

Sports, exercise and health science: Subject-specific guidance

See also: EE generic guide and EE Teacher support material

Overview

An extended essay (EE) in sports, exercise and health science (SEHS) provides students with an opportunity to apply the wide range of skills in the field of sports, exercise and health science to research into a topic of personal interest.

SEHS covers a wide range of topics from human physiology to principles of biomechanics and the nature of skill acquisition. It is an applied science course so its EE investigates a sporting or health-related issue using the principles of science.

Choice of topic

The EE must have a clear SEHS emphasis. This incorporates knowledge from a variety of fields, in particular biology, chemistry, physics and psychology, but the essay must focus on human health and performance in relation to sport and exercise.

The topic must allow for an approach that relates specifically to:

- human performance in sport or exercise, or
- an understanding of the role of exercise or nutrition in improving or maintaining health and managing disease.

For example, an essay that deals with the physiological responses to exercise should emphasize the relationship between the exercise and relevant bodily responses rather than the biological understanding of anatomy.

Inappropriate topics

Some topics may be unsuitable because of ethical or safety issues arising from the means of investigation.

The following are inappropriate:

- experiments in which the student is likely to inflict pain on, or cause undue stress to, subjects or compromise their health
- experiments involving body fluids (as there is a risk of the transmission of blood-borne pathogens)
- studies that require access to, or publication of, confidential medical information.

The investigation must comply with the IB [Animal Experimentation policy](#).

An experiment involving human subjects must be carried out with their, or their guardian's, written permission.

It is recommended that all test subjects complete a PAR-Q or similar readiness questionnaire before taking part in rigorous exercise, to ensure that they are not likely to be subject to activities that could affect their well-being.

Other topics may be unsuitable because the outcome is already well known and documented in standard textbooks.

Examples of topics

These examples are just for guidance. Students must ensure their choice of topic is focused (left-hand column) rather than broad (right-hand column).

✓	✗
Focused topics	Broad topics
The effect of energy drinks on recovery rates in middle-distance runners	Energy drinks and exercise
A study into the effect of pre-performance routines on basketball free throws	Psychology and performance
A study into the effect of fluid intake on the thermoregulation in high school female soccer players	Thermoregulation in soccer players
A study into the most effective angle of release for javelin throwing	The mechanics of throwing
A study into the correlation between the body fat readings obtained by using callipers and a bioelectric impedance monitor	Body composition of athletes

Treatment of the topic

Primary and secondary data

Students can base their essay on primary data collected through:

- experimentation in the laboratory or in the field
- questionnaires
- some other appropriate SEHS approach.

Alternatively, essays may be based on secondary data or information obtained from literature or databases. If students choose secondary data, they must manipulate or analyse it in an original way to answer their research question.

Students can also use secondary data in conjunction with primary data that they have collected themselves.

Whichever approach is chosen, students must ensure that they have access to sufficient data or information to research and analyse their topic effectively.

Essays that simply restate facts or data taken directly from the sources are of little value.

Essays that involve practical work carried out in the laboratory or in the field should include a clear and concise description of the experimental procedure.

Students should attempt to specify how the research approach and methodology were decided.

Supervision

Ideally, students should carry out the research for the essay under the direction of a school supervisor. Where this is not practical, for instance in testing multiple subjects in the field over a long period of time, every effort should be made to keep accurate documentation of the testing procedures.

It is possible to complete a good essay using the basic equipment available at most schools and this approach is to be encouraged.

Regardless of where, or under what circumstances, the research is carried out, students must provide evidence of their personal contribution to the research approach and to the selection of the methods used.

Essays based on research carried out by the student at a research institute, university or club under the guidance of an external mentor must be accompanied by [a covering letter](#) outlining the nature and level of guidance provided.

If this is the case, students must also have a school supervisor to guide them through the process and to undertake their reflection sessions with them.

Analysis and argument

Generating and presenting data should not be an end in itself; analysis using appropriate techniques is essential.

