

SYLLABUS

COURSE: DENS 2961 Growth and Development
SEMESTER: Spring
CREDIT HOUR: 0.5

REVISED: 2002
REPRINTED: 2007

COURSE DIRECTOR: Anna Maria Salas-Lopez, D.D.S., M.S.

GOAL

Malocclusion and dentofacial deformity arise through variations in the normal developmental process and therefore must be evaluated against a perspective of normal development. Because orthodontic treatment often involves manipulation of skeletal growth, clinical orthodontics requires an understanding of dental development and the more general concepts of physical growth.

During the second year of your dental education, this course will introduce you to basic concepts in physical growth and development, Basic Growth and Development. Information on physical growth and dental development at the various stages is then presented sequentially, beginning with prenatal growth and extending into adult life where developmental changes continue at a slower pace. You will be introduced to basic concepts of postnatal human growth and development, to the nature of craniofacial growth, and to the theories of craniofacial growth. The etiology of malocclusion and the special developmental problems of children with malocclusion and dentofacial deformity are considered in detail. The second part of this course will provide you with direct clinical applications of principles of growth and development, Applied Growth and Development. You will learn the basic techniques in the assessment of the developing child using four separate analyses: cephalometric, facial form, space, and hand wrist. Finally, you will learn the skills necessary to evaluate and to suggest treatment plans for a number of frequently encountered clinical problems of children.

OBJECTIVES

I. MALOCCLUSION AND DENTOFACIAL DEFORMITY IN CONTEMPORARY SOCIETY

1. List two areas of orthodontics that Kingsley emphasized.
2. Describe Angle's primary contribution to orthodontics.
3. Describe Angle's postulate.
4. Describe the classification of malocclusion by Angle.
5. Define the goal of modern orthodontics.
6. With respect to the USPHS epidemiology study, rank the malocclusion types with respect to frequency of occurrence.
7. List two weaknesses of the Angle classification system.
8. Define overjet, open bite, and overbite.
9. List three evolutionary trends that have affected the dentition of man.
10. Relate the two factors that together have resulted in malocclusion being so prevalent in modern man.
11. Describe the relationship between malocclusion and social acceptance, mastication, temporomandibular disorders traumatic injury, and periodontal disease.

II. CONCEPTS OF GROWTH AND DEVELOPMENT

1. Describe how bone grows.
2. Describe "growth fields", including resorptive and depository fields, and how they affect bone growth and growth movements.
3. Describe the role of periosteal and endosteal membranes in the growth of bone.
4. Describe the role of the "soft tissue matrix" on the growth of bone.
5. Describe how the rate of growth activity of the resorptive and depository growth fields affect the growth of bone.
6. Describe the role of remodeling in the growth process of bone.
7. Describe the process of primary displacement and its role in the growth process.
8. Describe the process of secondary displacement and its role in the growth process.
9. Describe "cephalocaudal gradient of growth".
10. Describe the significance of Scammon's curves.

11. Identify the Scammon's curve for a particular tissue.
12. Describe the change in proportion of the head (cranium) relative to the face during growth.
13. Describe the purpose of growth charts.
14. List two ways growth charts are used.
15. Describe, compare, and/or identify the two basic approaches to studying physical growth.
16. Describe, list, or identify the three measurement approaches.
17. Describe, list, or identify the three experimental approaches.
18. Describe the characteristics of cross-sectional studies and longitudinal studies.
19. Compare interstitial growth with direct/surface apposition of bone.
20. Compare intramembranous bone formation/ossification with endo-chondral bone formation/ossification.
21. Define hypertrophy and hyperplasia.
22. Describe the origin of tissue, sites of growth, type of growth, and the determinant or controlling factors, for the cranial vault, the cranial base, the nasomaxillary complex, and the mandible.
23. Describe the correct concept to view the growth of the mandible.
24. List the growth sites of the mandible.
25. Describe the postnatal growth of the mandibular body, ramus, condyle, and anterior part of the mandible (chin) with respect to the growth processes involved.
26. Describe the three theories of growth control with respect to tissues involved, determinant of growth, site of growth, experimental evidence for and/or against.
27. List which theories best describe craniofacial growth.

III. EARLY STAGES OF DEVELOPMENT

1. Describe the embryological development of the tissues of the face and neck.
2. List the stage of embryonic development in which most problems of craniofacial anomalies arise.
3. Describe primate and developmental spaces.
4. Describe the three ways a Class I permanent molar relationship develops from the primary dentition.
5. Describe the conditions under which an early mesial shift of the mandibular deciduous molars occurs.

