



Department of Biomedical Sciences
Physiotherapy Degree Programme
Clinical Kinesiology Syllabus

Academic year 2020-2021. Academic term: second semester of second year
Course coordinator: Prof Roberto Gatti

CLINICAL KINESIOLOGY (2 ECTS)

Prof Roberto Gatti Associate Professor at Humanitas University and Head of the Physiotherapy Degree Course. Head of the Physiotherapy Service at Humanitas Hospital.
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Objectives The aim of the module is to provide the skills to interpret movement dysfunctions of neurological and musculoskeletal origin from a kinesiological perspective.

Teaching methods Lectures, presentation of videos and work in small groups on motor dysfunction simulations.

Teaching material Slides and videos presented during lectures, available on LMS for physiotherapy students, and scientific articles presented during the course

Content

1) Compensation of joint limitations of the lower limb

Introduction to clinical kinesiology. Sitting and standing posture, walking, stairs, getting up from a chair with joint limitation in the tibiotarsal, knee and hip joints both unilaterally and bilaterally.

2) Compensation of joint limitations of the upper limbs

Dressing, grooming and washing with joint limitation of the shoulder and elbow joints

3) Video 1

Presentation and discussion of a patient presented in a video.

4) Compensation in the presence of hyposthenia or paresis of the muscles of the lower limbs

Locomotor activities and posture in the presence of both unilateral and bilateral hyposthenia or paresis of the dorsal flexors and plantar flexors foot muscles, extensors and flexors of the knee, hip flexors, extensors and abductors muscles.

5) Video 2

Presentation and discussion of a patient presented in a video

6) Compensation in the presence of hyposthenia or paresis of the muscles of the upper limbs

Dressing, grooming and washing in the presence of unilateral hyposthenia or paresis of the abductor flexor, internal rotator and external rotator muscles of the shoulder; scapulothoracic muscles; elbow flexors and extensors; intrinsic hand muscles

7) Hyperextended knee

<p>Mechanical conditions of knee hyperextension: hyposthenia, spasticity, other causes</p> <p>8) Functional activities in the presence of spasticity Pathophysiology and mechanical characteristics of spasticity. Locomotor activities and functional utilisation of the upper limb in the presence of spasticity of the plantar flexor muscles of the foot, quadriceps, hip adductors, finger flexors, pectoralis major and biceps humerus muscles</p> <p>9) Functional activities in the presence of balance disorders Different biomechanics of balance disorders depending on the pathophysiological disorder. Balance disorders and sensory deficits. Relationship between mechanical characteristics of balance disorders and pathophysiology of sensory impairment. Locomotor activities with balance disorders: use of aids and braces.</p> <p>10) Video 3 Presentation and discussion of a patient presented in a video</p>

KINESIOLOGY APPLIED TO CLINICAL RESPIRATORY MEDICINE (1 ECTS)	
Dr Sara Pierini	Graduated in Physiotherapy from the Vita-Salute San Raffaele University of Milan in 2011. Currently a physiotherapist at the Physiotherapy Service of Humanitas. Expert in respiratory physiotherapy. E-mail: sara.pierini@humanitas.it
Objectives	The aim of the course is to provide knowledge necessary for the observation and evaluation of breathing mechanics and kinesiology applied to patients with respiratory pathology.
Teaching methods	Lectures and classroom discussions
Teaching material	Slides presented during the lecture, available for physiotherapy students on LMS
Content	
<p>1) Introduction to the course Definition of respiratory muscle fatigue. Mechanics of breathing in chronic obstructive pulmonary disease (COPD). Lung volumes. Respiratory muscle strength. Thorax-pulmonary dynamics (diaphragm and other inspiratory muscles; abdominal muscles).</p> <p>2) Mechanics of breathing in chronic obstructive pulmonary disease (COPD) Flow-volume relationship. Work of Breathing. Ventilatory profile. Breathing mechanics during exercise</p> <p>3) Mechanics of breathing in neuromuscular restrictive lung disease Mechanics of breathing in myopathies. Static lung volumes. Thorax-pulmonary dynamics: flow-volume relationship; ventilatory profile and gas exchange</p> <p>4) Mechanics of breathing in the patient with spinal cord injury and in unilateral and bilateral diaphragm paralysis</p>	

<p>Static lung volumes. Thorax-pulmonary dynamics depending on the level of injury</p> <p>5) Mechanics of breathing in the surgical patient Effects of anaesthesia, paralysis and mechanical ventilation on breathing mechanics. Mechanics of breathing in the surgical patient: cardiac surgery, abdominal surgery</p>