The main body of the essay should consist of an argument or evaluation based on the data or information presented. Here, the students should point out the significance of any graphs, tables or diagrams.

Students should ensure that the main body of the essay is well structured and has an obvious logical progression. They can use numbered and headed paragraphs to impose a clear structure. Their evaluation should show they understand the results and their significance in the context of wider academic reading on the topic.

Depending on the topic chosen, students should allow room for discussion of conflicting evidence. The ability to analyse from different perspectives is very important in these circumstances.

It is not always appropriate to include graphs and tables for analysis, but every effort should be made to provide clear pathways to the outcome of any experimentation.

Students must be encouraged to undertake a critical evaluation of the work they have done.

In their analysis, the student should describe and explain the limitations imposed on the research by factors such as:

- the suitability and reliability of the sources accessed
- accuracy and precision of measuring equipment
- sample size
- validity and reliability of statistics.

When students' research has included experimentation, limitations should be considered, such as:

- the problem of repeatability and control when using human subjects
- the difficulties of generalizing from research based on small group samples
- elements that are difficult to control, such as weather conditions, prior health of the subjects or effort applied during testing.

Examples of topics, research questions and suggested approaches

Once students have identified their topic and written their research question, they can decide how to research their answer. They may find it helpful to write a statement outlining their broad approach. These examples are for guidance only.

Topic	The effect of energy drinks on recovery rates
Research question	To what extent do energy drinks affect recovery rates in middle-distance runners?
Approach	Students carry out an investigation into how different energy drinks affect the recovery rates of a group of middle-distance runners. Performances of athletes in a given repeated training activity are recorded, with one group being given energy drinks between repeats, and another a suitable control. Secondary data can also be found through literature research and can supplement the findings from the experiment.

Topic	Angles of release for thrown objects
Research question	What is the optimum angle of release for a male javelin thrower?
Approach	Students can carry out an investigation into the optimum angle of release of a javelin for a male athlete. Repeated measurements of release angle would best be carried out using motion analysis equipment to ensure accuracy. The use of secondary data in this instance is plentiful and should be comprehensively included and debated as a complement to the primary data collected by the student.

Topic	The effect of plyometric training
Research question	Will an eight-week short-term plyometric training programme have a beneficial effect on the explosive ability of volleyball players?
Approach	A digital jump mat for testing the standing high jump power of 10 high school volleyball players is used as a measure of explosive ability. Five of these volleyball players (selected at random) then carry out an eight-week training programme that includes one high-intensity plyometric training session. The remaining five athletes carry out the same eight-week training session but do not include the plyometric training session. The pre- and post-training data from both groups is compared.

An important note on “double-dipping”

Students must ensure that their EE does not duplicate other work they are submitting for the Diploma Programme.

The sports, exercise and health science EE and internal assessment

In particular, an EE in SEHS is not an extension of the internal assessment (IA) task. Students must ensure that they understand the differences between the two.

- The IA is more likely to focus on the syllabus content, whereas the EE could explore aspects of SEHS not covered in the syllabus.
- The IA must include data collection and analysis (from hands-on experiments, databases, simulations or modelling) and cannot purely be a literature review.
- The EE must construct a theoretical framework for the underlying SEHS of the chosen topic, whereas the IA focuses on the application of the scientific method to a problem of interest and will only include some background information.
- The EE explicitly assesses the students’ ability to analyse and evaluate scientific arguments.

Supervisors play an important role in guiding students on these distinctions. Students risk their diploma if academic misconduct is detected.

Interpreting the EE assessment criteria

Criterion A: Focus and method

(Strands: Topic, Research question, Methodology)

The topic and the research question must be clearly indicated at the start of the essay.

To establish the context of the research question, students should include:

- the area of the research
- the purpose and focus of the essay
- the general background SEHS theory required to understand the context.

For example, an essay on “Factors affecting performance in endurance runners” may refer to ergogenic aids, hydration and thermoregulation.

