.ly/3y0X8XJ
Image 14. https://bit.ly/3sAfw8D
Image 15. https://bit.ly/3gh5EeZ
Image 17. https://bit.ly/3gfTC5R
Image 18. https://bit.ly/3koWdvB
Image 19. https://bit.ly/3z1oxKh
Image 20. https://bit.ly/3y3ViFv
Image 21. https://bit.ly/37Wlwz1
Image 22. https://bit.ly/3j1WBAu
Image 23. https://bit.ly/3ARXcLh
Image 24. https://bit.ly/3DbynvQ
Image 25. https://bit.ly/3j2FzT0
Image 26. https://bit.ly/3D34I83
Image 27. https://bit.ly/3k6PLZJ
Image 29. https://bit.ly/3iYMjRx
Image 30. https://bit.ly/3yc278d
Image 31. https://bit.ly/3zejxSA
Image 32. https://bit.ly/3kbjctG

Unit 2.

Image 1. https://bit.ly/3AYrOdQ
Image 3. https://bit.ly/3AMALqO
Image 4. https://bit.ly/3kcp9H3
Image 5. https://bit.ly/3kanH7Q
Image 6. https://bit.ly/3koY8jN
Image 7. https://bit.ly/3st6tq8
Image 8. https://bit.ly/3D18O0s

Unit 3.

Image 1. https://bit.ly/3AVjWtP
Image 2. https://bit.ly/37XnVto
Image 3. https://bit.ly/2UzdwkA
Image 5. https://bit.ly/37UWGzJ
Image 6. https://bit.ly/3sEgykc
Image 7. https://bit.ly/2W8WxFY
Image 8. https://bit.ly/2XwxkpK
Image 9. https://bit.ly/3xZ06vF
Image 10. https://bit.ly/3CXX2no
Image 11. https://bit.ly/3sv43at
Image 12. https://bit.ly/3y0ZYMn
Image 13. https://bit.ly/3y7xaly
Image 14. https://bit.ly/3D18yOV
Image 15. https://bit.ly/3meywZl
Image 16. https://bit.ly/3yc3TpT
Image 17. https://bit.ly/3j0bvXQ

Unit 4.

Image 1. https://bit.ly/3mdiXkF
Image 2. https://bit.ly/2W8h9yG
Image 3. https://bit.ly/3suk2Wp
Image 4. https://bit.ly/3swCZHJ
Image 5. https://bit.ly/2XHqf5W
Image 6. https://bit.ly/3yc4qbn

Unit 5.

Image 1. https://bit.ly/2W8GKXK
Image 2. https://bit.ly/2WcW7Pg
Image 3. https://bit.ly/2WadZKw
Image 4. https://bit.ly/3z18L2b
Image 5. https://bit.ly/3gA0rPV
Image 6. https://bit.ly/2XGYNFt
Image 7. https://bit.ly/3y4E8Ye
Image 8. https://bit.ly/3y5MSgO
Image 9. https://bit.ly/3mhODWa
Image 10. https://bit.ly/2W6k3DW
Image 11. https://bit.ly/2UvN9vM
Image 12. https://bit.ly/2XwyQYY
Image 13. https://bit.ly/3k7BYCh
Image 14. https://bit.ly/3mhP8Q2
Image 15. https://bit.ly/3kccp35
Image 16. https://bit.ly/3ghwAeO
Image 17. https://bit.ly/2Waf19m
Image 18. https://bit.ly/2W23dWx
Image 19. https://bit.ly/3D4d0fA
Image 20. https://bit.ly/3z3PRaL
Image 21. https://bit.ly/3mli8pR
Image 22. https://bit.ly/3xWDegl
Image 23. https://bit.ly/3AV6E0h
Image 24. https://bit.ly/3kcdd87
Image 25. https://bit.ly/3B13VCN
Image 26. https://bit.ly/3syCjBD
Image 27. https://bit.ly/3k7oczJ
Image 28. https://bit.ly/3kbataS
Image 29. https://bit.ly/3CVbkoV
Image 30. https://bit.ly/3AQ5kf2
Image 31. https://bit.ly/3CZd28L
Image 35. https://bit.ly/3kp1OlB
Image 36. https://bit.ly/3D1p1CI

Unit 6.

