MARBELLA INTERNATIONAL UNIVERSITY CENTRE

Module Study Guide

Academic Year 2021–2022

Sport Analytics - SA

Level: 4

Credits: 10 ECTS

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1 Module overview

1.1 Introduction

Participation in sport, exercise, and physical activity are strongly associated with positive health benefits for both individuals and populations. The ability to accurately measure these behaviors is critical for establishing participation levels, screening for people who undertake insufficient levels of sport/exercise/physical activity, quantifying relationships with specific health outcomes and diseases, estimating overtraining and for determining the effectiveness of interventions.

1.2 Module summary content and aims

This unit focuses on integrating basic and advanced principles of quantitative research methods with a contemporary approach to data analysis built on magnitude-based inference statistics, with specific application to sport and exercise sciences. The unit will provide graduates with the skills to understand statistical analyses, including considering assumptions, limitations or pitfalls and conduct applied research, analyse data in ways that are relevant to sports and clinical practitioners and academics. Graduates will learn how to communicate research outcomes that can be understood by a variety of stakeholders (e.g., scientific community, coaches etc.).

The module is composed mainly of lectures and seminars and will run throughout the semester (14 weeks).

1.3 Learning outcomes to be assessed

At the end of the module you will be able to:

LO1. Analyse and critique contemporary perspectives and theories related to research in the field of sport and exercise sciences (Summative Assessment 1, 2, 3 & 4)

LO2. Clarify the essential elements and processes involved in undertaking applied statistical analysis. (Summative Assessment 1, 2, 3 & 4)

LO3. Undertake and communicate complex statistical analysis. (Summative Assessment 4)

LO4. Devise a methodology to collect and analyse data that can be applied to a minor thesis or industry project. (Summative Assessment 4)

1.4 Indicative Contact Hours

Teaching Contact Hours	56 hours
Independent Study Hours	144 hours
Total Learning Hours	200 hours

1.5 Summative assessment grid

Type of Assessment	Word Count or equivalent	Threshold (if Professional Body-PSRB applies)	Weighting	Pass Mark	Indicative Submission week	Method of Submission & Date of Feedback (refer to NEOlms)
A1: Written Examination (In-class exercise 1)	30 mins	n/a	10%	40	Week 4 (Date and Time TBC)	Via NEOLMS & 5 working days after in-class exercises
A2: Written Examination (In-class exercise 2)	30 mins	n/a	10%	40	Week 6 (Date and Time TBC)	Via NEOLMS & 5 working days after in-class exercises
A3: Written Examination (In-class exercise 3)	30 mins	n/a	10%	40	Week 8 (Date and Time TBC)	Via NEOLMS & 5 working days after in-class exercises
A4: Written Assignment (Final Project)	1500 words (+/-10%)	n/a	70%	40	Week 16 (Date and Time TBC)	Via NEOLMS & 10 working days after the assessment

1.6 Assessment brief including criteria mapped to learning outcomes

Assessment 1: In-class Exercise (1) Descriptive Statistics

This assessment will consider the understanding of basic statistics elements and research, measures of central tendency, variation, and frequency distribution.

Assessment criteria for Assessment 1 (LO1, LO2 will be assessed)
This assessment will be marked according to the following criteria:

- **Knowledge and understanding (30%):** Demonstrates an understanding of the principles, terms and concepts of statistics. Answers provide accurate information to the proposed questions.
- **Cognitive Skills (20%):** Ability to analyse problems and apply learned concepts into multidisciplinary areas.
- **Practical and professional skills (20%):** Independence, capacity, creativity and initiative to provide practical solutions to the questions proposed.
- **Transferable and key skills (30%):** Demonstrates outstanding skills in presenting information and results. Independent work abilities with minimal guidance will also be considered.

Assessment 2: In-class Exercise (2) Probability

This assessment will assess your understanding of graphical representation of data and foundations of probability.

Assessment criteria for Assessment 2 (LO1, LO2 will be assessed)
This assessment will be marked according to the following criteria:

- **Knowledge and understanding (30%):** Demonstrates an understanding of the principles, terms and concepts of statistics. Answers provide accurate information to the proposed questions.
- **Cognitive Skills (20%):** Ability to analyse problems and apply learned concepts into multidisciplinary areas.
- **Practical and professional skills (20%):** Independence, capacity, creativity and initiative to provide practical solutions to the questions proposed.
- **Transferable and key skills (30%):** Demonstrates outstanding skills in presenting information and results. Independent work abilities with minimal guidance will also be considered.

