

**Biological Changes during the Vital Cycle:
Implications for Speech Therapy**

Code: 101703
ECTS Credits: 6

Degree	Type	Year	Semester
2500893 Speech therapy	OB	2	1

Contact

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Teaching groups languages

You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

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Prerequisites

There are no official prerequisites for this subject. However, it is recommended that students have passed the subjects of the first course "*Anatomy and physiology of the voice and speech organs (101701)*" and "*Anatomy and physiology of the nervous system (101700)*".

Objectives and Contextualisation

This course is taught during the first semester of the second year, after having studied in the first year, the subjects "*Anatomy and physiology of the voice and speech organs (101701)*" and "*Anatomy and physiology of the nervous system (101700)*" that cover the different relevant systems in a situation of normality.

The subject "Biological changes during the life cycle: implications for speech therapy" aims for students to acquire basic learning of the processes and mechanisms of development, growth and human body changes along the life cycle (from the embryonic period to old age). Particular emphasis is placed on those systems which are relevant for speech therapists, such as the nervous system and organs related to speech, voice, hearing and swallowing.

The course is divided into two modules: the first refers to the prenatal period and the second to the postnatal period.

LEARNING OBJECTIVES

Module 1: Prenatal period

- Describe the development of male and female gametes, and explain the process of fertilization
- Describe the genetic control of development. Enumerate the phases of human prenatal development.
- Describe the most significant changes in each of the stages of human prenatal development. Classify specimens according to fetal and embryonic stages of development.
- Identify the germ layers and relate them to their derivatives
- Describe the most significant features of development and fetal behavior
- Explain in chronological order the development of the nervous system
- Explain the changes that lead to the structuring of the neural tube and the characteristics of the brain vesicles and the spinal cord
- Describe the embryonic origin of the ear and its main malformations
- Explain the processes that lead to the formation of the face from the different primordia that constitute the face.
- Explain the mechanisms of development that lead to the formation of the anatomical elements that constitute the phonatory apparatus (mouth, lips, soft and hard palate, nostrils, pharynx, larynx, trachea, bronchi and lungs)
- Relate birth defects (affecting the main processes and structures studied during the course) with the alteration of the causal developmental mechanisms.
- Describe the development of the pharyngeal apparatus and its derivatives
- Apply knowledge to the interpretation of symptoms and signs of common congenital and developmental abnormalities

Module 2: Postnatal period

- Describe the physiological condition according to the degree of maturity of the different systems of the human body, in particular the nervous system and the organs involved in voice and speech, at the different stages of the life cycle.
- Understand the different forms of intercellular communication that allow growth and maturation of the organism.
- Understand the role of the endocrine system, identify and describe the mechanism of action of the different hormones that are involved in postnatal growth and maturation of the body.
- Describe the events that mark the neural development after birth, such as synaptic plasticity, synaptogenesis, and myelination.
- Describe the sensori-motor changes occurring during postnatal development and ageing.
- Describe the variations in brain development and higher functions throughout postnatal development, adolescence and aging.
- Describe the factors that govern body maturation during infancy and adolescence periods
- Identify the normal evolution of the voice, and the differences by sex and age.
- Analyze and categorize the functional changes that occur during growth and aging in the organs of voice and speech.
- Assess and determine the factors involved in the postnatal growth of the larynx and the speech organs and the resulting functional changes.

Justification:

This subject provides the student of speech therapy with the basic knowledge about the biological changes that occur throughout the life in the organs and systems of the body. Knowing the stages of normal development will serve to define the baseline framework to assess the person's situation and progress, establish a rigorous differential diagnosis, and plan the most optimal treatment.

The function of the organs related to speech, voice, hearing and swallowing is heavily influenced by the history of the person, i.e. the genetic and environmental factors that shape their anatomy, the development of the necessary connections with the nervous system, and the learning and training of the function during the life. In

many occasions, abnormal development of embryo, altered growth of the child or biological changes at later ages may lead to important problems requiring logopedic interventions. Therefore, by knowing how the individual has been transformed during the different periods of life, we can correctly identify the biological situation of these structures and determine the goal and efficacy of the therapy.