The topic must be expressed in the form of a question. It should be a precisely formulated question that the research will attempt to answer. For example, the research question based on “Factors affecting performance in endurance runners” could be “What is the effect on recovery rates of athletes who drink energy fluids that contain different concentrations of maltodextrin carbohydrate?”

The student needs to demonstrate within the essay that the research has been well planned. They should show that they have researched the topic and selected an appropriate approach to the study of it.

While SEHS does not have a unique approach, it uses the principles of science applied in a specific context. This could be sport, exercise or health. This applies both to literature research and to primary data collection.

Students must demonstrate that their chosen methods and materials are appropriate for addressing the research question. The rationale for choosing practical methods should be clearly explained.

For experimental work, sufficient information on the methodology should be provided to allow the work to be repeated.

If students have undertaken an investigation that requires fieldwork, they must clearly demonstrate their understanding of the methods and equipment used.

All standardized tests should be clearly referenced and supporting evidence given as to why these tests were used.

If students are investigating a well-documented or standard topic, they should attempt to look for a new approach or perspective to the issue.

Any topic undertaken must show an appreciation and understanding of ethical considerations, and must not violate the ethical standards of the IB sciences.

Criterion B: Knowledge and understanding

(Strands: Context, Subject-specific terminology and concepts)

The source materials accessed should be clearly relevant and appropriate to the research question and to the field of SEHS.

There may be some research questions that require background from other disciplines. However, care should be taken when doing this as the essay will only be judged on its SEHS content. For example, a student writing on the topic “Diabetes and physical activity” must write about diabetes in the context of physical activity rather than its general health or medical aspects.

Work that is not the student’s own should be effectively referenced and used in a way that demonstrates the students’ understanding and relevance of the work cited. The literature used should predominantly come from acknowledged SEHS or scientific sources.

Students need to show a mastery of, and fluency in, the use of appropriate terminology. At the same time, students need to avoid excessive use of jargon.

Students should explain any technical terms they use and demonstrate an understanding of them by using them appropriately within the text.

The student must try to maintain a consistent linguistic style throughout the essay.

Criterion C: Critical thinking

(Strands: Research, Analysis and Discussion and evaluation)

The “research” refers to both literature sources and data collected by the students themselves. This research must be consistently relevant to the research question. The student must comment on the quality, balance and quantity of their sources.

Students must demonstrate the ability to apply their selected information and methods effectively in support of their argument.

Students are expected to show an awareness of any limitations or uncertainties inherent in their approach. In particular, they should comment critically on the validity and reliability of their data relative to their research question within the investigation.

The student is expected to present and analyse the data and sources appropriately. This analysis will often include:

- mathematical transformations
- statistical analysis
- tables of processed data
- graphs.

If the data are analysed statistically, the student must clearly show understanding of why that particular test was chosen and what the results mean.

If graphs are used, they must be correctly selected and drawn to illustrate key elements of the analysis. They should only be included if they improve communication.

Students must make a special effort to maintain a reasoned, logical argument that focuses on the research question. Essays that attempt to manipulate a large number of variables are unlikely to be focused and coherent. A clear and logical argument can be achieved by making repeated reference to the research question.

An assessment of the extent to which the research question is answered, or the conclusions formed are supported by the data or information accessed, should form part of the argument.

Particular care should be taken when dealing with essays that are focused on the psychology of sport. If questions are not tightly focused, there may be a tendency to investigate variables not closely related to the research question.

The stated conclusion(s) must be based on the data, information and evidence presented in the essay.

The data must be analysed and presented in such a way that the argument leading to the conclusion is supported and clarified. Tables of raw data will generally not achieve this on their own. Data must be analysed, processed and presented in a way that relates clearly and directly to the central argument of the essay.

Where appropriate, this analysis should allow for an assessment of the validity of the hypothesis.

