Unit 25: Research Investigation in Sport and Exercise Sciences

Unit code: F/600/0030

QCF Level 4: BTEC Higher National

Credit value: 10

Guided learning hours: 60

Aim and purpose

This unit provides an opportunity for the learner to design and independently carry out an in-depth research investigation into a topic of personal interest arising from any area within the sport and exercise sciences.

Unit introduction

This unit will enable learners to develop the pre-requisite skills, knowledge and understanding to be able to undertake a major research investigation. Throughout this unit, learners will develop and enhance their scientific research and investigative skills, maintaining close communication with the unit assessor whilst independently carrying out their research investigation. It is intended that this unit will build on well-established research skills developed during the first year of study at BTEC National level.

This unit provides the experience and opportunity for in-depth research and data analysis which will enhance the skills gained from studying at National level. Learners will develop an appreciation of the wide variety of research strategies and techniques used within the sport and exercise sciences and how to solve problems in a scientific way.

Learners will develop the ability to take responsibility for their own learning by independently identifying a research problem to be solved. Determining the solution to their research problem could have a number of benefits. For example, helping to improve educational practice or helping learners develop useful skills from pursuing their investigation. Whatever the rationale for developing their research proposal, it is important that the research topic is of personal interest to the learner. The research problem may arise from the real-world setting or be generated from theoretical concepts. Whichever route learners choose to take, it is paramount that in order to propose a valid research problem the learner possesses, or acquires, an in-depth knowledge about their topic of personal interest.

By conducting a literature review, learners will be able to explore and examine previous methodologies employed to solve particular scientific problems. A literature review can provide a wealth of information concerning selection of subjects, methodology and equipment, research design, statistical analyses, research implications and recommendations for future study within the area of interest. By conducting a review of the literature in an area of personal interest, learners will become familiar with research conducted by other people and will be able to see how this can relate to, and support, the formulation of their own research hypotheses. Learners will then design their research proposal and conduct an original investigation to test their research hypotheses.

This unit is designed to give learners an appreciation of the importance of data analysis for scientific research. Learners will apply appropriate statistical tests in order to carefully analyse research evidence and data collected, providing a clear and accurate account of their investigation. The final part of this unit will culminate in learners producing their research investigation in standard scientific format following dissertation guidelines.

Learners could use and apply knowledge and skills gained from this unit to bridge the gap between college/ school and progression to further study on an undergraduate degree or professional qualification in the sport and exercise sciences or related areas.

Learning outcomes

On completion of this unit a learner should:

1 Be able to design a research investigation

2 Be able to implement the investigation and interpret results

3 Be able to review the results of the research investigation

4 Be able to present the research investigation.

Unit content

1 Be able to design a research investigation

Research proposal: area of study (rationale for selection); statement of the problem; background to the problem; review of associated literature, eg locate, read and index literature from primary sources, secondary sources, consider usefulness/relevance of literature, references; critique of literature; investigation aim; research hypotheses (null and alternative hypotheses); justification of the study; research method; scope and limitations; implications, eg resources

Research design: systematic; original; ethical considerations in sport and exercise sciences (regarding human experimentation); health and safety considerations in sport and exercise sciences, eg gaining permission to test, production of disclaimer, informed consent; type of research, eg qualitative, quantitative; subject characteristics; subject safety considerations; sample size; methodology; resources; statistical analyses; validity; reliability; control of variables

2 Be able to implement the investigation and interpret results

Implement: eg according to research design and research method, to test research hypotheses, considering test validity, reliability, considering health and safety of subjects

Data collection techniques: type, eg qualitative, quantitative; selection of appropriate tools for data collection; systematic recording; appropriate units; methodological problems, eg bias, variables and control of variables, validity, reliability

Present data: eg use of tables, use of graphs

Data interpretation: selection of appropriate methods of analysis; selection of relevant statistical test, eg t-test, Pearson's Product Moment Correlation Coefficient (r), Analysis of Variance, Intraclass Correlation Coefficient; level of significance

3 Be able to review the results of the research investigation

Results: success of the investigation with reference to aim and hypotheses; validity of results; reliability of results; discussion of outcome(s) in terms of literature review; conclusion(s)

