Musculoskeletal Physiotherapy Sciences

VU University Amsterdam - Fac. der Gedrags- en Bewegingswetensch. - Master Musc. Physioth. Sciences - 2015-2016

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Master MPS Electives

Courses:

Name	Period	Credits	Code
3D-Kinematics	Period 4	3.0	B_3DKIN
Electromyography	Period 5	3.0	B_ELECTROMYO
Histology	Period 5	3.0	B_HISTOLOGY
Imaging	Period 4	3.0	B_IMAGING

Master MPS Obligatory

Courses:

Name	Period	Credits	Code
Biomechanical analysis of human mov.	Period 2	6.0	B_BIOMANAHM
Master Research Project	Ac. Year (September)	0.0	B_MRP
Measuring movement	Period 1	6.0	B_MEASMOV
Physiotherapy organisation and practice	Period 1	6.0	B_PHYSORPR
Research meth. in musc. physio 1	Period 1	6.0	B_REMMP1
Research meth. in musc. physio 2	Period 2	6.0	B_REMMP2
Translational research	Period 3+4+5+6	6.0	B_TRANSRES
Writing and Designing a Research Proposal	Period 3	3.0	B_WRITPROP

3D-Kinematics

Course code	B_3DKIN (900632)
Period	Period 4
Credits	3.0
Language of tuition	English
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	prof. dr. H.E.J. Veeger
Examinator	prof. dr. J. Harlaar
Teaching staff	prof. dr. H.E.J. Veeger, prof. dr. J. Harlaar
Teaching method(s)	Lecture, Computer lab
Level	500

Course objective

The student is capable to:
• Define and calculate local joint coordinate systems;
• use and understand different calibration methods and their limitations;
• translate technical motion descriptions into clinically relevant units;
• apply the above to experimental data;
• interpret and comment on methods as described in the literature.

Course content
In this course students are introduced to the fundamentals of three-dimensional kinematics, as well as the (more or less) standard application methods.
The course will comprise three separate blocks focusing on
1. the definition and use of local coordinate systems in the calculation of osteokinematics;
2. the use of technical marker sets as well as the practical implications of data processing, especially correcting for missing markers and;
3. the calculation procedures for obtaining helical axes, needed for the definition of functional axes-based coordinate systems

Form of tuition
Lectures, computer practicals and tutorials

The three computer practicals are linked to in-term assessments. Each practical will contribute for 15% to the final score.

Type of assessment
- completion of all 3 assignments is mandatory to quilify for the exam
- two in-term tests on calculation skills, partially exempting for exam
- final test on calculation skills + literature
- score: 3 x 20% for calculation questions (one for each block)
40% for essay question
above 100% = 9/10

Course reading
Relevant papers will be listed in Blackboard.
A useful source is the book by Zatsiorsky (Zatsiorsky, Valdimir M., Kinematics of Human Motion. Champaign, Illinois: Human Kinetics, 1st edition, 1998. ISBN 0-880110767-5), which will be used as reference material.

Entry requirements
This course requires proficiency in Matlab and matrix calculation. If there is a deficiency related to Matlab skills, students are strongly advised to take the TUE web-based matlab course that can be found at http://www.imc.tue.nl/
The BSc course “Mechanische Analyse …” is advised.

Remarks
The maximum number of participants in this course is limited to 40.

Biomechanical analysis of human mov.

Course code	B_BIOMANAHM ()
Period	Period 2

Credits	6.0
Language of tuition	English
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. J.H.P. Houdijk
Examinator	dr. J.H.P. Houdijk
Teaching staff	dr. J.H.P. Houdijk
Teaching method(s)	Lecture, Practical
Level	400

Course objective
In this course the student will learn to select and apply predefined data analysis routines to analyze available data on human movement and interpret the results. Moreover, the student will learn to understand and critically evaluate methods, results and interpretations of biomechanical analyses presented in scientific literature regarding musculoskeletal physiotherapy.