Errors and uncertainties arising from the methodology, instruments or techniques should be analysed and critically evaluated. Special care should be taken when using data from field research in SEHS as some variables cannot be controlled and this may reveal unexpected outcomes. These should be pointed out, where appropriate, even if they were not part of the original plan.

It is not unusual for the original research question to be not fully answered by the investigation. In these cases, the student should point out unresolved issues and make suggestions as to how these might be further investigated.

Criterion D: Presentation

(Strands: Structure, Layout)

This criterion relates to the extent to which the essay conforms to accepted academic standards in relation to how research papers should be presented. It also relates to how well these elements support the reading, understanding and evaluation of the essay.

Students must provide a section and subsection structure to their essays, with appropriate informative headings.

Any charts, images or tables from literature sources included in the essay must be carefully selected and labelled. They should only be used if they are directly relevant to the research question, contribute towards the understanding of the argument and are of a good graphic quality.

Large tables of raw data collected by the student are best included in an appendix, where they should be carefully labelled. Tables of processed data should be designed to clearly display the information in the most appropriate form. Graphs or charts drawn from the analysed data should be selected to highlight only the most pertinent aspects related to the argument. Too many graphs, charts and tables will distract from the overall quality of the communication.

Only processed data that is central to the argument of the essay should be included in the body of the essay, as close as possible to its first reference. Tables should enhance a written explanation but not themselves include significant bodies of text. If they do, then these words will be included in the word count.

For experiments where numerical results are calculated from data obtained by changing one of the variables, it is generally good practice to show one example of the calculation. The remainder can be displayed in tabular or graphical form.

If an experimental method is long and complex, students may place the protocol in an appendix and just include a summary of the methods in the body of the essay. Students who choose this option must be careful to ensure that the summary contains all elements that contribute to the quality of the investigation, since appendices are not an essential section of the EE and examiners are not required to read them. In other words, any important information that contributes to the evaluation of the method must be in the body of the essay and not the appendix.

Any material that is not based on the student's own data must be carefully acknowledged, with specific attention paid to the acknowledgment and referencing of quotes and ideas. This acknowledgment and referencing is applicable to audiovisual material, text, graphs and data published in print and electronic sources. If the referencing does not meet the minimum standard as indicated in the guide (name of author, date of publication, title of source and page numbers as applicable), and is not consistently applied, work will be considered as a case of possible academic misconduct.

A bibliography is essential and has to be presented in a standard format. Title page, table of contents, page numbers, etc must contribute to the quality of presentation.

The essay must not exceed 4,000 words of narrative. Graphs, figures, calculations, diagrams, formulas and equations are not included in the word count. Students should be aware that examiners will not read beyond the 4,000-word limit, or assess any material presented past this.

Criterion E: Engagement

(Strands: Reflections on planning and progress)

This criterion assesses the student's engagement with their research focus and the research process. It will be applied by the examiner at the end of the assessment of the essay, and is based solely on the candidate's reflections as detailed on the [RPPF](#), with the supervisory comments and extended essay itself as context.

Students are expected to provide reflections on the decision-making and planning process undertaken in completing the essay. Students must demonstrate how they arrived at a topic as well as the methods and approach used. This criterion assesses the extent to which a student has evidenced the rationale for decisions made throughout the planning process and the skills and understandings developed.

For example, students may reflect on:

- the approach and strategies they chose, and their relative success
- the [Approaches to learning](#) skills they have developed and their effect on the student as a learner
- how their conceptual understandings have developed or changed as a result of their research
- challenges they faced in their research and how they overcame these
- questions that emerged as a result of their research
- what they would do differently if they were to undertake the research again.

Effective reflection highlights the journey the student has engaged in through the EE process. Students must show evidence of critical and reflective thinking that goes beyond simply describing the procedures that have been followed.

The reflections must provide the examiner with an insight into **student** thinking, creativity and originality within the research process. The **student** voice must be clearly present and demonstrate the learning that has taken place.