For this purpose, the course is dedicated to offer the student of speech therapy the tools to understand the evolution of a subject from conception to death so the student will be able to recognize normality and identify more accurately pathological situations. The course is divided in two modules: prenatal and postnatal, which deal with the molecular, cellular and physiological mechanisms occurring before and after birth, respectively. Fundamental concepts on cell biology and genetics will be reviewed at the beginning of the course for better understanding of embryonic and fetal development mechanisms.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Adapt to new situations.
- Analyse and synthesise information.
- Demonstrate an understanding of disorders in communication, language, speech, hearing, voice and non-verbal oral functions.
- Evaluate the scientific production that supports speech therapists' professional development.
- Express oneself fluently, coherently and suitably following established norms, both orally and in writing.
- Innovate in the methods and processes of this area of knowledge in response to the needs and wishes of society.
- Integrate the foundations of biology (anatomy and physiology), psychology (evolutionary processes and development), language and teaching as these relate to speech-therapy intervention in communication, language, speech, hearing, voice and non-verbal oral functions.
- Managing communication and information technologies.
- Master the terminology that facilitates effective interaction with other professionals.
- Organise and plan with the aim of establishing a plan for development within a set period.
- Students can apply the knowledge to their own work or vocation in a professional manner and have the powers generally demonstrated by preparing and defending arguments and solving problems within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must develop the necessary learning skills in order to undertake further training with a high degree of autonomy.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Understand, integrate and relate new knowledge deriving from autonomous learning.

Learning Outcomes

1. Adapt to new situations.
2. Analyse a situation and identify points for improvement.
3. Analyse and synthesise.
4. Analyse the indicators of sustainability of academic and professional activities in the areas of knowledge, integrating social, economic and/or environmental dimensions.

5. Analyse the sex- or gender-based inequalities and the gender biases present in one's own area of knowledge.
6. Communicate in an inclusive manner avoiding the use of sexist or discriminatory language.
7. Correctly use the principal terms in anatomy, embryology, teratology, physiology, biology, genetics and gerontology.
8. Critically analyse the principles, values and procedures that govern the exercise of the profession.
9. Explain the explicit or implicit code of practice of one's own area of knowledge.
10. Explain the relationship of various speech-therapy pathologies with certain disorders in the development of the nervous system and the organs of speech, voice and hearing.
11. Express oneself fluently, coherently and suitably following established norms, both orally and in writing.
12. Identify and describe the main processes occurring during postnatal development, maturation and aging in the nervous system and in the speech, voice and deglutition organs.
13. Identify and describe the main stages and processes that occur in the embryo and fetus during normal development of the nervous system and speech, voice and deglutition organs, as well as their regulation.
14. Identify situations in which a change or improvement is needed.
15. Identify the main changes throughout life in language, speech, voice, hearing and deglutition demonstrate knowledge of their biological bases.
16. Managing communication and information technologies.
17. Organise and plan with the aim of establishing a plan for development within a set period.
18. Propose new experience-based methods or alternative solutions.
19. Propose projects and actions that are in accordance with the principles of ethical responsibility and respect for fundamental rights and obligations, diversity and democratic values.
20. Propose ways to evaluate projects and actions for improving sustainability.
21. Students can apply the knowledge to their own work or vocation in a professional manner and have the powers generally demonstrated by preparing and defending arguments and solving problems within their area of study.
22. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
23. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
24. Students must develop the necessary learning skills in order to undertake further training with a high degree of autonomy.
25. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
26. Synthetically explain the objectives, methodology, main results and discussion of scientific articles on the development, maturation and aging of the nervous system and of the organs related to language, speech, voice and deglutition.
27. Understand, integrate and relate new knowledge deriving from autonomous learning.

