Research Methods and Statistical Techniques for Clinical Decision Making in Sports Medicine

Spring 2019

Meeting days: Thursday	Instructors: Brent A. Alvar, Ph.D.
Meeting times: 8:00 – 10:00am	Phone: Dr. Alvar - 619-849-3007
Meeting location: : Mission 201	E-mail: balvar@pointloma.edu
Final Exam: N/A	Office location and hours: Dr. Alvar: KIN #12; M & W; 9:00am – 11:00am or by appointment

PLNU Mission
To Teach ~ To Shape ~ To Send

Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service becomes an expression of faith. Being of Wesleyan heritage, we aspire to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

DESCRIPTION and OUTCOMES

COURSE DESCRIPTION

This course will explore the variety in research design and statistics commonly used in clinical research, further developing student analytical skills needed to support professional evidence-based practice in athletic training. Students will evaluate the merit and relevance of published research to the practice of athletic training from the perspective of experimental methodology and design. This course also provides an overview of statistics including descriptive and inferential statistics and one-way ANOVA. Students should have a basic understanding of conducting library and Internet information searches prior to taking this course. Students will select a topic of interest related to athletic training, conduct a review of the literature, define a research question, and prepare and present a report to their peers. Students will complete Collaborative Institutional Training Initiative (CITI training).

COURSE AIM

INSTITUTIONAL LEARNING OUTCOMES (ILO)

1. **Learning, Informed by our Faith in Christ**
   Students will acquire knowledge of human cultures and the physical and natural world while developing skills and habits of the mind that foster lifelong learning.
2. **Growing, In a Christ-Centered Faith Community**
   Students will develop a deeper and more informed understanding of others as they negotiate complex professional, environmental and social contexts.
3. **Serving, In a Context of Christian Faith**
   Students will serve locally and/or globally in vocational and social settings.

PROGRAM LEARNING OUTCOMES (PLO)

The Point Loma Nazarene University MS-AT graduate will be able to:

1. To prepare students to demonstrate competency in interpreting evidence-based research and improving clinical standards and practice through clinical question development and research methodology
2. To prepare students to develop expertise in the athletic training domains through an integrative experiential clinical model
3. To equip students with appropriate knowledge and educational foundation required for an entry-level Certified Athletic Trainer
4. To prepare students to establish and understand the importance of inter-professional relationships, while collaborating with other health care professionals to become effective communicators
5. To prepare students to demonstrate preparation, knowledge and skill in the delivery of comprehensive health care to a diverse set of patients with musculoskeletal injuries and conditions and illnesses in a distinctly moral and ethical manner, integrating Christian faith with clinical practice.
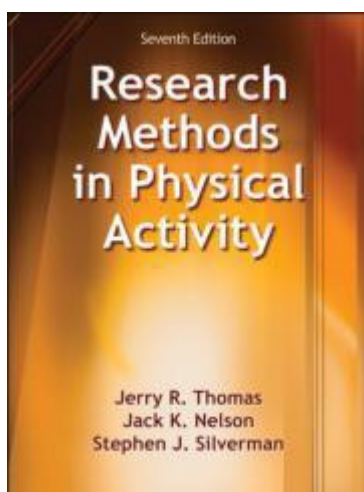
COURSE LEARNING OUTCOMES (CLO)

The following learning outcomes will be achieved by students in this course:

1. Explain the value and importance of developing research ideas, conducting research and employing the scientific method within Athletic to solve relevant problems.

2. Explain the general principles of research design for experimental and non-experimental research, including literature review, sampling procedures, selection of subjects, ethical treatment of subjects, data collection, and IRB standards.
3. Understand basic measurement constructs such as validity, reliability, scales of measurement, field tests, and laboratory tests
4. Employ statistical analysis for the purpose of exploratory data analysis and hypothesis testing, including t-tests, ANOVAs with post hoc tests, factorial ANOVAs, correlation and regression, power analysis, and selected non-parametric procedures.
5. Develop and present a research project proposal

REQUIRED RESOURCES

Thomas, J.R., Nelson, J.K., & Silverman. S. (2015). **Research methods in physical activity** (7th ed.). Champaign, IL: Human Kinetics. Purchase eBook here.