Image 1. https://bit.ly/3CY1UZI
Image 2. https://bit.ly/3CX6d7L
Image 3. https://bit.ly/3gg1KTV
Image 4. https://bit.ly/3xYxItH
Image 5. https://bit.ly/2WaikNO
Image 6. https://bit.ly/2XH3cZ1
Image 7. https://bit.ly/3swZzAa
Image 8. https://bit.ly/3k5ikqB
Image 9. https://bit.ly/3k5ijTz
Image 10. https://bit.ly/3su8hzb
Image 11. https://bit.ly/2W7mJ4l
Image 12. https://bit.ly/2UvRj6S

Appendix 1

Evaluation rubrics

COMPETENCIES	EVALUATION CRITERIA
CONCEPTUAL Explain the most important milestones in child development between 0-6 years old.	- Identify the most important characteristics and elements of development in ages 0-6 years. - Recognize the vocabulary relevant to the subject. - Differentiate the characteristics and elements making up the most important development milestones between ages 0-6 years.
PROCEDURAL Know how to apply the most important child development milestones in ages 0-6 years.	- Compare the characteristics of development between 0-3 years old and 3-6 years - Generalize the most important development characteristics in ages 0-6 years.
ATTITUDINAL Promote primary and secondary prevention in early ages	- Make proposals for prevention programs in ages 0-3 and 0-6 years..

EVALUATION CRITERIA	CLEARLY INSUFFICIENT	NOT ACCEPTABLE	GOOD	VERY GOOD	EXCELLENT
	0	1-2	3	4	5
Explain current techniques for measuring neuropsychological development in ages 0-6 years.	Identify the characteristics and elements (less than 30%) making up neuropsychological development in ages 0-6 years.	Identify the characteristics and elements (30-39%) making up neuropsychological development in ages 0-6 years.	Identify the characteristics and elements (40-59%) making up neuropsychological development in ages 0-6 years.	Identify the characteristics and elements (60-79%) making up neuropsychological development in ages 0-6 years.	Identify the characteristics and elements (80-100%) making up neuropsychological development in ages 0-6 years.
	0	1-2	3	4	5
Explain the relationship between neurological development and the learning process in ages 0-6 years.	There are significant errors in recognizing the vocabulary of the topic and the subject.	Does not fully or clearly recognize the subject or topic vocabulary.	Clearly recognizes the subject and topic vocabulary without significant mistakes.	Clearly recognizes the subject and topic vocabulary.	Clearly and fully recognizes the subject and topic vocabulary.
	0	1-2	3	4	5
Analyse neuropsychological development in various developmental disorders in ages 0-6 years.	Does not differentiate (less than 30%) of the characteristics and elements making up neuropsychological development in various developmental disorders in ages 0-6 years, which makes even the simplest examples hard to recognize.	Differentiates (39-40%) the characteristics and elements making up neuropsychological development in various developmental disorders in ages 0-6 years, which makes them hard to recognize.	Differentiates (40-59%) the characteristics and elements making up neuropsychological development in various developmental disorders in ages 0-6 years, allowing them to recognize basic examples.	Clearly differentiates (60-79%) the characteristics and elements making up neuropsychological development in various developmental disorders in ages 0-6 years, recognizing them without significant issues.	Clearly differentiates (60-79%) the characteristics and elements making up neuropsychological development in various developmental disorders in ages 0-6 years, recognizing them without significant issues.