Future consideration: significance of research investigation; application of research results; implications; limitations of the investigation; improvements; recommendations for further research

4 Be able to present the research investigation

Scientific format: title page; contents page (list of tables, list of figures); acknowledgements; abstract; introduction; review of literature; methodology; hypotheses (null and alternative hypotheses); results (statistical analysis of data); discussion; conclusion; references (Harvard referencing system); appendices

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 produce a valid research proposal for a sport and exercise sciences-based research investigation, with tutor support [IE1, IE2, IE3, CT1, CT2, CT3, CT4, CT5, CT6, SM3]	**M1** produce a valid research proposal for a sport and exercise sciences-based research investigation, with limited tutor support	**D1** independently produce a valid research proposal for a sport and exercise sciences-based research investigation
P2 describe the research design for a sport and exercise sciences-based research investigation [IE1, IE2, IE3, CT1, CT2, CT3, CT4, CT5, CT6, SM3]	**M2** explain the research design for a sport and exercise sciences-based research investigation	**D2** justify the research design for a sport and exercise sciences-based research investigation
P3 implement the research investigation, describing data collection techniques [IE1, IE2, IE3]	**M3** implement the research investigation, explaining data collection techniques	
P4 present and interpret collected data, applying statistical techniques to describe the research results [IE4, IE6]	**M4** present and interpret collected data, explaining the research results	**D3** present and interpret collected data, analysing the research results.
P5 review the investigation results, explaining areas for future consideration [IE4, IE6, RL5, EP4]	**M5** critically analyse the investigation results, justifying areas for future consideration.	
P6 produce the research investigation, following standard scientific format. [IE4, IE6, RL5]		

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key			
	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

Delivery of this unit may be integrated with other units across the BTEC Level 3 Nationals in Sport and Sport and Exercise Sciences programme of study. The unit should be delivered in the second year of the programme. Learners will need to develop research skills and techniques from their underpinning knowledge of scientific investigation arising from the first year of study. It is important that the research topic is of personal interest to learners and that learners possess or acquire an in-depth knowledge and understanding of the topic and related areas.

Although a major part of the delivery focuses on learners practically conducting their research investigation, the unit must be supported by theoretical input from the tutor. Learners must understand concepts related to the research proposal and design as well as research skills, techniques and methodologies before they can consider, explore and produce a valid research proposal. At the research proposal stage, the tutor may, if necessary, provide support to help shape the proposal and give the learner direction to ensure an original and valid research proposal is presented. Tutors should note that if support is provided, this will affect the final unit grade that learners will be capable of achieving.

The research proposal will require learners to adopt an in-depth and investigative approach and will include a statement of the problem and background factors related to it. At this stage tutors should direct learners to consider why is the proposed investigation worthwhile, who would the results be useful to, what is the research problem, what does the literature say, what are the hypotheses and what would the investigation contribute to the field of sport/sport and exercise sciences? If support from the tutor is needed at the research proposal stage it should be given in order to ensure the resulting proposal and design are valid. The level of tutor support required will affect the overall grade learners will be capable of achieving for the unit.

Once the area to be investigated has been established by learners and agreed with the tutor, learners may commence their full research proposal. The proposal will include a review and critique of the associated literature, the aim of the investigation, research hypotheses and consideration of any implications for the project. Learners will then be able to independently move onto their research design. The research design will include health, safety and ethical considerations for their investigation as well as the type of research to be conducted, test methodology and statistical analyses. Learners must give due consideration to availability of, and access to, resources for their investigation. They will also need to consider validity and reliability issues and control of variables.

Following production of a valid research proposal and design, learners will be able to move onto the independent implementation of their research investigation and interpretation of research results. Learners should be introduced to quantitative and qualitative data collection techniques and application of techniques to their research methodology. Learners need to be aware of, and use, appropriate methods of analysis for their investigation, including application of statistical test(s). It would be beneficial for tutors to use appropriate computing facilities with suitable software (use of spreadsheets, Statistical Package for the Social Sciences – SPSS) to aid delivery of the statistical analyses component of the unit. However, statistical analyses to determine degree of difference in data results, such as t-tests, and analyses to determine degree of correlation, such as Pearson's (r), can be successfully computed by hand. Learners need to be aware of the level of significance used to interpret data results.