ADDITIONAL RESOURCES PROVIDED:

*   Lecture notes, videos, and journal articles available via the course in Canvas

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law. All supplemental materials posted on this course site (including articles, book excerpts, or other documents) are provided for your personal academic use. These materials may be protected by copyright law and should not be duplicated or distributed without permission of the copyright owner.

ASSESSMENT AND GRADING

Course Requirements: Assessment of Course Learning Outcomes

I. **_Class attendance and Participation (14%):_**
Regular and punctual class attendance is expected of each student in this course. There will also be times when individual and/or group participation is necessary for learning. Student will be assessed for each class period.

II. **_Discussion Board Participation (18%):_**
We have supplemented the course text and lecture materials with current evidence-based medical literature. These readings will be provided via electronic access to journal articles and systematic reviews. It is expected that course material will be read **before** the scheduled lecture so that informed and lively discussion may be the primary focus of class meetings. The aim of supplemental readings is to keep you current with contemporary practice (aka "Journal Club"). After certain readings, and prior to the in-class discussion, you will respond to questions on the Discussion Board on Canvas. At other times, you will be asked to summarize the key points of outside readings by outlining the major points of the article prior to class. You should be ready to discuss these outlines with your colleagues in class. Additionally, you are expected to participate in the People Introductions discussion in Week 1 (worth 5 points).

III. **_NIH Protecting Human Research Participants Certification (4%):_**
All investigators engaging in clinical research where human participants are involved must undergo human subjects training. This training covers the ethical issues involving human participants in research and is administered by the National Institutes of Health (NIH) Office of Extramural Research You will need to submit your certificate of completion by week 3, which is worth 10 points. You cannot participate in any of the course's assignments involving data collection and analysis (described in IV-VI below) without this certificate.

IV. **_Research Article Summaries (5%)_**
Article summaries help you to develop essential skills in critical reading, summarizing, and clear, organized writing. Furthermore, an article summary requires you to read a scholarly article quite closely, which provides a useful introduction to the conventions of writing in the Athletic Training disicplien. Although article summaries are often short and do not account for a large portion of your grade, they are a strong indicator of your reading and writing skills.

V. **_Assignments (20%):_** There are several assignments all designed to enhance your understanding and application of research methods and/or statistical concepts. All write ups need to be completed in APA format and submitted via Canvas before class on the due date (see course schedule).

VI. **_Proposal presentation (18%):Signature Assignment – Assessed Using Oral Rubric_**
During the last week of classes, you will be expected to present your research project in a formal proposal environment. Your grade for this presentation will be based on the quality of your presentation and mastery of the material, your ability to respond to content questions from the audience, and your overall professionalism.

VII. **_Peer Feedback (2%):_** We learn by critiquing others work. Effective researchers need to be able to critically analyze the work of themselves and others. Science is founded on the concept of peer review. This is not a punitive process, rather it is a process designed to improve the final product by insure that threats to validity are accounted for.

VIII. ***Research Proposal (9%): Signature Assignment – Written Rubric***
The culmination of your semester's work will be a completed research proposal document to be submitted via Canvas. This document will be graded based on quality of content, the degree to which you have addressed all the major aspects of your thesis/project topic, and your ability to meet department guidelines for completed thesis/capstone project. Your proposal document should include the following items and will be due in parts at various dates throughout the semester:

- Research Question(s): You will identify your question of interest for the Proposal Project.
- Introduction
- Literature Review – Presenting the Problem
- Proposed Methods and Data Analysis

VII. **Final Exam/Assignment (9%):**
The final exam will be given at the end of the quad and will be summative over the course content covered in class with emphasis on material covered.

INCOMPLETE AND LATE ASSIGNMENTS

All assignments are to be submitted via Canvas by the due date and time listed in the calendar.
Late work (turned in any time after the due date and time) may be turned in until the last day of class, for a maximum of 50% credit (this is a still a failing grade but is better than zero points).
Missed exams may ONLY be made up with a legal, written excuse. A missed exam for an approved reason MUST be completed prior to the subsequent module.