6. Describe the conditions under which a late mesial shift of the permanent mandibular 1st molars occurs.
7. Describe why spacing of the deciduous dentition is desirable.
8. Define "incisor liability".
9. Describe the change in incisor liability from the eruption of the permanent first molars to the eruption of the permanent cuspids.
10. List the arch in which incisor liability can be critical.
11. List three factors which aids in the resolution of incisor liability.
12. Describe why children undergo a transitory stage of crowding during the mixed dentition.
13. List two factors which do not aid in the resolution of incisor liability.
14. Define arch length and arch circumference.
15. Describe the change in arch length and arch circumference as the transition is made from the primary to the permanent dentition.
16. Describe the "ugly duckling" stage of development.
17. Describe how the "ugly duckling" stage is resolved.
18. Define leeway space.
19. Describe how the initial primary molar relationship, leeway space, and differential mandibular growth affect the permanent molar relationship as the transition is made from the primary dentition to the permanent dentition.
20. As the transition is made from flush terminal plane to Class I molar relationship, list the amount of anteroposterior correction is derived from leeway space and from differential mandibular growth as a fraction.
21. Describe the consequences of modified mandibular growth and/or insufficient leeway space on the final permanent molar relationship as the transition is made from the primary dentition to the permanent dentition.

IV. LATER STAGES OF DEVELOPMENT

1. Describe the growth of the nasomaxillary complex with respect to mechanisms of growth, direction of growth, and processes of growth.
2. Describe the process of the accentuation of the prominence of the chin during mandibular growth.
3. List the sequence in which growth of the width, length, and height of the jaws are completed.
4. Describe and compare internal rotation and external rotation with respect to growth of the mandible.

5. Describe and compare matrix rotation and intramatrix rotation with respect to growth of the mandible.
6. Correlate short face and long face individuals with specific rotations of the mandible during growth.
7. Correlate facial type with incisor and molar eruption and position during growth.
8. List three theories that have been proposed to explain late mandibular crowding.
9. List possible consequences of late mandibular growth on the dentition and the temporomandibular joint.
10. Describe the most significant finding of Behrent's study.
11. Describe and rank the magnitude of skeletal changes in the vertical, anteroposterior, and transverse dimensions that occur with respect to facial growth in adults.

V. THE ETIOLOGY OF ORTHODONTIC PROBLEMS

1. Given a list, select/match those problems attributed to skeletal growth disturbances, muscle dysfunction, disturbances of dental development, improper guidance of eruption, and/or trauma to teeth.
2. Correlate force magnitude and force duration and their relationship to equilibrium effects on the dentition.
3. Describe the consequences of a child sucking his thumb.
4. Describe the consequences of "tongue thrust swallow" behavior.
5. Describe the relationship of "tongue thrust swallow" and anterior open bite.
6. Describe the relationship of altered respiratory pattern and malocclusion.

VI. FACIAL FORM ANALYSIS. SPACE ANALYSIS AND HAND WRIST ANALYSIS

1. Describe the purpose of performing a mixed dentition space analysis.
2. Describe the mixed dentition space analysis in general terms.
3. Name the individual who developed the mixed dentition space analysis.
4. List the four reasons that mixed dentition space analysis is used.
5. List the probability level of the prediction values used in performing the mixed dentition space analysis.
6. Describe why the 75% probability level is used when a mixed dentition space analysis is performed.
7. Describe the significance when probability levels of 25%, 50%, or 75% of the prediction values are used in performing the mixed dentition space analysis.
8. Describe the process for using the prediction tables in predicting the size of both the lower and the upper unerupted canines and premolars.

9. Describe the effect during growth of the following skeletal patterns on mandibular incisor position, arch length, and arch circumference:
 - 9.1 Class I
 - 9.2 Class II
 - 9.3 Class III
10. Define the use of facial form analysis.
11. Define the goals of the facial form analysis.
12. Describe how the facial profile analysis, the skeletal pattern, and lip posture is used to interpret the results of a mixed dentition space analysis of a patient.
13. Correlate the position of the lips to the position of the lower incisors relative to their supporting bone.
14. Describe how changing lip protrusion during orthodontic treatment, for esthetic reasons, influences arch length, arch circumference, and mandibular incisor position.
15. Describe how changing the position of the lower incisor relative to supporting bone is related to arch length.
16. List three major questions that profile analysis answers.
17. Describe the radiographic analysis of skeletal maturation.
18. Explain why a hand wrist film is taken in growing patients.
19. Define the sequence of skeletal maturity indicators.