Course content
Physiotherapists on a daily basis observe human movement to assess issues such as joint range of motion, movement pattern anomalies, muscles and joint strain. Although the practiced eye can derive such information in a reliable way in given circumstances, often these issues remain obscure for the human eye. The human musculoskeletal system is a complex system of multiple bones, muscles and connecting tissues. It is a versatile system that can accomplish an overwhelming number of tasks, given its large number of degrees of freedom. However, this seemingly redundant number of joints and muscles challenges the analysis of these motor tasks. Fortunately, sophisticated measurement techniques and analysis methods are currently available that can be employed to face this challenge. These help us to describe movement patterns and joint movements (i.e. kinematics) and understand underlying forces (kinetics). This course focuses on the mechanical analysis of human movement. It teaches you how mathematical and mechanical laws and conventions can be used to describe and understand human movement and the accompanying load. The (bio)mechanical models and techniques used in these analyses will be discussed and their potential pitfalls and limitations will be highlighted. You will perform the analyses on several available data sets, interpret the results of these analysis in the light of clinical problems and contrast them with results from scientific literature. At the end of the course you are able to apply predefined data analysis routines to available data and interpret the results. Moreover you are able to understand critically evaluate methods, results and interpretations of biomechanical analyses presented in scientific literature.

Form of tuition
Contact hours; 64 (7 lectures; 14 hours, 5 practicals; 40 hours, 5 response lectures; 10 hours) Self study; 104 hours.

Type of assessment
Examination and grading of this course will be based on the practical reports and a written assignment. Practical reports of each practical (except practical 1) need to be handed after each practical. Each report will account for 12.5% of the final grade. The written assignment involves a methodological research proposal, which will account for 50% of the final grade.

Course reading
Research Methods in Biomechanics-2nd Edition, Robertson et al. 2014,
Lecture handouts
Practical assignments
Selected research papers

Entry requirements
No strict admission criteria apply, but basic knowledge of biomechanics, matlab and measuring movement is required.

Registration procedure
For more info on workgroups, laboratories, (computer) practicals etc. please see Blackboard.

Remarks
Course manual will be available on BlackBoard

Electromyography

Course code	B_ELECTROMYO (900815)
Period	Period 5
Credits	3.0
Language of tuition	English
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	prof. dr. J.H. van Dieen
Examinator	prof. dr. J.H. van Dieen
Teaching staff	prof. dr. J.H. van Dieen
Teaching method(s)	Lecture, Practical, Computer lab
Level	400

Course objective
- The student has a basic knowledge of electrophysiology and the background of electromyographical; signals;
- the student has a basic knowledge of the different ways; of collecting electromyograpical data in various fields of application;
- the student can analyze EMG data for kinesiological use;
- the student can choose the appropriate method for collecting and analyzing EMG data
in a kinesiological study;
- the student knows the possibilities and limitations of EMG data;
- the student can interpret EMG data in relation to motor control, force and fatigue;
- the student can identify contamination in EMG data and can apply methods to reduce its effects;
- the student knows the standards for reporting EMG data.

Course content
In this course, the students are introduced to the electrophysical background of electromyography (EMG). Subsequently, the course focuses on
methodological aspects of EMG acquisition and analysis, addressing the potential of this method as well as its pitfalls.

Form of tuition
lectures 6 x 2 hours
practical 2 x 3 hours
The lectures introduce the following topics:
- electrophysiology;
- motor control (motor unit recruitment and firing);
- instrumentation and electrodes;
- HD- EMG and spatio- temporal information;
- onset determination;
- amplitude estimation;
- force estimation;
- cocontraction and cross- talk;
- motor unit firing and decomposition;
- frequency content, conduction velocity and fatigue.
Practicals concern analyzing EMG data.

Type of assessment
2 hours; written test with equally weighted open- ended questions

Course reading
Research articles and lecture handouts to be made available before the course

Entry requirements
- knowledge of and skills in programming in MATLAB at the level described for example in ‘Verwerken van digitale signalen’.
- basic knowledge and understanding of the physiology of muscles and their control.