Content

MODULE 1- PRENATAL DEVELOPMENT

Lectures: This block has 12 sessions of 1.5h (4 of biology and 8 of embryology) covering the following topics:

Unit 1. Cellular division: Mitosis, meiosis, spermatogenesis, oogenesis and fertilization.

Unit 2. Cellular mechanisms of development: cell growth, determination and differentiation of the cell, cell proliferation, apoptosis (programmed cell death), cell migration, regulation and intensification of transcription during development and intercellular communications.

Unit 3. Genetic control of development: general characteristics and examples of implicated genes: transcription factors- Genes HOX and PAX; signal molecules- SHH.

Unit 4. First week of gestation: cleavage divisions and the migration of the embryo through the Fallopian tube, the blastocyst.

Unit 5. Second week of gestation: implantation, bilaminar embryonic disc, formation and fate of the embryonic layers. Abnormalities

Unit 6. Third week of gestation: gastrulation (embryonic disc, primitive streak, primitive node), notochord, trilaminar embryo. Derivates of the germ layers.

Unit 7. The fourth to eighth week. Embryo folding. Organogenesis.

Unit 8. Fetal development

Unit 9. Development of the nervous system: neurulation, reorganization of the neural tube, early brain structure. Central nervous system malformations

Unit 10.- Development of the pharyngeal apparatus: pharyngeal grooves, pharyngeal arches, pharyngeal pouches.

Unit 11.- Development of the face: nose and nasal cavity, oral cavity, palate and tongue. Main malformations.

Unit 12.- Development of the eyes: optic vesicles, optic cup and lens placode. Main malformations.

Unit 13. Development of the ears: inner ear, middle ear and outer ear. Malformations that affect hearing loss

Unit 14.- Development of respiratory system: upper respiratory tract and lower respiratory tract, lung development stages. Malformations of the larynx.

Seminars: In this learning activity the students will be divided into small groups to promote interaction with the teaching staff.

Sem.1- Genetics: Students will work in groups looking for information on genetic diseases involved in the malformations of the speech, voice and hearing organs. At the beginning or the end of the seminar, students will have to answer an EV2 exam. In addition, each group of students will have to present a summary of their conclusions (EV4).

Sem 2- Early embryonic development: Students will work in small groups to reinforce the theoretical content. At the beginning or the end of the seminar, the students will have to answer an exam corresponding to EV3.

Sem 3.- Organogenesis: Students will work in small groups to reinforce the theoretical content. At the beginning or the end of the seminar, the students will have to answer an exam corresponding to EV3.

Sem 4.- Anomalies in the development of the prenatal period: Students will work in small groups to reinforce the theoretical content. At the beginning or the end of the seminar, the students will have to answer an exam corresponding to EV3.

MODULE 2 - POSTNATAL PERIOD

Lectures: This block has 9 sessions covering the following topics:

Unit 15. General concepts on growth and postnatal development: Differences between growth and development, factors that influence growth, measurement and assessment of growth.

Unit 16. Physiology of growth: The physiological process of growth, homeostasis and feedback systems.

Unit 17. Hormonal regulation of growth: Hormonal control of somatic growth, types of hormones and classification, growth hormone (GH), thyroid hormones and their involvement in postnatal development.

Unit 18. Growth and development of the nervous system: Neuronal regeneration and compensatory mechanisms, synaptogenesis, neural plasticity and myelination during life.

Unit 19. Growth and development after birth: Physiological adaptation to the birth process, cardiorespiratory changes at birth, swallowing function during the first year of life, neurological development and the speech function after birth and later years.

Unit 20. Biological changes during adolescence: Sexual hormones, puberty and adolescence, development during adolescence, maturation of the oropharynx and larynx during adolescence, physiological changes of speech during adolescence.