Following independent implementation of their investigation and interpretation of data results, learners will then review their results in terms of meeting the original aim and hypotheses. The review will include the validity and reliability of results and how the outcomes and conclusions link back to the literature review and critique. By applying their in-depth knowledge and understanding of the research topic, learners will need to explain areas for future consideration, including limitations of their investigation and recommendations for further research.

Learners must understand and follow correct conventions for scientific report writing and produce their completed research investigation adopting standard scientific format.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Tutor overview of the unit and assessment.
Interactive lecture: the process of developing a valid research proposal. **Assignment 1: The Research Proposal (P1, M1, D1, P2, M2, D2)**. Tutor introduces the assignment brief.
Tutor introduction to research methods and techniques – including learner activity covering Harvard referencing system.
Lecture and case studies: health, safety and ethical guidelines for testing human subjects – including essential features of an informed consent form.
Designing research hypotheses – learner activity.
Developing the research proposal: group work and individual tutorials, includes learner-initiated private study – research of the literature.
Writing the literature review and critique: group discussion of literature review exemplar and critique.
Lecture: how to write a critique – exemplar and learner activity.
Overview of the research design: learner activity focusing on scientific format for capturing subject characteristics and essential features of the methodology.
Presenting the research proposal and design – learner verbal presentations to the group, includes time allocated for questions and tutor support if required.
Assignment 2: The Research Investigation (P3, M3, P4, M4, D3, P5, M5, P6). Tutor introduces the assignment brief.
Introduction to validity, reliability and control of variables: learner activity to account for these in their research design – feedback to the group and group discussion.
Designing informed consent and disclaimers – learner activity.
Introduction to statistical analyses: t-tests – learner activity.
Introduction to statistical analyses: Pearson's (r) and ICC – learner activity.
Introduction to statistical analyses: ANOVA – computer-based learner activity using statistical package.
Data collection techniques: group work and individual tutorials, includes time allocated to learner research and study.
Developing and confirming the research proposal and design – includes time allocated to learner individual tutorials.
Data collection – includes time allocated for learners to present the data collected.
Statistical analyses and interpretation of results – against original aims and hypotheses.

Topic and suggested assignments/activities and/assessment
Reviewing investigation results and future considerations – group work and individual tutorials.
Preparing the research investigation – includes computer time to prepare presentation of the investigation following scientific format.
Review of the research investigation and assessment of the unit. Includes time for evaluation.

Assessment

Assessment of this unit is through the production of a research investigation, following standard scientific format.

For P1, learners need to produce a valid research proposal covering the areas stated in the *Unit content*. Tutors may provide support at the research proposal stage to ensure overall investigation design is sound. If learners require substantial tutor support and direction with their research proposal, then the higher grading criteria (M1, D1) cannot be achieved. Tutors must provide the level of support required by learners at this stage to ensure that the resulting research proposal is valid.

For P2, learners need to plan and describe the research design for their independent research investigation (covering the areas stated in the *Unit content*). A suitable assessment method for criteria P1 and P2 would be for learners to verbally present their research proposal and design to their peers, supported by production of a written copy. By completing a presentation, the tutor and other members of the group will be able to raise questions relating to the research proposal and/or design, which may further help to shape the intended investigation. Tutors should complete a witness statement to support this assessment activity.

Following successful completion of their research proposal and design, learners will proceed with the independent implementation of their investigation, including data collection and interpretation (P3). Learners need to be able to demonstrate sound data collection techniques and interpret data through application of statistical analyses (P4). Assessment evidence for the implementation and interpretation of research results will be through the production of their completed research investigation, which will require learners to report on their methodology, hypotheses and statistical analyses of data.

For P5, learners need to review the results of their investigation, fully explaining areas for future consideration. Learners need to consider the overall significance of their investigation, the application and implications of results, together with the investigation limitations and suggested improvements. Learners will also need to explain their recommendations for further research.

For P6, learners need to produce their research investigation following standard scientific format for their report writing.