Remarks
Maximum number of students: 40

Histology

Course code	B_HISTOLOGY ()
Period	Period 5
Credits	3.0
Language of tuition	English
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. W.M.H. Hoogaars
Examinator	dr. W.M.H. Hoogaars
Teaching staff	dr. W.M.H. Hoogaars
Teaching method(s)	Lecture, Practical
Level	500

Course objective
Patients with debilitating musculoskeletal disorders, such as arthritis, osteoporosis and muscle atrophy, form a large and expanding diagnosis group in health care. Physical therapy is generally part of the treatment of these disorders and crucial to attenuate the progression of the disorder and to maintain or improve mobility of these patients. In order to optimize care and to provide the best physical therapy possible for these patients, it is crucial to understand the molecular and cellular processes involved in musculoskeletal adaptation and disease and unravel the mechanisms underlying the physical therapy interventions

to recover from tissue injury. This course is an introduction to histology with an emphasis on the microscopic anatomy of the musculoskeletal system, the function of different cells in muscles, bones and joints and the molecular mechanisms underlying the etiolology of musculoskeletal disorders. Histochemical and immunohistochemical techniques will be will be introduced to study structure and function of cells. In addition, practical exercises with microscopes and tissue sections will be used to familiarize students with microscopy and the cellular structure and organization of different tissues of the musculoskeletal system.

This course provides an introduction into the histology of the musculoskeletal system and the molecular and cellular processes that underlie the development of musculoskeletal disorders.

Intended learning outcomes
• To be able to describe and explain the basic principles of histology and use of histological techniques.
• To be able to assess the value and limits of specific (immuno) histological methods used to study the microanatomy of the musculoskeletal system and musculoskeletal disorders.
• To gain knowledge about the basic principles of cell biology and the function of different cells and structures associated with the musculoskeletal system.
• To gain knowledge about the cellular and molecular processes underlying musculoskeletal disorders.
• To be able to identify and describe the microscopic organization and adaptation of different cells and tissues in muscles, bones, joints and their attachments using histology.
• To be able to identify and interpret molecular and cellular processes associated with tissue injury and musculoskeletal disorders using histology.
• To gain insight in the scientific and clinical relevance of histology and cell biology in the field of musculoskeletal disorders and physical therapy research.
• To be able to contribute to scientific discussions about research on the underlying (molecular) mechanisms of musculoskeletal disorders and the effects of physical therapy

Course content
The course will include:
• Lectures on basic histological and immunohistochemical techniques used to identify cells and tissues in the musculoskeletal system.
• Lectures on the microscopic anatomy and cellular/molecular biology of the musculoskeletal system.
• Lectures on cellular and molecular adaptations of the musculoskeletal system and pathophysiological processes involved in musculoskeletal disorders, such as arthritis, osteoporosis and muscle wasting disorders.
• Lectures/class discussions discussing recent histological and molecular biology research relevant to the physical therapy field.
• Practicals on microscopy and histochemistry to analyse structure and functional properties of musculoskeletal system.

Lectures and class discussions:
The lectures will provide students with basic knowledge about histology and cellular biology of the musculoskeletal system and current knowledge about the molecular mechanisms of musculoskeletal disorders and tissue regeneration. Reading material mainly consists of Junqueira’s basic

histology book chapters and current research papers and reviews. Details on the latter resource will be provided on BlackBoard before the course starts. Lecture slides will be posted on BlackBoard after the lecture under Course Documents. The student is encouraged to read through the study material pertaining to the lecture (see course schedule) beforehand as this will facilitate the understanding of the lecture.
There will be two class discussions where students can ask questions and participate in class discussions on examples of current research papers relevant to physical therapy research. Before the last class discussion example exam questions will be posted on BlackBoard, which will be discussed in the last week.

Practical assignments
There will be 2 practical assessments in this course regarding skeletal muscle structure and adaptation. The practical sessions will consist of an introduction to the laboratory of myology at the department of human movement sciences (1 hour) and two assignment with open questions on skeletal muscle structure and skeletal muscle adaptation (3 hours). Students will use a microscope and histological sections of skeletal muscles to answer the questions described in the Practical Guide. The practical guide will be posted on BlackBoard under course documents.

Form of tuition
The course consist of 3 ECTS, which equals a load of 84 study hours. These hours could be divided over the course program as follows:

Preperation lectures 26hrs
Lectures and class discussions 9x2=18hrs
Preparing practical assignments 16hrs
Practical assignments 2x4=8hrs
Exam preparation 14hrs
Exam 2hrs
Total 84hrs

Type of assessment
Examination and grading of this course will be based on a knowledge assessment (weight 70%) and the practical assessments (weight 30%).