Assessment 3: In-class Exercise (3) Distributions and hypothesis testing

This assessment will consider the understanding of well-known variable distributions and main statistical tests for hypothesis testing.

Assessment criteria for Assessment 3 (LO1, LO2, LO3 will be assessed)
This assessment will be marked according to the following criteria:

- **Knowledge and understanding (30%):** Demonstrates an understanding of the principles, terms, and concepts of statistics. Answers provide accurate information to the proposed questions.
- **Cognitive Skills (20%):** Ability to analyse problems and apply learned concepts into multidisciplinary areas.
- **Practical and professional skills (20%):** Independence, capacity, creativity, and initiative to provide practical solutions to the questions proposed.

— **Transferable and key skills (30%):** Demonstrates outstanding skills in presenting information and results. Independent work abilities with minimal guidance will also be considered.

Assessment 4: Final project

The marking criteria will consider the knowledge and understanding and cognitive skills of the student in statistics. Practical and professional skills will be considered to assure that the student choose an appropriate statistical technique for the provided dataset. Moreover, the marking criteria will consider transferrable and keys skills to assure the creativity, presentation abilities or clarity, among others.

Assessment criteria for Assessment 4 (LO1, LO2, LO3 and LO4 will be assessed)
This assessment will be marked according to the following criteria:

- **Knowledge and understanding (30%):** Demonstrates an understanding of the principles, terms and concepts of statistics. Answers provide accurate information to the proposed questions.
- **Cognitive Skills (20%):** Ability to analyse problems and apply learned concepts into multidisciplinary areas.
- **Practical and professional skills (20%):** Independence, capacity, creativity, and initiative to provide practical solutions to the questions proposed.
- **Transferable and key skills (30%):** Demonstrates outstanding skills in presenting information and results. Independent work abilities with minimal guidance will also be considered.

For guidance on online submission of assignments, including how to submit and how to access online feedback, please refer to the MIUC lms student guideline.

1.7 Learning materials

The reading list for this module is available on lms in the module area

- **Core textbook(s):**

- Bennett, J. *Statistic in sport*. Arnold. (1998)
- Caldwell, S.*Statistics Unplugged*. 4th edition (2013)
- Conrad Carlberg, *Statistical Analysis: Microsoft Excel 2010*. Pearson Education Inc
- Diez, D.M., Barr, C.D., Cetinkaya-Rundel, M.*OpenIntro Statistics*. 3rd edition (2015)
- Wheelan, C.J.*Naked statistics: stripping the dread from the dat.*(2013)

- **IT, audio-visual or learning technology resources**

Moneyball movie 2011

Alphago documentary 2017

- **Other recommended reading:**

- Cumming, G. & Calin-Jageman, R. (2017).*Introduction to the New Statistics. Estimation, open Science, and Beyond.* Routledge.
- F. Stephan David, A. Szabat Kathryn, M. Lev David. *Statistics for Managers Using Microsoft Excel* 8thEdition

Remember to log into MIUC lms daily to receive all the latest news and support available at your module sites!

2 Things you need to know

2.1 Engagement

During the academic year 2021-22, the health, welfare and safety of all our students and staff is our top priority as Spain continues to deal with the ongoing implications of the COVID-19 outbreak.

Face to-face-teaching, access to MIUC facilities and being part of our unique University community are key parts of the excellent student experience at MIUC. We have been working to create a safe and efficient plan that will allow us to deliver these elements when you start with us in the fall semester, subject to government regulation.

MIUC will be ready to teach in September and we are committed to engaging with you as closely as we can, and to ensuring that you have a rich educational experience that is safe and protected to ensure that you continue to get the most from the University life and the city of Marbella.

Whether you are engaging with teaching and learning activities on site or via the MIUC Virtual Learning Environment, we expect the same level of commitment and engagement from you. If you are unable to attend scheduled on site or online activities or complete activities in the timeframes set out, you should let your module leaders know. You should aim to stick to assessment deadlines; if you are concerned that you will not be able to complete your assessments on time, you should talk to your module leaders. Your engagement, whether online or on site, will be tracked and if we see that you are not engaging, we will get in contact with you. However, we encourage you to let us know if you are struggling so we can work with you to find solutions and get you back on track as soon as possible. Give yourself the best possible chance to succeed by engaging with the full range of learning and teaching activities available to you.