Unit 21. Maturation and development of the voice and speech function during adulthood: physiological changes of voice and speech, environmental-related and other common variations of the normal voice function.

Unit 22. Biological changes during ageing: the ageing process, physiological, molecular and cellular changes of ageing.

Unit 23. Ageing of organs and systems: ageing of the cardiorespiratory system, ageing of the nervous system, ageing of the language and speech function.

Seminar: Students have a seminar consisting of a group oral presentation and interactive discussion

Sem 5.- Changes in voice, swallowing, speech, and language during the postnatal period.

Methodology

Lectures: Systemized lectures on subject topics, emphasizing those concepts related to speech therapy practice. Students acquire the basic scientific knowledge of the subject by attending theory classes, which must be complemented by personal and independent study. Each lecture lasts 1.5 hours.

Seminars: The knowledge acquired in the lectures and self-study will be applied to solve clinical cases. The seminars involve active student work in small groups supervised by the teacher.

Virtual classroom: The virtual classroom (*Campus Virtual*) will encourage continuous learning of the students through the exchange of relevant scientific articles, videos, links, etc., and discussions.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	31.5	1.26	27, 10, 15, 7
Seminars	14	0.56	1, 27, 26, 10, 11, 12, 13, 15, 17, 7, 16
Type: Supervised			
Tutorials in person and virtual	6	0.24	27, 26, 10, 12, 13, 15, 17
Type: Autonomous			
Drafting of works	15	0.6	26, 10, 11, 12, 13, 15, 7
Evaluation	8.5	0.34	3, 27, 10, 11, 12, 13, 15, 7

Reading of texts	20	0.8	3, 27, 10, 12, 13, 15, 16
Search for documentation	15	0.6	3, 12, 13, 15, 16
Study	36	1.44	3, 27, 10, 12, 13, 15, 16

Assessment

PARTIAL EXAMS: The competencies of the subject are assessed by means of two partial exams: the first partial corresponds to the prenatal module and the second partial to the postnatal module. Students will have eliminated the subject when the grade point average is greater than or equal to 5.00.

1st part (prenatal module):

- Represents 65% of the grade of the subject.
- The competences of this module will be assessed by:
 - EV1: written questions (first assesment periode)
 - EV2: test in the classroom during seminar 2, 3, and 4.
 - EV3: report of the group project of seminar 1
- The grade for this part will be the result of:
 - Part A- 60% of the mark of this part will correspond to a written exam (test or non-test). The characteristics of the exam and the number of questions will be given in the exam call. This exam will focus on the contents of the whole subject (theory and seminars) of the prenatal module.
 - Part B- 10% of the mark of this partial will correspond to the mark obtained from seminar 1 (Biology part)
 - Part C- 30% of the mark of this partial will correspond to the mark obtained from the seminars 2,3,4 (part Embryology)
 - To eliminate this partial it is essential: 1) to obtain a minimum grade of 4.00 in each part (A, B and / or C), 2) that the weighted grade of the three parts is equal to or greater than 5.00 $60\% + 10\% + 30\% \geq 5.00$
 - The partial will not be eliminated unless these two premises are met. Students must retake ALL parts with a grade <5.00 .

2nd part (postnatal module):

- Represents 35% of the grade of the subject.
 - EV4: written questions about the theory topics (second assesment periode).
 - EV5: Exposition and discussion of the work for the postnatal seminar.(sem.5)
- The grade for this part will be the resultof:
 - Part A- 65% of the mark of this part will correspond to a written exam (test or non-test). This exam will focus on the contents of the whole subject (theory and seminars) of the postnatal module.
 - Part B- 35% of the mark of this partial will correspond to the exposition of the cases treated in the seminar 5 (part Physiology)
 - To eliminate this partial it is essential: 1) to obtain a minimum grade of 4.00 in each part (A, and / or B), 2) that the weighted grade of the two parts is equal to or greater than 5.00 $(65\% + 25\% \geq 5.00)$
 - The partial will not be eliminated unless these two premises are met. Students must retake ALL parts with a grade <5.00 .