Knowledge assessment:
The knowledge assessment will cover lecture sheets, extra literature provided on blackboard (in the form of reviews and research papers) and chapters from Junqueira’s Basic Histology Text and Atlas and Skeletal Muscle from Molecules to Movement (ISBN 9780443074271). The exam will last 2 hours and will consist of multiple open questions.

Practical assessment:
The practical assessment will contain questions about microscopic analysis of histological muscle sections. For the practical assessment you are allowed to take your plan and notes. The assessment has to be submitted through BlackBoard before the deadline. The average grade for the 2 practical assessments will make up 30% of the final grade for this course. All practical assessments have to be submitted through BlackBoard before the deadline. Assessments handed in after the deadline will not be taken into account.
Final grade:
The final grade for this course will be determined from the practical assessments (30%) and the knowledge assessment (70%). The final graded

will be determined based on non rounded-off grades for the practical and knowledge assessment. The final grade (on a scale of 1-10) will be rounded down to the nearest half point.

Course reading
Junqueira's Basic Histology Text & Atlas 13th Edition (ISBN 0071780335)
Skeletal Muscle from Molecules to Movement (ISBN 9780443074271)

Other sources:
Recent research papers and reviews (will be available on blackboard)

Imaging

Course code	B_IMAGING ()
Period	Period 4
Credits	3.0
Language of tuition	English
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	prof. dr. H.E.J. Veeger
Examinator	prof. dr. H.E.J. Veeger
Teaching staff	prof. dr. H.E.J. Veeger, dr. R.T. Jaspers
Teaching method(s)	Lecture, Practical
Level	500

Course objective
To be able to interpret x-ray images, MRI and ultrasound and to recognize relevant structures of the musculoskeletal system (1)
• To be aware of projection and field strength pitfalls (2, 9)
• using x-ray: to be able to recognize signs of arthrosis and osteoporosis (3)
• using MRI: to be able identify ACL injuries and rotator cuff tears (3)
• using ultrasound: to be able to identify tendon and muscle damage (3)
• to be able to perform an ultrasound assessment evaluation of the shoulder or knee, based on a specific research question (3, 5, 6, 18)
• able to report on an ultrasound assessment evaluation of the shoulder or knee, based on a specific research question (14)

Course content
In this course students will be trained in interpreting images from the most common imaging tools used in orthopaedics: x-ray, MRI and ultrasound. As ultrasound is one of the tools that is most easily available in physiotherapy practice, students will learn to record and interpret ultrasound images based on existing cases.
The course will comprise:
• classes on the basic theory behind x-ray, MRI, and ultrasound.
• classes on the recognition of a selection of musculoskeletal disorders using images.
• Visit to the imaging department VUmc
• Demo of ultrasound use within a physiotherapy practice.

Form of tuition

Practical + report on a specific case based on ultrasound recordings.

Type of assessment
Interim exam
Conditional requirements
Students need to be in time and to bring their VU_ID to the exam in order to be admitted. Students who are more than half an hour late are not allowed to take the interim exam. Their exam will be graded with a 1.0.

Examination and grading
The interim exam exists of multiple choice questions and open-end questions. The multiple choice questions count for 60% to the grade for the interim exam, the open-end questions for 40%.
The grade for the interim exam will be determined using the standard procedure for setting of a cutting score. This procedure can be found on Blackboard The grade will be round off at half points.

Report
Students will be working on the presentation of a case in groups of three. The results of their work should be presented in a short report, containing a brief introduction and explanation of the research question, a description of the method, the measurement results and interpretation thereof, and a brief discussion of their findings. The report will be graded as a group effort. The criteria for grading can be found on BlackBoard (see: "report_instructions").

Conditional requirements
The report should be constructed conform the instructions as can be found on BlackBoard (see: "report_instructions").
Reports shall be handed in through Blackboard as a group assignment.
Reports will undergo a plagiarism check.

Determining final grade
The final grade will be determined as follows:

40% x grade interim exam (rounded off at half point) + 60% x grade report (rounded of at half point). A minimum score of 5.5 for the report is required.

Resit
In case of a final score below 5.5 (and a minimum score of 5.5 for the report), the interim exam can be retaken. The resit will be an oral exam.