2.2 Need help, just ask

The University recognises that there are times when you may encounter difficulties during your course of study and provisions are made to help you. If you are struggling with meeting deadlines please talk to us, whether it's your course/module leader, personal tutor or any member of staff, speak to them so they can get you the support you need to succeed. You can extend your deadline if you have a good reason why you are not able to submit a piece of coursework on time, apply online for an extension before your deadline. An extension will allow you an extra 10 working days. If an extension is not sufficient and circumstances beyond your control are preventing you from completing your assessment, then you can, apply online for mitigation.

Please remember late submission without extension or mitigation will result in penalties depending on how late it is, see Academic Regulations.

You are reminded that MIUC applies penalties to students who commit an academic offence, in which case the Academic Offences Regulations will be used to deal with any cases of academic misconduct including examination offences, plagiarism and other means of cheating to obtain an advantage.

You are encouraged to seek advice from the Students' Union and counselling service which support you with all aspects of your academic experience by providing advice and guidance to ensure you are fully informed of the academic regulations as well as advocate for student views.

You are expected to behave in line with University expectations, irrespective of whether your interactions with staff and other students are in person or online. As you will be engaging with others online and a range of online materials, it is important to consider how to stay safe online and ensure your communications are secure and appropriate. If you have any questions about how to manage your online activities, please contact your module leader.

If you have an issue about the module, you should speak to your Module Leaderor Course Leader informally in the first instance. Your Course Representative can also raise your concerns at Course Committees, which take place each semester. If you are unable to resolve it informally, you should refer to the Complaints Procedure which is outlined in the student handbook and consult the Students' Union about it. The University aims to ensure that issues are resolved informally as quickly as possible to have minimum impact on your studies.

2.3 Getting support for your studies

Throughout your course of study, you will have access to a wide variety of sources of support depending on your individual circumstances and needs. Your first point of call for getting general academic support is your Personal Tutor. As well as approaching your Module Leader with any questions specifically related to your module and your Course Leader with questions on your Course, do contact your Personal Tutor for academic advice in relation your studies and your academic development.

Apart from the University-wide support framework, which encompasses the Module Leaders, Course Leader, the Subject Librarian and your Course Administrator, you will also have at your disposal the MIUC Academic Support Team. The Team offers Academic Skills Workshops throughout the year, helping you to develop skills relevant to your degree. Workshops include for instance Essay Planning and Writing; Critical Thinking; Reflective Writing; Group Work and Presentation Skills.

English Language support and One-to-one academic support opportunities are also available. For information about all these services, please consult the Academic Office.

2.4 Student support

In addition to the support listed in the previous section, there is also more help offered by MIUC Student services, consisting of Student Life Department, Internship Support, Life Coaching Service and Counselling service. They offer a wide range of support and services consisting of extracurricular activities; Careers and internship support; Student Welfare and Counselling.

Contact Student Services for more information at:

Student Life Department: student.life@miuc.org

Internship Support: TBC

Life Coaching Service: Ms. Ana Cantle, ana.cantle@miuc.org

Counselling Service: Ms. Eva Berkovic, eva@miuc.org

2.5 Module evaluation – have your say!

Towards the end of the module you will be invited to provide someanonymousfeedback to the Module Leader through a (online) survey. This is your opportunity to give some direct feedback about the module through a series of questions and free text. Your constructive feedback will help the Module Leader and teaching team to understand the module experience from your perspective and helps inform the development of the module.

3 Appendix: Weekly Content

Week 1 - Introduction to Statistics

Key concepts/issues: Welcome to Class; Using statistics in multidisciplinary areas; Valid and Reliable research

Literature for this session:

- Caldwell, S. (2013) *Statistics Unplugged*. 4th edition. [Chapter 1]
  Free available here, at the **Library** or under the **Readings** folder.
- Diez, D.M., Barr, C.D., Cetinkaya-Rundel, M. (2015) *OpenIntro Statistics*. 3rd edition. [Chapter 1]
  Free available here or at the **Library**.
- Wheelan, C.J. (2013) *Naked statistics*: stripping the dread from the data. [Chapter 1]
  Available at the **Library**.

Independent study: Assigned Readings.

Description:

This session will introduce you to the module organization, structure and assessments. You will be exposed to the time commitments you will need to make and the skills you will develop through the duration of the module. Furthermore, you will get an understanding of the importance of statistics in multidisciplinary areas and for valid and reliable research.