For M1, which links to P1, learners must be able to produce a valid research proposal with limited support from the tutor. For M2, which links to P2, learners need to explain the research design for their investigation, providing reasons and/or evidence to support their choice of design. For M3, which links to P3, learners need to implement their research investigation, explaining their data collection techniques. For M4, which links to P4, learners need to present and interpret data, explaining their research results. For M5, which links to P5, learners need to provide a critical analysis of their investigation results, justifying areas for future consideration. Learners should draw on examples from the literature to provide a precise and detailed critical analysis, providing reasons or evidence to support their future considerations and recommendations for further research.

For D1, which builds on M1, learners need to adopt a completely independent approach to the production of their valid research proposal. For D2, which builds on M2, learners need to justify the research design for their investigation. Learners need to give reasons or evidence to show how they arrived at their research design. For D3, which builds on M4, learners must present and interpret collected data, analysing their research results.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1, P2, M2, D2	The Research Proposal	You are to conduct an original research investigation into any topic within the sport and exercise sciences. Produce a research proposal and design and present to the group.	Presentation and report. Witness statement.
P3, M3, P4, M4, D3, P5, M5, P6	The Research Investigation	Implement the research investigation, interpreting and reviewing results.	Production of the research investigation adopting standard conventions for scientific report writing.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Sport sector suite and the BTEC Sport and Exercise Sciences sector suite. This unit has particular links with the following unit titles in the BTEC Sport suite and the BTEC Sport and Exercise Sciences suite:

Level 3 Sport	Level 3 Sport and Exercise Sciences
Exercise, Health and Lifestyle	Sport and Exercise Physiology
Fitness Testing for Sport and Exercise	Research Methods in Sport and Exercise Sciences
Psychology for Sport Performance	Sport and Exercise Psychology
Analysis of Sports Performance	Research Project in Sport and Exercise Sciences
Laboratory and Experimental Methods in Sport and Exercise Sciences	Sports Biomechanics in Action
	Exercise, Health and Lifestyle
	Fitness Testing for Sport and Exercise
	Analysis of Sports Performance
	Applied Sport and Exercise Psychology
	Applied Sport and Exercise Physiology
	Laboratory and Experimental Methods in Sport and Exercise Sciences

Essential resources

Access to library facilities with internet access is essential to the delivery of this unit. Learners must have access to a wide range of information sources including relevant texts, journals, newspapers, CD ROMs and DVDs.

Access to a suitable statistical software package such as the Statistical Package for the Social Sciences (SPSS) would be beneficial.

Employer engagement and vocational contexts

This unit gives learners the opportunity to conduct research into any topic within sport or sport and exercise sciences. Therefore, the scope for employer engagement will be vast and the resulting vocational context will vary depending on the area and type of research investigation conducted.

Indicative reading for learners

Textbooks

Allen M B – *Sports Exercise and Fitness: A Guide to Reference and Information Sources* (Libraries Unlimited Inc, 2005) ISBN 9781563088193

Bell J – *Doing Your Research Investigation: A Guide for First-time Researchers in Social Science, Education and Health* (Open University Press, 2005) ISBN 9780335215041

Clarke G M and Cooke D – *A Basic Course in Statistics* (Hodder Arnold, 2004) ISBN 9780340814062

Cohen L and Holliday K M E – *Practical Statistics for Learners* (Paul Chapman Publishing, 1996) ISBN 9781853963292

Coolican H – *Introduction to Research Methods and Statistics in Psychology* (Hodder Arnold, 1996) ISBN 9780340679371

Heyes S, Hardy M, Humphreys P and Rookes P – *Starting Statistics in Psychology and Education: A Student Handbook* (Oxford University Press, 1993) ISBN 9780297821700

Hyllegard D – *Interpreting Research in Sport and Exercise Science* (Primis, 2000) ISBN 9780072463248

Kane E and O'Reilly De Brun M – *Doing Your Own Research: In the Field and on the Net* (Marion Boyars, 2001) ISBN 9780714530437

Malim T and Birch A – *Research Methods and Statistics* (Palgrave MacMillan, 1996) ISBN 9780333644393