CREDIT HOUR INFORMATION

Distribution of Contact Hours

Course Assignments	Pre-Class Hours	Class Hours	Post-Class Hours
Class Sessions		20	
Online Participation in forums, groups, etc.	10		10
Reading	10	5	10
Writing		5	10
Other Assignments & Learning Activities	10	5	10
Exams & Quizzes	7	1	0
Total Course Hours: 113	37	36	40

Grading Points

Course Assignments	Points
Class Attendance and Participation	80
Discussion Board	100
Research Article Summaries (4 at 10 points)	40
NIH PHRP Certification	25
Assignments	110
Final Exam	50
Final Research Proposal Paper	50
Final Research Proposal Presentation	100
Peer Feedback on Research Proposal Presentation	10
	Total Course Points: 565

COURSE SCHEDULE AND ASSIGNMENTS

Date	Topic	Meeting	*Assignment due this week*
January 7	Introduction	January 10 at 9:00am in Mission 201	Assignment: Scientific Method Research Article Summaries #1
January 14	Research Questions and Hypothesis	January 17 at 9:00am in Mission 201	Discussion: Research Questions and Hypotheses Research Article Summaries #2
January 21	Presenting the Problem	January 24 at 9:00am in Mission 201	Presenting the Problem Paper
January 28	Methodology	January 31 at 9:00am in Mission 201	Research Article Summaries #3

			Methods Paper
February 4	Statistical Analysis	February 7 at 9:00am in Mission 201	Discussion: Statistics in Research Planning Research Article Summaries #4 Stats Paper
February 11	Ethics	February 14 at 9:00am in Mission 201	NIH Protecting Human Research Participants Discussion:
February 18	Lit Summary	February 21 at 9:00am in Mission 201	Final Exam Discussion: Draft of Research Proposal Paper
February 25	Presentations	February 28 at 9:00am in Mission 201	Oral Presentation of Research Proposal Final Research Proposal Paper

Timeline

Week 1: Jan. 7 - 13. Introduction and Scientific Method

Objective: The purpose of this unit is to review the scientific method and begin working on and individual research project

Class Meeting January 10

Students are to participate in course orientation at Mission Valley on January 10.

You should note that attendance and participation is considered critical for all students to gain full value from this course, and is closely correlated with student success and grades. Each weekly seminar period involves providing you with the information you need to write your research project as well as and pass the exams.

Class Attendance and Participation 10 points

Assignments:

Scientific Method
Explain the steps in the scientific method of problem solving. Briefly discuss at least two important assumptions that underlie the scientific method. Explain how these assumptions agree or disagree with the definition set forth by [AERA](#). Be sure to cite references (using APA format), if applicable, to support your claims.
Due January 13 – 10pts

Research Article Summaries #1
Find, review and summarize at least two NEW articles related to your research topic (not used in your CAT). Make sure they to help describe the background information relative to your research problem. Submit using formatting of your choice. Include APA reference for each article.
Due January 13 – 10pts

Week 2: January 14 - 20. Research Problems Hypothesis and Theoretical Rationale

Objective: The purpose of this unit is to review the construction of research hypothesis based on logical research problems and a sound theoretical rationale.

Class Meeting January 17: Class Attendance and Participation 10 points

Discussions #1: Research Problems, Hypotheses and Theoretical Rationale
- **Part 1:** Submit your problem statement and proposed research question that could be your model research paper. You can use the previous work that you conducted for your CAT or chose something completely different. My goal is to give you the experience necessary to design a proper research study. I have provided a couple examples, but your submissions will have a couple more details.
  1. Please explain your Problem Statement and Research Question - one sentence each.
  2. Describe the Specific Aims of the Study
  3. Describe the variables you have included in your research question. Include a description of which variable is being treated as the independent variable and which variable is the dependent variable in your research question.
  4. Identify possible null and research hypotheses that could be created from your research question.