Week 2 - Basic elements in research, populations, and sampling

Key concepts/issues: Population; Sample; Variables: types and classification

Literature for this session:

- Caldwell, S. (2013) Statistics Unplugged. 4th edition. [Chapter 2]
  Free available here, at the **Library** or under the **Readings** folder.
- Diez, D.M., Barr, C.D., Cetinkaya-Rundel, M. (2015) OpenIntro Statistics. 3rd edition. [Chapter 1]
  Free available here or at the **Library**.

Independent study: Assigned Readings.

Description:

In this session, you will be introduced to the concepts of population and sample as terms that refer to the ideal case of infinite data available and to the concrete data you are dealing with. Moreover, you will learn how variables of your data can be classified.

Week 3 - Measures of Central Tendency and measures of Variability

Key concepts/issues: Measures of central tendency (mean median mode); Measures of variability (range, variance, standard deviation)

Literature for this session:

- Caldwell, S. (2013) Statistics Unplugged. 4th edition. [Chapter 2]
  Free available here, at the **Library** or under the **Readings** folder.
- Wheelan, C.J. (2013) Naked statistics: stripping the dread from the data. [Chapter 2]
  Available at the **Library**.
- Coolican Chapter 15
  Available at the **Library** or under the **Readings** folder.

Independent study: Complete exercises

Description:

In this session, you will be introduced to two important statistics measures of a variable: the central tendency and the variability. You will learn how to calculate the mean, median and mode as measures of central tendency as well as to calculate the range, variance and standard deviation to get the variability of a given variable.

Week 4 - Frequency Distribution – Summarising Data

Key concepts/issues: Measures of central tendency (mean median mode); Measures of variability (range, variance, standard deviation)

Literature for this session:

- Caldwell, S. (2013) Statistics Unplugged. 4th edition. [Chapter 2]
  Free available here, at the **Library** or under the **Readings** folder.
- Wheelan, C.J. (2013) Naked statistics: stripping the dread from the data. [Chapter 2]
  Available at the **Library**.
- Coolican Chapter 15
  Available at the **Library** or under the **Readings** folder.

Independent study: Complete exercises

Description:

In this session, you will be introduced to two important statistics measures of a variable: the central tendency and the variability. You will learn how to calculate the mean, median and mode as measures of central tendency as well as to calculate the range, variance and standard deviation to get the variability of a given variable.

Week 5 - Graphical representation of data

Key concepts/issues: Graphs; Bar charts, line charts, histograms; Exploration, stem and leaf display, box plot

Literature for this session:

- Coolican Chapter 14
  Available at the **Library** or under the **Readings** folder.

Independent study: Assigned Readings.

Description:

In this session, you will get a better understanding of your data using different ways of representing your data in a graph. In this sense, you will be introduced to bar and line charts, histograms or box plots among other existing types of graphs.

Week 6 - Foundations of probabilities – Part I

Key concepts/issues: Facts; Probability

Literature for this session:

- Diez, D.M., Barr, C.D., Cetinkaya-Rundel, M. (2015) OpenIntro Statistics. 3rd edition. [Chapter 2]
  Free available at the **Library** or under the **Readings** folder.
- Wheelan, C.J. (2013) Naked statistics: stripping the dread from the data. [Chapters 5 and 7]
  Free available at the **Library**.

Independent study: Complete exercises

Description:

In this session, you will be introduced to the statistical concept of probability. In statistical terms, you will learn how to measure the probability of having a concrete fact of interest.

Week 7 - Combinatorial statistics

Key concepts/issues: Permutations; Variations; Combinations

Literature for this session:

- Diez, D.M., Barr, C.D., Cetinkaya-Rundel, M. (2015) OpenIntro Statistics. 3rd edition. [Chapter 2]
  Free available at the **Library** or under the **Readings** folder.
- Wheelan, C.J. (2013) Naked statistics: stripping the dread from the data. [Chapters 5 and 7]
  Free available at the **Library**.

Independent study: Complete exercises

Description:

In this session, you will be introduced to permutations and combinations of objects chosen from a sample space, since a preliminary knowledge of combinatorics is necessary for a good command of statistics.

Week 8 - Foundations of probabilities – Part II

Key concepts/issues: Conditional probability; Bayes theorem

Literature for this session:

- Diez, D.M., Barr, C.D., Cetinkaya-Rundel, M. (2015) OpenIntro Statistics. 3rd edition. [Chapter 2]
  Free available at the **Library** or under the **Readings** folder.
- Wheelan, C.J. (2013) Naked statistics: stripping the dread from the data. [Chapters 5 and 7]
  Free available at the **Library**.