VII. CEPHALOMETRIC ANALYSIS

1. Describe the goals of the cephalometric radiography.
2. Explain how you could predict further development on the same patient.
3. List the cephalometric equipment.
4. Describe the patient's head position, orientation of the x-ray beam and target object.
5. Identify the following landmarks given in the cephalometric head film:
 - 5.1 cranial base
 - 5.2 frontal bone
 - 5.3 key ridge
 - 5.4 orbits
 - 5.5 pterygomaxillary fossa (PTM)
 - 5.6 palate
 - 5.7 maxillary incisor and molar
 - 5.8 mandibular condyles, ramus and body
 - 5.9 mandibular incisor and molar
 - 5.10 anatomic porion
 - 5.11 soft tissue profile
 - 5.12 sella (S)
 - 5.13 nasion (N)

- 5.14 orbitale (Or)
 - 5.15 anterior nasal spine (ANS)
 - 5.16 posterior nasal spine (PNS)
 - 5.17 porion (P)
 - 5.18 articulare (Ar)
 - 5.19 A point or subspinale (A)
 - 5.20 B point or supramentale (B)
 - 5.21 pogonion (Pog)
 - 5.22 menton (Me)
 - 5.23 gnathion (Gn)
 - 5.24 gonion (Go)
 - 5.25 glabella
 - 5.26 subnasale
 - 5.27 upper vermillion border
 - 5.28 stomion
 - 5.29 basion (Ba)
6. Identify the following anatomic planes given in the cephalometric head film:
- 6.1 sella-nasion plane (SN)
 - 6.2 Frankfort Horizontal plane (FH)
 - 6.3 palatal plane (PI)
 - 6.4 mandibular plane (MP)
 - 6.5 Y axis (S-Gn)
7. Identify the following skeletal horizontal and vertical measurements given in the cephalometric head film:
- 7.1 SNA angle
 - 7.2 SNB angle
 - 7.3 ANB angle
 - 7.4 mandibular plane angle (SN-MP)
 - 7.5 Y axis (SGn-FH)
 - 7.6 upper incisor to Frankfort Horizontal (U1-FH)
 - 7.7 upper incisor to NA line (U1-NA)
 - 7.8 lower incisor to mandibular plane angle (L1-MP)
 - 7.9 lower incisor to NB line (L1-NB)
 - 7.10 interincisal angle (U1-L1)
 - 7.11 pogonion to NB line (Pg-NB)
 - 7.12 E line (lip protrusion)
8. Describe the skeletal pattern in a given cephalometric tracing.
9. Describe the dental pattern in a given cephalometric tracing.
10. Describe the soft tissue profile in a given cephalometric tracing.
11. Describe the diagnosis and treatment planning in a given cephalometric tracing.

RESOURCES

I. Media Resources

A. Printed Media

1. Required textbook

Proffit, W. R.
Contemporary Orthodontics, 3rd ed.
C. V. Mosby, St. Louis, 2000

2. Monograph

Salas-Lopez, Anna Maria, D.D.S., M.S.
Growth and Development
University of Texas Dental Branch at Houston, 2001

3. Lab Manual

Anna Maria Salas-Lopez, D.D.S., M.S.
Jeryl D. English, D.D.S., M.S.

Cephalometric Tracing Technique Manual
Department of Orthodontics
University of Texas Dental Branch at Houston, 2001

4. Handouts given on each lecture

II. Human Resources

Anna Maria Salas-Lopez, DDS, MS
Phone: 713-500-4143; Room 365
Email: Anna.M.Salas@uth.tmc.edu

STUDY PLAN AND REQUIREMENTS

DENS 2961 GROWTH AND DEVELOPMENT 2007 Spring Semester Schedule

Monday, 9-9:50 am, with exceptions; Labs by group, April 12 and 19, Apr 24 and Apr 26
Sessions held in Room 132, unless indicated otherwise.