EVALUATION CRITERIA	CLEARLY INSUFFICIENT	NOT ACCEPTABLE	GOOD	VERY GOOD	EXCELLENT
	0	1-2	3	4	5
Analyse the knowledge acquired about neuropsychological development and the learning process in ages 0-6 years.	There are significant errors when comparing the characteristics and elements comprising neuropsychological development and the learning process in ages 0-6 years which indicate notable gaps in understanding of the subject.	There are significant errors when comparing the characteristics and elements comprising neuropsychological development and the learning process in ages 0-6 years.	Compares the characteristics and elements comprising neuropsychological development and the learning process in ages 0-6 years with minor errors.	Clearly compares the characteristics and elements comprising neuropsychological development and the learning process in ages 0-6 years.	Clearly and accurately compares the characteristics and elements comprising neuropsychological development and the learning process in ages 0-6 years, including more complex examples.
	0	1-2	3	4	5
Summarize the development of primary and secondary reflexes in the first and second years of life and the implications for development: consequences of disorders.	Cannot generalize the characteristics and elements that make up the development of primary and secondary reflexes in the first and second years of life and their implications for development: consequences of disorders, there are significant errors.	Cannot generalize the characteristics and elements that make up the development of primary and secondary reflexes in the first and second years of life and their implications for development: consequences of disorders, there are some notable errors.	Generalizes the characteristics and elements that make up the development of primary and secondary reflexes in the first and second years of life and their implications for development: consequences of disorders, there are some minor errors.	Generalizes the characteristics and elements that make up the development of primary and secondary reflexes in the first and second years of life and their implications for development: consequences of disorders. Extracts common references clearly and accurately.	Generalizes the characteristics and elements that make up the development of primary and secondary reflexes in the first and second years of life and their implications for development: consequences of disorders. Extracts common references clearly, accurately and fully, with coherent, logical explanation.
	0	1-2	3	4	5
Analyse neuropsychological development in recognition of others in ages 0-6 years and the implications in development: consequences of disorders.	Classifies the characteristics of neuropsychological development in recognition of others in ages 0-6 years and the implications in development: consequences of disorders (less than 30%) according to given categories.	Classifies the characteristics of neuropsychological development in recognition of others in ages 0-6 years and the implications in development: consequences of disorders (30-39%) according to given categories.	Classifies the characteristics of neuropsychological development in recognition of others in ages 0-6 years and the implications in development: consequences of disorders (40-59%) according to given categories.	Classifies the characteristics of neuropsychological development in recognition of others in ages 0-6 years and the implications in development: consequences of disorders (60-79%) according to given categories.	Classifies the characteristics of neuropsychological development in recognition of others in ages 0-6 years and the implications in development: consequences of disorders (80-100%) according to given categories.

EVALUATION CRITERIA	CLEARLY INSUFFICIENT	NOT ACCEPTABLE	GOOD	VERY GOOD	EXCELLENT
	0	1-2	3	4	5
Design early stimulation programs for 0-3 year-olds: Precursors of the Theory of Mind.	Does not produce early stimulation programs for 0-3 year-olds: Precursors of the Theory of Mind. Significant errors in the approach to the design.	Starts to create early stimulation programs for 0-3 year-olds: Precursors of the Theory of Mind, there are some significant errors.	Starts to create early stimulation programs for 0-3 year-olds: Precursors of the Theory of Mind, there are some minor errors.	Starts to create early stimulation programs for 0-3 year-olds: Precursors of the Theory of Mind, with a clear plan.	Starts to create early stimulation programs for 0-3 year-olds: Precursors of the Theory of Mind, including particularly complex cases.
	0	1-2	3	4	5
Design early stimulation programs for 3-6 year-olds:	Does not produce early stimulation programs for 3-6 year-olds. Significant errors in the approach to the design	Starts to create early stimulation programs for 3-6 year-olds, there are some significant errors.	Starts to create early stimulation programs for 3-6 year-olds, there are some minor errors.	Starts to create early stimulation programs for 3-6 year-olds, with a clear plan.	Starts to create early stimulation programs for 3-6 year-olds, including particularly complex cases.

Appendix 2

Self-assessment instruments for the concepts and procedures learned

See instruments for evaluating knowledge from the six teaching units.

Appendix 3

Instruments for assessing satisfaction with the teaching-learning process

Record sheet

for assessment of competencies in topics on neuropsychological development in ages 0-6 years

TYPE OF ACTIVITY	
CITY	
COUNTRY	

Evaluation criteria are measured on a Likert-type scale from 1 to 5 where 1 means not competent at all and 5 means fully competent.

EVALUATION CRITERIA	RATING SCALE					OBSERVATIONS
1. Explain current techniques for measuring neuropsychological development in ages 0-6 years.	1	2	3	4	5	
2. Explain the relationship between neurological development and the learning process in ages 0-6 years.	1	2	3	4	5	
3. Analyse neuropsychological development in various developmental disorders in ages 0-6 years.	1	2	3	4	5	
4. Analyse the knowledge acquired about neuropsychological development and the learning process in ages 0-6 years.	1	2	3	4	5	
5. Summarize the development of primary and secondary reflexes in the first and second years of life and the implications for development: consequences of disorders.	1	2	3	4	5	
6. Analyse neuropsychological development in recognition of others in ages 0-6 years and the implications in development: consequences of disorders.	1	2	3	4	5	
7. Design early stimulation programs for 0-3 year-olds: Precursors of the Theory of Mind.	1	2	3	4	5	
8. Design early stimulation programs for 3-6 year-olds	1	2	3	4	5	

Satisfaction questionnaire

for the topic units on neuropsychological development in ages 0-6 years

TYPE OF ACTIVITY	
CITY	
COUNTRY	

The closed questions use a Likert-type scale from 1 to 5 where 1 means not at all and 5 means completely.