Independent study: Complete exercises

Description:

In this session, you will be introduced to the statistical definition of conditional probability. Commonly, an event will happen linked to another event thus requiring to re-define the concept of probability in such a way that these two events are considered.

Week 9 - The Normal Distribution

Key concepts/issues: The normal distribution (the bell curve); Z-scores; Probability and percentiles

Literature for this session:

- Caldwell, S. (2013) Statistics Unplugged. 4th edition. [Chapters 3 and 4]
  Free available here, at the **Library** or under the **Readings** folder.
- Diez, D.M., Barr, C.D., Cetinkaya-Rundel, M. (2015) OpenIntro Statistics. 3rd edition. [Chapter 3]
  Free available at the **Library** or under the **Readings** folder.
- Coolican Chapter 15
  Free available at the **Library** or under the **Readings** folder.

Independent study: Assigned Readings.

Description:

In this session, you will learn different distributions from which a variable can be drawn according to statistics. In particular, you will learn the main features of the well-known normal distribution (bell shape). Moreover, you will learn the concept of z-scores as well as how to calculate it given a normal distribution of a variable.

Week 10 - Mean hypothesis testing

Key concepts/issues: The t-statistic; Independent samples t-test; Paired samples t-test; Interpreting statistical tests.

Literature for this session:

- Caldwell, S. (2013) Statistics Unplugged. 4th edition. [Chapters 7, 8 and 9]
  Free available here, at the **Library** or under the **Readings** folder.

Independent study: Assigned Readings.

Description:

In this session, you will be introduced to the concept of hypothesis testing. There exists many statistical test to test different hypothesis from which you will learn how to perform a t-statistic to test whether the mean of two given distributions are equal or not. Moreover, you will learn how to extend this statistical test to perform a paired samples t-test.

Week 11 - Analysis of variance: basic

Key concepts/issues: ANOVA; F-test

Literature for this session:

- Carlberg [Chapter 10]
  Free available here, at the **Library** or under the **Readings** folder.

Independent study: Assigned Readings.

Description:

In this session, you will receive a basic introduction to two well-known statistical tests used to test hypothesis related to the variance of two given distributions: ANOVA and F-test.

Week 12 - More advanced statistical tests

Key concepts/issues: Review of Hypothesis testing and tests of mean differences: t-test; Analysis of Variance (ANOVA); Chi-Square test

Literature for this session:

- Caldwell, S. (2013) Statistics Unplugged. 4th edition. [Chapters 7, 8 and 9]
  Free available here, at the **Library** or under the **Readings** folder.
- Caldwell, S. (2013) Statistics Unplugged. 4th edition. [Chapters 11]
  Free available here, at the **Library** or under the **Readings** folder.

Independent study: Assigned Readings.

Description:

In this week's sessions, we will review the principles of hypothesis testing and statistical significance. We will also review tests of mean differences including the independent samples t-test. In addition to this we will cover more advanced techniques, including the One Way Analysis of Variance (ANOVA) and the Chi Square test.

Week 13 - Linear bivariate Correlations

Key concepts/issues: Pearson's product-moment correlation coefficient (r); Linear Regression; Prediction

Literature for this session:

- Caldwell, S. (2013) Statistics Unplugged. 4th edition. [Chapter 12]
  Free available here, at the **Library** or under the **Readings** folder.
- Diez, D.M., Barr, C.D., Cetinkaya-Rundel, M. (2015) OpenIntro Statistics. 3rd edition. [Chapter 7]
  Free available here, at the **Library** or under the **Readings** folder.

- Wheelan, C.J. (2013) Naked statistics: stripping the dread from the data. [Chapters 4 and 12]
  Free available here, at the **Library** or under the **Readings** folder.

Independent study: Assigned Readings.

Description:

In this session, you will learn to study the relationship between two variables in your data. You will be introduced to the Pearson correlation coefficient to measure how two variables correlate between each other. Moreover, you will learn the concept of prediction where a dependent variable wants to be predicted from a set of independent variables. You will be introduced to the simplest statistical predictive model: linear regression.

Week 14 - Writing reports in statistics

Key concepts/issues: Summarising results; Reporting findings

Literature for this session:

- Review of previous material

Independent study: Assigned Readings

Description:

In this session, you will learn how to summarize results of any case study base on statistical concepts learned so far. Moreover, you will be prepared on how to report statistical findings of your research study.