5. Do your best to explain the theoretical rationale for your study (this will not be in the chapter)?

Part 2 : Students will read at least two peers' posts and provide feedback and suggestions to improve the topical area.
Original Post Due January 18 and follow up Posts Due January 20

Research Article Summaries #2: Find, review and summarize two additional articles related to your research proposal. Include a brief discussion of how the articles add to your topical area. Submit via Assignments. Formatting can be of your choice. Include an APA reference for each article. **Due January 20**

Week 3: January 21 - 27. Presenting the Problem

Objective: The purpose of this unit is to give you a better understand of how to frame your research question and apply the evidence that you need in order to enhance your clinical practice.

Class Meeting January 24: Class Attendance and Participation 10 points

Presenting the Problem Paper:

This is the first part of your research project proposal paper.   This review will serve as your background and introduction of your research proposal. Remember, the idea is to give the reader an overview of the research problem, what information is available in the current literature, and any gaps of information that justifies your specific research study.

Follow this outline as a guide for writing your literature review after obtaining and reviewing at least 10 articles related to your topic:

1. **General Introduction**
   - Description of the overall research problem
     1. This might involve epidemiological information
     2. Should start broad and become narrow in focus
   - Statement(s) of Clinical Relevance
     1. Explain why your topical area is important
     2. What does it mean to your specific profession
2. **Summary of Background**
   - Detail in your own words findings published in the current literature
   - Cite references where appropriate (Use the APA format for in-text citations and reference list.)
3. **Lead-in**
   - Summarize your critiques of current literature

- Identify gaps in the available data
4. **Purpose and Hypothesis Statements**
   - State the purpose of your study (as a result of previous research)
   - What is your hypothesis?
5. **What is the theoretical rationale behind your study?**

Your review must be a minimum of 3-4 pages (not including the bibliography) in length and follow APA format using 12-point Times New Roman font, double-spaced. A minimum of 10 references from peer-reviewed sources only.
Due January 27

Week 4: January 28 – February 3. Proposal Methodology

Objective: The purpose of this unit is to give you a better understand of how design a sounds methodological approach to answering a research question.

Class Meeting January 31: Class Attendance and Participation 10 points

Research Article Summaries #3: Find, review and summarize at least two NEW articles related to your research topic (not used in your CAT). Make sure they to help you to design and describe your proposed research methods. They should be exemplar studies, meaning that they provide a framework for how and why you would conduct your own study. Make sure to spend most of your review describing why these articles are a good match for your stated methods. Submit using formatting of your choice. Include APA reference for each article. **Due February 3**

Methods Paper: Students will develop a document (1-2 pages) explaining the methodology proposed for the proposed research paper. This should be a step by step explanation of how the project will be carried out. Details should emphasize the ability to replicate the study by outside researchers. Include references. **Due February 3**

Week 5: February 4 - 10. Statistical Analysis

Objective: The purpose of this unit is to give you a better understand and the ability to define basic statistical terms, compute descriptive statistics and frequency distribution, and interpret the probability, significance, and power of published research data. We will also discuss different statistical techniques and when they are appropriate.

Class Meeting February 7: Class Attendance and Participation 10 points

Discussion: Statistics in Research Planning

For this Discussion, we will review the following paper:

Myer, G. D., Ford, K. R., Palumbo, O. P., & Hewett, T. E. (2005). Neuromuscular training improves performance and lower-extremity biomechanics in female athletes. *Journal of Strength & Conditioning Research, 19*(1), 51-60.

Read and review the paper but don't worry too much about the statistical details (Bonferroni who?).. Post and/or reply to this forum and focus mainly on the main aspects of their research design:

- What is the null hypothesis of their study?
- What is their research hypothesis? (what do the authors believe?)
- What is their alpha? How is it reported in their research paper?
- What is the sample size?
- What is the effect size? Choose a dependent variable (i.e., knee flexion, valgus torque, etc.)
- What is the power of their research study? Run *G*Power* to estimate the post-hoc power of their results (for a paired t test) using the above conditions (alpha, effect size, sample size):

Descriptive Statistics Assignment: Student will complete a descriptive statistics assignment as described in Canvas with the assigned data file. Students will calculate mean, median, mode, standard deviation as well as generate appropriate charts.