ASSESSMENT CRITERIA	RATING SCALE				
1. In your opinion, the course objectives were clear.	1	2	3	4	5
2. In your opinion, the concepts covered in the course were clear.	1	2	3	4	5
3. In your opinion, the gamification activities helped you to understand the theoretical concepts.	1	2	3	4	5
4. The feedback from the avatar was accurate.	1	2	3	4	5
5. The expectations you had when you signed up to this course were met.	1	2	3	4	5
6. In your opinion, the use of the VLE virtual platform helped in the learning process.	1	2	3	4	5
7. Your overall level of satisfaction with the activities.	1	2	3	4	5
8. Would you recommend these activities.	1	2	3	4	5
9. Do you think any of the topics about neuropsychological development between the ages of 0 and 6 years old should be removed? Why?					
10. Do you think any additional elements about neuropsychological development between the ages of 0 and 6 years old should be added? Why?					

Glossary

Glosario

Generalization activities: These are learning activities that have a similar structure to the activities that have served as the basis for learning, at varying degrees of difficulty.

Advanced Learning Technologies: a methodology that is based on learning using Technology 4.0 resources.

Lifelong learning: refers to the acquisition of knowledge throughout one's life, regulated or unregulated.

Self-regulated learning: a methodology that facilitates learning from personal or technological resources that guide the learner during the learning process.

Project-Based Learning: a learning methodology that focuses on learning development from the resolution of a task, problem, or project. It is collaborative and involves the implementation of theoretical knowledge applied to the resolution of a practical task.

Effective learning: achieving secure, deep, continuous learning over time, which is also correct.

Personalized learning: a learning design based on adaptation of content to learners' characteristics in terms of learning style and previous knowledge of the subject matter.

Significant learning: Focuses on the acquisition of knowledge based on the construction of learning and not simply on memorization.

Avatar: an animated figure that guides the learning process.

Self-assessment: In learning environments this is the assessment that the learner performs about process and product of their own learning.

b-Learning: learning that is done in virtual environments or platforms in combination with face-to-face learning spaces.

Non-regulated education: education that is not aimed at obtaining official qualifications which may be used professionally.

Regulated education: education that is aimed at obtaining official qualifications which may be used professionally.

Sustainable education: Refers to the planning of personal and material resources from the principles of non-duplication and optimization.

Continuous evaluation: systematic evaluation based on an evaluation of the learning process and not just the product.

Formative assessment: a type of systematic evaluation in which the teacher gives feedback to the learner on every relevant aspect of their learning process.

Summative assessment: the feedback the teacher gives the learner about the final product of the learning.

Process-oriented feedback: feedback that the teacher or learning manager gives the learner about how the task was done focusing on information about the entire learning process (start-development-final) and not just about the product or end result.

Gamification: a learning methodology based on the use of serious games in learning a task, usually done in technological environments.

Digitizing tools: resources based on learning techniques based on using new technologies to present tasks via multiple channels (visual, auditory, text or interaction between all of them).

Heteroevaluation: evaluation of a learning process or product by different personal or technological agents.

Social inclusion: providing resources that allow access to standardized learning environments to different people regardless of their personal and social educational needs.

Interdisciplinary: collaborative work teams composed of professionals from different disciplines. Produces a much more complete product that is suitable for its social application**.**

Learning Management System: learning managers implemented through interactive and modular learning platforms such as the Moodle environment.

Motivation: Refers to the student's interest in the learning process and the achievement of satisfactory results, it is related to intrinsic motivation based on self-effort.

Teaching-learning process: the interactive process between the teacher and the learner throughout the teaching. This process can be in-person or non-in-person via technological resources.

Evaluation rubrics: an evaluation methodology based on the establishment of evaluation criteria for the competencies to be acquired by the learner. Competencies are measured using a scale that can be quantitative, qualitative or both.

Self-Regulated Learning: a learning methodology based on the personalized construction of learning through self-regulated resources whether human, technological, or both.

Bloom Taxonomy for the Digital Age: based on Bloom's original classification of varying degrees of learning in relation to the development of cognitive and metacognitive competencies that include learning terms of the digital age.

Smart Tutoring: involves a personalized tutoring process through the use of technological resources.

Virtual Learning Environment: learning managers or LMS.

Abreviaturas

PBL = Project-Based Learning
ALT = Advanced Learning Technologies
LMS = Learning Management System
SRL = Self-Regulated Learning
SmartArt = Self-Regulated Learning in SmartArt
VLE = Virtual Learning Environment