INSTRUMENTAL ANALYSIS OF MOVEMENT (1 ECTS)	
Dr Paola Adamo	<p>Graduated in Physiotherapy from the University Vita-Salute San Raffaele. She currently works as a physiotherapist at the Physiotherapy Service of the Humanitas Hospital, where she is involved in physiotherapy after orthopaedic surgery and in scientific activities at the Movement Analysis Laboratory.</p> <p>E-mail: paola.adamo@humanitas.it</p>
Objectives	The module 'Instrumental Analysis of Movement' aims to provide the essential knowledge of the methods and instruments used for the objective analysis of movement relevant to physiotherapy.
Teaching methods	Lectures with classroom discussion.
Teaching material	Slides presented in class, available to physiotherapy students on LMS, and scientific articles presented during the course
Content	
<p>1) Course presentation and introduction to biomedical signals Illustration of the course organisation. Introduction to the collection, quality control and analysis of biomedical signals. Noise, interference and artefacts. Filters for biomedical signals</p>	
<p>2) Electromyography: use and signal generation Illustration of the use of electromyography in the analysis of human movement. Signal generation. Comparison of the use of intramuscular and surface electromyography. Methodology for electromyographic sampling (skin preparation, type of sampling, electrode positioning).</p>	
<p>3) Electromyography: analysis and interpretation Description of common descriptors of the electromyographic signal. Physiological interpretation of electromyographic signal in static and dynamic conditions. Relationship between electromyographic activity and muscle strength. Limitations of electromyography.</p>	
<p>4) Electromyography: practical demonstration Illustration of the use of electromyography in practice. A high-density electrode system will be used to demonstrate: skin preparation, localisation of the innervation zone, propagation of the action potential in fusiform muscles, absence of propagation in pennate muscles, movement contractions, fatiguing contractions.</p>	
<p>5) Stimulated contractions and reflexes Illustration of the use of electrical and magnetic stimulation to test different circuits of the neuromuscular system. Use of stimulation to activate the muscle. Use of electrical and mechanical</p>	

stimulation to test spinal circuits. Use of transcranial stimulation to activate corticospinal pathways.

6) Ultrasound

Illustration of the principles behind the ultrasound. Muscle architectural parameters that can be measured under static conditions. Muscle architectural parameters that can be measured under dynamic conditions. Use of elastography to estimate muscle forces. Practical demonstration.

7) Force, moment, pressure

Illustration of the differences between force, moment and pressure. Measurement of moment in isometric, isotonic, isokinetic conditions. Evaluation of voluntary activation using electrical stimulation and force measurements. Use of devices to measure pressure as descriptors of force or muscle activity (e.g. craniocervical flexion test).

8) Combined use of various techniques

Examples of application of the techniques examined in the previous lessons. Examples could be: studying fatigue (force, electromyography, reflexes); studying the effect of experimental pain (force, electromyography, stimulation).

9) Kinematics

Overview on the analysis of joint kinematics (fluoroscopy, magnetic resonance imaging). Methods for kinematic analysis: comparison between goniometers, cameras, inertial sensors. Kinematic evaluations using low-cost technologies.

10) Kinetics and combined use of various techniques

Force platforms. Measurement of centre of pressure. Measurement of reaction forces and inverse kinematics. Examples of the application of techniques examined in previous lessons: gait analysis (kinematics, kinetics, electromyography); estimation of internal knee adduction moment (kinematics, kinetics).

PRESENTATION OF CLINICAL CASES (1 ECTS)

Dr Federico Temporiti	Graduated in Physiotherapy from the University Vita-Salute San Raffaele of Milan in 2014. Temporiti currently works at the Physiotherapy Service and the Movement Analysis Laboratory of the Istituto Clinico Humanitas, as well as at Humanitas University as a Tutor supporting the Physiotherapy degree. E-mail: federico.temporiti@humanitas.it
Objectives	Provide the necessary elements to conduct the functional assessment of the patient in a logical manner, and to interpret the observations by making clinical links between what was detected during the physical assessment and the disability observed in daily life activities. The ultimate goal is to build a hierarchy of observations in order to identify and prioritise treatment goals.
Teaching methods	Lectures with classroom discussion.

Teaching material	Lecture slides, available for physiotherapy students on LMS, multimedia material and scientific articles presented during the course
<p>Content</p> <p>1) Functional assessment of the patient Functional assessment of the patient, using the elements and steps that characterise the assessment and assigning them a correct order. The lecture will use slides and interactive multimedia material (video illustrating how to conduct a functional assessment).</p> <p>2) Clinical cases - Videos 1 and 2 Examples of real functional assessments of patients, with emphasis on the logical sequence of what is being assessed. The student is stimulated to grasp the link between the observed deficit and its repercussion in the main activities of daily life (getting up and sitting down from a chair, walking, taking the stairs, etc.).</p> <p>3) Kinesiology of functional activities performed with the upper limb Kinesiological analysis of daily life activities performed with the upper limb in the healthy subject (putting a hand on the head/combing, putting a hand in the back pocket of the trousers, putting on a jacket, washing the shoulder with the contralateral upper limb).</p> <p>4) Pathokinesiology of functional activities performed with the upper limb Analysis and interpretation of the pathokinesiology of daily life activities analysed in the previous lesson in patients with upper limb problems.</p> <p>5) Clinical case - Video 3 Clinical case of a patient with an upper limb problem, stimulating the ability to make clinical links between the aspects revealed during the physical assessment and the disability observed in functional activities.</p>	

<p>Examination for the Clinical Kinesiology Course. Oral examination for all modules of the Course (Chairman of the Examination Committee: Prof. Roberto Gatti)</p>
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