Course reading
Cornwall, Nyre & Harris: Imaging Hanbook for Physical Therapists. ISBN: 978-1-4511-3031-7

Daniels & Dexter (eds.): Selected chapters from; Basics of Musculoskeletal Ultrasound (2013) (url: http://www.springer.com/us/book/9781461432142)

Master Research Project

Course code	B_MRP ()
Period	Ac. Year (September)

Credits	0.0
Language of tuition	English
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	prof. dr. M.W.J. Coppieters
Teaching staff	dr. J.H.P. Houdijk, prof. dr. M.W.J. Coppieters
Teaching method(s)	Study Group
Level	600

Measuring movement

Course code	B_MEASMOV ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. T. IJmker
Examinator	dr. T. IJmker
Teaching staff	dr. R. Verheij, dr. T. IJmker
Teaching method(s)	Lecture, Practical, Computer lab
Level	400

Course objective
In this course the student will become familiar with measurement techniques and methods frequently used to measure physical quantities in musculoskeletal physiotherapy sciences. The student will also learn how to use Matlab to process the obtained data and interpret their observations.

Course content
Within human movement sciences in general and physiotherapy research in particular a large set of measurement techniques and methods is available, ranging from a more psychosocial towards a biomechanical approach. This course will only cover some of the most frequently used techniques from the more biomechanical approach to answer scientific questions related to human movement. The following techniques will be addressed specifically: measuring positions with Optotrak, measuring forces with a force platform, measuring linear and angular accelerations with an accelerometer, and measuring muscle activity with electromyography (EMG).

A large part of this course consists of general methods and techniques that apply to the measurement of almost all physical signals, or the processing of these signals into meaningful quantities. Students will learn how to perform measurements with the aforementioned equipment, and how to process the acquired signals using Matlab. Lastly, students will learn to analyze the reliability and precision of the given methods and to make a sound judgment as to the adequacy and limitations of a given measurement method to solve a problem.

Form of tuition
Contact hours: 52 (10 lectures (2 hours each), 4 practicals (for each practical 3 hours data collection and 5 hours of data analysis))

Self-study: 104 hour (preparation of lectures and practicals, exam preparation)

Type of assessment
Knowledge assessment (70%)
Consisting of multiple choice questions, administered through Question Mark Perception.

Practical assessment (30%)
Consisting of 4 open book practical assessments, 1 after each practical, containing open end questions. Administered through blackboard. The average grade for the 4 practical assessments will make up 30% of the final grade for this course.

Course reading
Exam material:
• Book: Research methods in biomechanics - 2nd Edition, Robertson et al. 2014 - Selected chapters
• Lecture sheets (BlackBoard)
• Selected research articles
• Additional texts on selected topics (Blackboard)

Entry requirements
Knowledge and understanding of basic mathematics and biomechanics and basic Matlab programming skills are a prerequisite for this course.

Registration procedure
For more info on workgroups, laboratories, (computer) practicals etc. please see Blackboard.

Remarks
The Course manual will be available on Blackboard

Physiotherapy organisation and practice

Course code	B_PHYSORPR ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. G.G.M. Scholten-Peeters
Examinator	dr. A.L. Pool-Goudzwaard
Teaching staff	dr. G.G.M. Scholten-Peeters, dr. A.L. Pool-Goudzwaard
Teaching method(s)	Lecture, Seminar
Level	400

Course objective
In this course the student will get insight into the physiotherapy profession and process to create relevant research questions and to communicate and collaborate with physiotherapists in the field.

Course content
In order to perform relevant scientific research within the physiotherapy field, students should be familiar with the primary principles of the physiotherapy profession. In this module, students

will get insight into the Dutch physiotherapy practice. Aspects like the different roles of the physiotherapists, legal, positioning of the physiotherapists in the different care settings will be discussed. The primary principles of the physiotherapy practice are considered like the different models of care, evidence based practice (EBP), clinical reasoning within the screenings- diagnostic and treatment process, the use of clinical guidelines and the International Classification of Functioning, Disability, and Health (ICF).