Research Article Summaries #4: Find, review and summarize two additional articles that can be used as examplar studies related to your statistical section. Submit via Assignments. Formatting can be of your choice. Include an APA reference for each article. **Due February 10**

Statistics Paper Assignment: Students will develop a document (1-2 pages) explaining the data analysis procedures proposed for the proposed research paper. This should include very specific study variable descriptions, how data will be summarized and/or aggregated and specific details of advanced data analysis (e.g. correlations, group comparisons, etc). Detail should emphasize the ability to determine relevance and appropriateness of the analysis procedures. **Due February 10**

Week 6: February 11 – 17. Ethical Issues in Research

Objective: The purpose of this unit is to give you a better understand and prevent unethical behaviors in research. This includes, scientific misconduct, including fabrication, falsification or plagiarism in proposing, performing, reviewing or reporting research results. You will also complete the NIH training in Human Subjects Testing.

Class Meeting February 14: Class Attendance and Participation 10 points

NIH Human Subjects Testing. Most research in kinesiology involve human participants. Therefore, researcher need to be concerned of issues and situations that may be harmful to human subjects. All investigators involved in clinical research are required to protect the rights and well-being of their participants. In this program as well as most clinical institutions, a certificate of human subjects training is required before research can be performed, regardless of level of involvement at the institution. One such training can be obtained from the NIH Office of Extramural Research and each student must submit this certificate as part of this course. Students will complete the 7 modules of this course. The cost of the course is approximately $40.00.

Discussion Ethical Issues. Students will review and article and provide a summary of the ethical dilemmas presented using the SNFO method. The bulk of your critique should consist of your assessment of the article in regards to responsible research conduct. Please use references to support your opinion.

Service, R. F. (2009). A dark tale behind two retractions. *Science, 326* (5960), 1610-1611. DOI: 10.1126/science.326.5960.1610

Your discussion post should be organized as follows:

- Stakeholders: Who has an interest in the decision being made?
- Facts: What facts are relevant to a solution? Which facts might generate disagreement? What facts may change the outcome of the scenario?
- Norms: What ethical principles, norms or values are present? What professional codes or laws are present? Which principles, norms or values are most relevant? Which conflict and/or generate disagreement?
- Options: What actions deserve serious consideration? What can or should be done differently?

Week 7: February 18 – 24. Writing of the Literature Review

Objective: The purpose of this unit is to give you a better understand and prevent unethical behaviors in research. This includes, scientific misconduct, including fabrication, falsification or plagiarism in proposing, performing, reviewing or reporting research results. You will also complete the NIH training in Human Subjects Testing.

Class Meeting February 21: Class Attendance and Participation 10 points

Peer Review

The purpose of this week is provide peer review of your classmates papers.

Discussions 5: "Start a new thread" with your name (Brent Alvar Discussions #5) and post the draft of your research proposal paper.

Provide Peer Review (via Forum): We learn by critiquing others work. Effective researchers need to be able to critically analyze the work of themselves and others. Science is founded on the concept of peer review. This is not a punitive process, rather it is a process designed to improve the final product by insure that threats to validity are accounted for.

Provide substantive feedback to the assigned 2 colleagues related to decisions the depth and breadth of their paper and the logic of the program.) 10 points each

Initial post Due February 22 and **Feedback Post to 2 Draft Literatures Reviews Due by February 24**. Feel free to post commentary on other student's forums. All feedback is welcome!!

Week 8: February 25 – March 3. Final Literature Review Document and In-Class Presentations

The purpose of this week is to complete the final document for your literature review and well and finalize and give your final research proposal.

Presentation of Research Proposal: Each student will have 10 minutes to present an updated literature review. Students will be evaluated based upon the following:

       -presentation organization

       -communication and professional presentation skills

       -use of presentation time limit

       -ability to address questions during Q/A session

Paper should be submitted via canvas no later than midnight March 3.

Final Paper is Due March 3

LATE ASSIGNMENTS

Late assignments will be subject to a deduction of 10% per day. Even if deadline is missed, all assignments are expected to be submitted.

INCOMPLETES AND LATE ASSIGNMENTS

All assignments are to be submitted/turned in by their assigned dates (midnight). Incompletes will only be assigned under extremely unusual circumstances.

A 20% reduction in grade will be assessed for all late assignments.