Date	Lecture Topic	Preparation
Feb 26	Malocclusion and Dentofacial Deformity in Contemporary Society	<p>I. Malocclusion and Dentofacial Deformity in Contemporary Society</p> <p>A. Read Chapter 1, <u>Contemporary Orthodontics</u>, 2nd ed., pp. 2-15. Despite these criticisms, the Angle method of classifying cases is the most practical and the most popular system of classification in use today.</p>
		<p>B. The Angle system of classification is based on the anteroposterior relationship of the maxillary first permanent molar to the mandibular first permanent molar. Angle originally presented his classification on the theory that the maxillary first permanent molar invariably was in the correct position. Emphasis on the relationship of the first permanent molars caused clinicians to ignore the facial skeleton and to think solely in terms of the position of the teeth. Therefore, malfunction of muscles and problems of growth of bones were often overlooked. Even today, there is a tendency for the inexperienced clinician to focus too much attention on this one tooth relationship. The first molar relationship changes during the various stages of development of the dentition. A better correlation between Angle's concepts and treatment is obtained if one uses Angle groups to classify skeletal relationships. A Class II molar relationship may result in several different ways, each requiring a different strategy in treatment, but a Class II skeletal pattern is not misunderstood, since it dominates the occlusion and its treatment. Clinicians now use the Angle system differently than it was originally presented, for the basis of the classification has shifted from the molars to skeletal relationships.</p> <p>The Angle system does not consider nor assess discrepancies in the vertical or the transverse plane. Although the anteroposterior relationship of the teeth may be the most important single consideration, this classification system sometimes causes the uninitiated to overlook problems such as overbite, open bite, crowding, rotations, crossbites, and narrowness of the arches.</p>

Date	Lecture Topic	Preparation
Mar 5 8-9:50 am	Concepts of Growth and Development - Part I Room 340	II. Concepts of Growth and Development A. Read Chapter 2, <u>Contemporary Orthodontics</u> , 2nd ed., pp. 18-41. B. Be sure you understand the information and concepts presented in Figures 2-22, 2-24, 2-25, 2-26, 2-27, 2-28, 2-29, 2-30, 2-31, and 2-32.
	Concepts of Growth and Development - Part II	III. Concepts of Growth and Development
Mar 12	Early Stages of Development	IV. Early Stages of Development A. Read Chapter 3, <u>Contemporary Orthodontics</u> , 2nd ed., pp. 56-85. B. Be sure you understand the information and concepts presented in Figures 3-40, 3-42, 3-43, 3-44, and 3-45.
Mar 19-23	Spring Break	
Mar 26	MIDTERM EXAM Room 207	
Apr 2	Later Stages of Development	V. Later Stages of Development A. Read Chapter 4, <u>Contemporary Orthodontics</u> , 2nd ed., pp. 87-103. B. Be sure you understand the information and concepts presented in Figures 4-8 and 4-12.
Apr 9 8-9:50 am	Cephalometric Analysis Room 340	VII. Cephalometric Analysis A. Read monograph: "UTHHSC Dental Branch Cephalometric Tracing Technique Manual"
Apr 12 2-3:50 pm	Groups A & B Growth and Development Laboratory in B81	VIII. Growth and Development Laboratory A. Prepare for this laboratory by reviewing the monograph: "Cephalometric Tracing Technique Manual". Orthodontic residents will serve as your teaching assistants on the day you perform these exercises. Have your resident review and evaluate your analyses.
Apr 16	The Etiology of Orthodontic Problems	VI. The Etiology of Orthodontic Problems A. Read Chapter 5, <u>Contemporary Orthodontics</u> , 2nd ed., pp. 105-135.
Apr 19 1-2:50 pm	Groups A & B Growth and Development Laboratory in B81	Growth and Development Lab continued
3-3:50 pm	LAB EXAM	
Apr 23	Facial Form Analysis Space Analysis Handwrist Analysis	IX. Facial form analysis. Space analysis and hand wrist analysis Course Evaluation

Date	Lecture Topic	Preparation
<p>Apr 24 & Apr 26</p> <p>1-2:50 pm</p> <p>Apr 26 3-3:50 pm</p>	<p>Groups C & D</p> <p>Growth and Development Laboratory in B81</p> <p>LAB EXAM</p>	<p>X. Growth and Development Laboratory</p> <p>A. Prepare for this laboratory by reviewing the monograph: "Cephalometric Tracing Technique Manual". Orthodontic residents will serve as your teaching assistants on the day you perform these exercises. Have your resident review and evaluate your analysis.</p>
<p>Thu, May 3</p> <p>3-3:50 pm</p>	<p>FINAL EXAM Room 207</p>	

EVALUATION METHODS

Two mass exams and one lab exam will be given. The first mass exam will cover Weeks 1-4 and the second exam will cover Weeks 5-8 of the Study Plan. The lab exam will be based on the exercises covered during the laboratory. For the lab exam you will be responsible for performing cephalometric analysis on patient records and answering questions relevant to each analysis. The objectives for the lab exam are the objectives in Part VII of the Objectives. The exams will be a combination of multiple-choice, fill-in-the-blank, matching, listing, and short-answer questions. Each mass exam will count for 40% of the final grade. The lab exam will count for 20% of the final grade.

Bring a cephalometric protractor, Boley gauge, and pencil to the preclinical lab.