The physiotherapy profession has undergone a paradigmatic shift, where a ‘biopsychosocial’ model of care has acquired popularity alongside the traditional ‘biomedical model’ of care. Physiotherapists offer treatment aimed at recovery, optimization or maintenance of movements. Their clinical reasoning process is necessary to provide a specific physiotherapy diagnosis including the relevant dimensions of the ICF. The physiotherapy profession uses the most recent scientific insights, to provide (cost)effective and safe patient care. Evidence- based practice within the physiotherapy field includes: the best available external evidence, the physiotherapist’s preferences/expertise and patient’ preferences/personal values. The physiotherapist discusses and provides the patient with the evidence on the important harms and benefits of the physiotherapy intervention taking into consideration the personal preferences, wishes, needs and qualities of patient as a whole person in his biopsychosocial, family and working surrounding. The physiotherapy optimizes its collaboration with other health care professionals by using the "International Classification of Functioning, Disability, and Health" (ICF) system developed by the World Health Organization (WHO). The importance of clinical guidelines and measuring of recovery will be discussed.

During the first 5 weeks, these main theoretical principles are considered and theoretically applied on some cases. The internships in week 6-8 are aimed to gain experience with the physiotherapy practice, get insight into the barriers and facilitators to provide evidence based treatment, perform research and reveal gaps of knowledge within the physiotherapy profession. Student will not be trained to become physiotherapists themselves. No ‘hands-on’ practica will be performed.

Form of tuition
Lectures (4x), 2 hours each
Tutorial groups (8x), 2 hours each

The lectures will provide the theoretical background of common principles in physiotherapy practice. To prepare the lectures, students have to read at least the peer-reviewed articles, guidelines, websites and chapters from recommended books as suggested on the course schedule. Lecture slides will be posted afterwards on BlackBoard under 'Course Documents'.
There will be 8 tutorial groups in this course. The educational form will vary from discussions and critical reflections on the diagnostic and therapeutic process of patients from physiotherapy practice, presentations about the clinical guidelines and (dis)adventage of questionnaires within the physiotherapy, and a debate about the applicability of scientific evidence within the physiotherapy practice. To prepare the tutorial groups, students have to read at least the recommended literature as suggested on the course schedule.
The internships will take place in three different physiotherapy practices, preferably in three different care settings (primary care, hospital care and rehabilitation care settings). The students will

receive a list with address data and have to contact the physiotherapists themselves to make an appointment. Arrangements of internship data need to be made during the first 2 weeks of the course to prevent delay. The internships should not be started before week 4 because the lack of theoretical background and theoretical principles of the physiotherapy.

Type of assessment
Examination and grading of this course will be based on a critically appraised patient report (70%, minimum 5.5), a summary of the best available evidence combined with patient and therapeutic perspectives and a report of gaps of knowledge in the physiotherapy field with corresponding relevant research questions (30%, minimum 5.5).

Course reading
literature to be studied: will be provided through blackboard

Registration procedure
For more info on workgroups, laboratories, (computer) practicals etc. please see Blackboard.

Research meth. in musc. physio 1

Course code	B_REMMP1 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. M.J.M. Hoozemans
Examinator	prof. dr. M.W.J. Coppieters
Teaching staff	dr. M.J.M. Hoozemans, prof. dr. M.W.J. Coppieters
Teaching method(s)	Lecture, Practical
Level	400

Course objective
In this course the student will become familiar with the research methodology that is frequently used in musculoskeletal physiotherapy sciences. The student will also learn how to use SPSS for statistical analyses, and how to interpret and document the output in relation to research questions.
Intended learning outcomes:
- To gain knowledge and understanding of research methods commonly used in musculoskeletal physiotherapy (epidemiology, regression analysis, research designs, qualitative research, prognostic research and diagnostic research)
- To be able to apply knowledge to formulate new research questions, to select appropriate research designs, to correctly select and perform statistical procedures using SPSS software, to interpret the output properly and to communicate the methods and findings correctly.
- To be able to use appropriate knowledge and tools to critically appraise the quality of scientific research in musculoskeletal physiotherapy and related fields.
- To reach a level of understanding of clinical epidemiology, experimental research and statistics that enables participation in the debate about strengths and limitations of specific research designs and

statistical procedures.