SPIRITUAL CARE

PLNU Liberty Station Campus:
PLNU strives to be a place where you grow as whole persons. To this end we provide resources for our graduate students to encounter God and grow in their Christian faith. At the Liberty Station campus we have an onsite chaplain, Rev. Wil Ryland who is available during class break times across the week. If you have questions, desire to meet with Rev Ryland or prayer requests you can contact him directly at gradchaplainlibertystation@pointloma.edu. In addition there are resources for your Christian faith journey available at http://www.pointloma.edu/experience/faith/graduate-student-spiritual-life

PLNU COPYRIGHT POLICY

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

PLNU ACADEMIC HONESTY POLICY

Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See Academic Policies in the Graduate and Professional Studies Catalog for definitions of kinds of academic dishonesty and for further policy information.

PLNU ACADEMIC ACCOMMODATIONS POLICY

If you have a diagnosed disability, please contact Jean Moncada in the Center for Student Success (CSS) within the first two weeks of class to demonstrate need and to register for accommodation by phone at (619) 563-2849 or by e-mail at

jmoncada@pointloma.edu. Ask your academic advisor or program director for any additional accommodation information.

PLNU ATTENDANCE AND PARTICIPATION POLICY

Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See Academic Policies in the Graduate and Professional Studies Catalog for additional detail.

Attendance Policy for Fully Online Courses

Students taking online courses are expected to attend each week of the course. Attendance is defined as participating in an academic activity within the online classroom which includes posting in a graded activity in the course. (Note: Logging into the course does not qualify as participation and will not be counted as meeting the attendance requirement.)

Students who do not attend at least once in any 3 consecutive days will be issued an attendance warning. Students who do not attend at least once in any 7 consecutive days will be dropped from the course retroactive to the last date of recorded attendance.

Students who anticipate being absent for an entire week of a course should contact the instructor in advance for approval and make arrangements to complete the required coursework and/or alternative assignments assigned at the discretion of the instructor. Acceptance of late work is at the discretion of the instructor and does not waive attendance requirements.

Attendance Policy for Hybrid/Blended Courses

Students taking hybrid/blended courses are expected to attend each week of the course. Attendance is defined as participating in an academic activity within the online classroom which includes posting in a graded activity in the course and attending face-to-face class meetings. (Note: Logging into the course does not qualify as participation and will not be counted as meeting the attendance requirement.)

Students who do not attend at least once in any 3 consecutive days in the online course will be issued an attendance warning. Students who do not attend at least once in any 7 consecutive days in the online course or face-to-face sessions will be dropped from the course retroactive to the last date of recorded attendance.

ACADEMIC STANDING

Graduate students at Point Loma must obtain a 3.0 GPA to remain in good standing in the MS Kinesiology program: http://catalog.pointloma.edu/content.php?catoid=20&navoid=1403#Academic_Standing. Additionally, all graduate students need to earn a C or higher in all graduate courses according to the catalog grading policy:

Grading System

Traditional letter grades (A, B, C, D, F) including plus and minus grades are used to indicate the level of scholarship earned for each course. Except for the correction of an error, all traditional letter grades are final at the conclusion of the academic term. Once the degree has been posted on the student's official transcript, no change of grade action is allowed for courses leading to the degree. The grade of C is the lowest grade acceptable for graduate credit

No	Competency
EBP-3	Describe and differentiate the types of quantitative and qualitative research, research components, and levels of research evidence.
EBP-4	Describe a systematic approach (eg, five step approach) to create and answer a clinical question through review and application of existing research.
EBP-8	Describe the differences between narrative reviews, systematic reviews, and meta-analyses.
EBP-12	Describe the types of outcomes measures for clinical practice (patient-based and clinician-based) as well as types of evidence that are gathered through outcomes assessment (patient-oriented evidence versus disease-oriented evidence).
PHP-2	Identify and describe the measures used to monitor injury prevention strategies(eg, injury rates and risk, relative risks, odds ratios, risk differences, numbers needed to treat/harm).
CE-10	Explain diagnostic accuracy concepts including reliability, sensitivity, specificity, likelihood ratios, prediction values, and pre-test and post-test probabilities in the selection and interpretation of physical examination and diagnostic procedures.