Morrow J R, Jackson A, Disch J and Mood D – *Measurement and Evaluation in Human Performance* (Human Kinetics Europe, 2006) ISBN 9780736065030

Owen F and Jones R – *Statistics* (Prentice Hall, 1994) ISBN 9780273603207

Rees D G – *Essential Statistics* (Chapman and Hall, 2000) ISBN 9781584880073

Robson C – *Real World Research* (Blackwell, 2002) ISBN 9780631213055

SPSS – *Base 16.0 SPSS User's Guide* (SPSS Inc, 2007) ISBN 9780136036005

Thomas J R, Nelson K and Silverman S – *Research Methods in Physical Activity* (Human Kinetics Europe, 2005) ISBN 9780736056205

Vincent W J – *Statistics in Kinesiology* (Human Kinetics Europe, 2004) ISBN 9780736057929

Wragg C and Williams C – *Data Analysis and Research for Sport and Exercise Science: A Student Guide* (Routledge, 2003) ISBN 9780415289719

Journals

American College of Sport Medicine's Health and Fitness Journal

British Journal of Sports Medicine

Exercise and Sport Sciences Reviews

International Journal of Sports Science and Coaching

Journal of Applied Physiology, Nutrition and Metabolism

Medicine and Science in Sports and Exercise

Pediatric Exercise Science

Research Quarterly for Exercise and Sport

Websites

American College of Sports Medicine	www.acsm.org
British Association of Sport and Exercise Sciences	www.bases.org.uk
Human Kinetics	www.humankinetics.com
Sport Science	www.sportsci.org
Sports Coach UK	www.sportscoachuk.org
Top End Sports	www.topendsports.com

Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	producing a valid research proposal for a sport and exercise sciences-based research investigation, with tutor support describing the research design for a sport and exercise sciences-based research investigation implementing the research investigation, describing data collection techniques presenting and interpreting collected data, applying statistical techniques to describe the research results reviewing the investigation results, explaining areas for future consideration producing the research investigation, following standard scientific format
Creative thinkers	producing a valid research proposal for a sport and exercise sciences-based research investigation, with tutor support describing the research design for a sport and exercise sciences-based research investigation
Reflective learners	reviewing the investigation results, explaining areas for future consideration producing the research investigation, following standard scientific format
Self-managers	producing a valid research proposal for a sport and exercise sciences-based research investigation, with tutor support describing the research design for a sport and exercise sciences-based research investigation
Effective participators	reviewing the investigation results, explaining areas for future consideration.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Creative thinkers	giving others feedback on their research proposal and design answering questions from others on their research proposal and design
Reflective learners	giving others feedback on their research proposal and design answering questions from others on their research proposal and design
Self-managers	collecting data for the research investigation
Team workers	giving others feedback on their research proposal and design answering questions from others on their research proposal and design collecting data for the research investigation.

Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	conducting a review of the literature conducting data interpretation (statistical analyses)
Manage information storage to enable efficient retrieval	systematically recording data
Follow and understand the need for safety and security practices	systematically recording data
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	conducting a review of the literature producing the research proposal and design
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	researching exemplar consent forms/disclaimers conducting a review of the literature
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: • text and tables • images • numbers • records	preparing a medical history questionnaire producing the research proposal and design
Bring together information to suit content and purpose	producing the research proposal and design
Present information in ways that are fit for purpose and audience	producing and presenting the research proposal and design presenting collected data
Evaluate the selection and use of ICT tools and facilities used to present information	conducting data interpretation and presenting data
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	presenting the research proposal and design presenting data

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	interpreting data (statistical analyses of results)
Identify the situation or problem and the mathematical methods needed to tackle it	producing the research design
Select and apply a range of skills to find solutions	interpreting data (statistical analyses of results)
Use appropriate checking procedures and evaluate their effectiveness at each stage	interpreting data (statistical analyses of results)
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	interpreting data (statistical analyses of results)
Draw conclusions and provide mathematical justifications	interpreting data (statistical analyses of results) presenting data reviewing investigation results
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	presenting the research proposal and design providing feedback to others on their research proposal and design
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	conducting the literature review producing the research proposal and design
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	producing a written research investigation adopting standard scientific format.