Course content
Research Methodology in Musculoskeletal Physiotherapy Part 1 provides an overview of research methods and evidence-based musculoskeletal physiotherapy. Topics that are discussed are: revision of basic statistics, descriptive and analytic epidemiology, regression analysis (including multiple and logistic regression), research designs, qualitative research, prognostic research (including survival analysis and clinical prediction rules) and diagnostic research (including clinimetrics (reliability and validity)). The critical appraisal of the quality of studies in these domains is also covered. Practical sessions (computer labs) are organised for students to learn how to apply the statistical methods using statistical software packages (SPSS).

Form of tuition
Preparation time lectures: 44 hours
Lectures: 22 hours
Practical assignments: 20 hours
Exam preparation: 76.5 hours
Exams: 5.5 hours

Type of assessment
Learning outcomes are assessed via a theoretical and practical examination. Both examinations are conducted at the end of the teaching period. The theory examination (65% of total score) consists of short answer questions. In the practical examination (35% of total score), students are requested to analyse datasets using SPSS software. Both examinations are must-pass components (5.5/10).

Course reading
Field (2013) Discovering statistics using IBM SPSS statistics (3th or 4th edition)
Fletcher (2014) Clinical epidemiology (5th edition)
Selected scientific papers and book chapters

Registration procedure
For more info on workgroups, laboratories, (computer) practicals etc. please see Blackboard.

Research meth. in musc. physio 2

Course code	B_REMMP2 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	prof. dr. M.W.J. Coppieters
Examinator	prof. dr. M.W.J. Coppieters
Teaching staff	dr. M.J.M. Hoozemans, prof. dr. M.W.J. Coppieters
Teaching method(s)	Lecture, Practical
Level	400

Course objective
In this course the student will become familiar with the research methodology that is frequently used in musculoskeletal physiotherapy sciences. The student will also learn how to use SPSS for statistical analyses and how to interpret and document the output in relation to research questions.
Intended learning outcomes:
- To gain knowledge and understanding of research methods commonly used in musculoskeletal physiotherapy (clinical effectiveness research designs, statistics in experimental research, systematic reviews, and academic integrity and ethical conduct)
- To be able to apply knowledge to formulate new research questions, to select appropriate research designs, to correctly select and perform statistical procedures using SPSS software, to interpret the output properly and to communicate the methods and findings correctly
- To be able to use appropriate knowledge and tools to critically appraise the quality of scientific research in musculoskeletal physiotherapy and related fields
- To reach a level of understanding of clinical epidemiology, experimental research and statistics that enables participation in the debate about strengths and limitations of specific research designs and statistical procedures, and that enables effective communication and collaboration with other clinicians, researchers, epidemiologists and statisticians
- To understand academic integrity and ethical conduct, and to act accordingly

Course content
Research Methodology in Musculoskeletal Physiotherapy Part 2 continues the overview of research methods and evidence-based musculoskeletal physiotherapy. Topics that are discussed are: clinical effectiveness research designs (including randomised clinical trial methodology), statistics in experimental research (including one-way and two-way, repeated-measures, between groups and mixed design ANOVA), systematic reviews, and academic integrity and ethical conduct. The critical appraisal of the quality of studies in these domains is also covered. Practical sessions (computer labs) are organised for students to learn how to apply the statistical methods using statistical software packages (SPSS).

Form of tuition
Preparation time lectures: 40 hours
Lectures: 20 hours
Practical assignments: 24 hours
Preparation debate: 16 hours
Workgroup debate: 2 hours
Writing report of the debate: 20 hours
Exam preparation: 40.5 hours
Exams: 5.5 hours

Type of assessment
Learning outcomes are assessed via a theoretical and practical examination, and a group presentation accompanied by a written report. Both examinations are conducted at the end of the teaching period. The theory examination (50% of total score) consists of an actual exam with short answer questions and the written report of the academic debate. The practical examination (50% of total score) consists of an actual exam, in which students are requested to analyse a dataset using SPSS software and report the methods and results in line with the

requirements of a scientific journal, and the group presentation. All assessment components are must-pass components (5.5/10).

Course reading
Field (2013) Discovering statistics using IBM SPSS statistics (3th or 4th edition)
Fletcher (2014) Clinical epidemiology (5th edition)
Selected scientific papers and book chapters

Registration procedure
For more info on workgroups, laboratories, (computer) practicals etc. please see Blackboard.