RECOVERY EXAM (Final):

All EVs are recoverable. Students who have failed a subject in the partial assessments will not be required to take this assessment.

Must take the resit exam (final):

- Students who want to raise a grade for a grade (must notify the coordinator at least 15 days before the exam and must give up the grade for the grade they want to grade).

- Students who have not taken 1 or 2 partial exams.

- Students who have not eliminated the subject in 1 or in the 2 partial exams. For each part not eliminated, only the part of the exam (A, B and / or C) will be presented with a mark lower than 5.00.

Students who are required to apply for both part-timers will retake the first part and then the second part. They will therefore have a recovery note for each partial.

The calculation will be as follows, either with the marks obtained in the partials or with the marks of the resit exam:

- 1st partial grade = 60% + 10% + 30% (minimum grade of 4.00 in each part).
- 2nd partial grade = 65% + 35% (minimum grade of 4.00 in each part).
- Subject grade = prenatal module grade (65%) + postnatal module grade (35%). (minimum grade of 4.00 in each module).

MODALITY ONE SINGLE EXAM: The students that have chosen this modality will have to take the exam at the same date and time scheduled for the second partial exam. This single exam will evaluate all the theory given in the lessons, including the seminars. The work corresponding to EV3 will be handled on the exam's day. The work subject will be defined 15 days before the deadline. This work will be handled the same day of the Single Exam.

Students following this modality with a score on the single exam <5 or students aiming to get a better score, they should make the Recovery Exam (Final Exam).

REPEATING STUDENTS: The grade for any part from one year to the next is NOT saved. The subject does NOT DIFFERENTIATE between repeating and non-repeating students.

Evaluation guideness: <https://www.uab.cat/web/estudiar/grados/grados/evaluaciones-1345732995017.html>

Students who have submitted evidence of learning with a weight equal to or greater than 4 points (40%) may not be listed in the proceedings as "not assessable".

In the event that the student has difficulty understanding the language of the statements of the written tests, they can request the test in another language as long as they do so before week 4 in writing to the coordination of the subject.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
EV1, EV4-Written tests	62	4	0.16	3, 27, 26, 10, 11, 12, 13, 15, 25, 24, 21, 22, 7
EV2, EV3-Cooperative learning (group work)	18	0	0	1, 8, 4, 3, 5, 2, 27, 6, 26, 9, 10, 11, 12, 13, 15, 14, 17, 20, 18, 19, 25, 24, 23, 21, 22, 7, 16
EV5-Oral presentations	20	0	0	1, 8, 4, 3, 5, 2, 27, 6, 26, 9, 10, 11, 12, 13, 15, 14, 17, 20, 18, 19, 25, 24, 23, 21, 22, 7, 16

Bibliography

Prenatal module:

Main:

- LARSEN WD (2016) Embriología humana. 5ª edición. Elsevier Ed. Format e-book a la UAB (Biblioteca de la UAB)
- SADLER TW (2019) Embriología médica de Langman. 14ª edición. Wolters Kluwer/Lippincott Williams & Wilkins. Format e-book a la UAB (biblioteca UAB)

Postnatal module:

Main;

- PAPALIA DE, OLDS SW.; DUSKIN R (2009). Human development. 13th edition. McGraw-Hill
- KLIEGMAN RM; STANTON B; St GEME J; SCHOR NF. (2015). Nelson textbook of pediatrics. 20th edition.

Additional:

- BUSTOS SANCHEZ I. (2014). Intervención logopédica en trastornos de la voz. Ed. Paidotribo
- COLL FLORTIT M; AGUADO G., FERNANDEZ ZUÑIGA A.; GAMBRA S, PERELLÓ E, VILA-ROVIRA JM (2013). Trastornos del habla y de la voz. Ed: UOC

Software

It is not needed.