Translational research

Course code	B_TRANSRES ()
Period	Period 3+4+5+6
Credits	6.0
Language of tuition	English
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. A.L. Pool-Goudzwaard
Examinator	dr. A.L. Pool-Goudzwaard
Teaching staff	dr. G.G.M. Scholten-Peeters, dr. A.L. Pool-Goudzwaard
Teaching method(s)	Lecture, Seminar
Level	400

Course objective
In this course the student will become familiar with translational research models within the physical therapy domain. This knowledge will enable the student to describe the next step in translational research related to his or her own research within the master project and all possible following steps in translational research. To create optimal chance for funding of the next step(s) in translational research the student will learn to apply this knowledge in writing a business model for external stakeholders and potential financiers.

Course content
In this course students will gain knowledge and be trained in translational research within the domain of physiotherapy. Data derived from their own master research project will be used to set up the next step in translational research. A paradigm shift is necessary to reach meaningful research questions for stakeholders to invest in research. Development of relevant research questions, setting up a correct design as well as reaching for useful clinical tools, efficacy and (cost) effectiveness and/or implementation will be studied (lectures and self study) and practiced by tutorial groups. The student will learn to interpret and practice this knowledge in writing a business case for external stakeholders for funding of the translational research related to their own master project.

Form of tuition
The lectures will provided global theoretical background of common principles in measuring movement and signal processing and prepare the students for the practical assignments. The lectures and tutorials follow the course manual, with key publications per lecture. Lecture

slides will be posted on BlackBoard after the lectures under Course Documents. The student is encouraged to read through material (literature and assignments) pertaining to the lecture and tutorial groups (see course schedule) beforehand, as this will facilitate the understanding and applying of knowledge in translational research.

The course will comprise lectures on :
• Translational research models
• From lab to clinical research to epidemiological research
• Efficacy and (cost) effectiveness, DALY's and QALY's in PT – relevance for researchers/ stakeholders
• Models in implementation research – relevance for researchers/stakeholders
• How to write a business model
• Sociodemographic analysis on macro-meso/ micro level
• Market /customer analysis
• Financial paragraph of a business case – SWOT analysis

Skills will be trained in
• Analysis of Cost effectiveness Daly's and Qaly's
• Implementation research identifying facilitators and barriers
• Qualitative research setup of questionnaires – Delphi rounds
• How to write a business case relevant for stakeholders, with all its important steps
• How to present a business case to a stakeholder

Type of assessment
The exam exists of an oral presentation and discussion (35%) and writing a business case (65%)

Course reading
literature to be studied: will be provided through blackboard

Registration procedure
For more info on workgroups, laboratories, (computer) practicals etc. please see Blackboard.

Writing and Designing a Research Proposal

Course code	B_WRITPROP ()
Period	Period 3
Credits	3.0
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	prof. dr. A.M.L. Kappers
Examinator	prof. dr. A.M.L. Kappers
Teaching staff	prof. dr. A.M.L. Kappers, dr. K. Levels
Teaching method(s)	Lecture, Seminar
Level	400

Course objective

This course aims to let students gain insight into the different aspects of preparing a research study and to develop the skills to write a research proposal. Students will learn which conditions must be met for a good research proposal. They will have to put this knowledge into

practice by writing their own research proposal.

Course content
Writing a research proposal is not just about having a good idea, but also about motivating and clearly formulating a research question and substantiating the methods used to answer the research question. This skill is required when you conduct research, for example, during your research internship, but also if you want to submit a grant proposal or need to get approval for your study by a (medical) ethical committee. In this course, students will learn how to write a research proposal. Also the process of applying for a grant will be discussed. Experienced researchers will explain which elements of a proposal are important for reviewers. This also includes, for example, setting up your CV and considering ethical issues and societal relevance. These skills are required for and can be used in future (scientific) careers. The proposal can, if applicable, be used as preparation for the research internship, which will start in period 4, but that is not mandatory.

Form of tuition
4 lectures (2 hours), 4 workgroups (2 hours), selfstudy
Active participation in workgroups, providing feedback

Type of assessment
Complete research proposal in a prescribed format

Course reading
Study manual

Registration procedure
For more info on workgroups, laboratories, (computer) practicals etc. please see Blackboard.