



Extended essay guide

Details—Sports, exercise and health science

Sports, exercise and health science

These subject guidelines should be read in conjunction with the “Introduction”, “Outline” and “Details—all essays” sections of this guide.

Overview

An extended essay in sports, exercise and health science (SEHS) provides students with an opportunity to apply a wide range of skills while researching a topic of personal interest in the field of SEHS. The nature of an extended essay in SEHS is characterized by a specific focus that investigates an aspect of the relevant subject matter within the general context of a scientific investigation.

Choice of topic

It is important that the extended essay has a clear SEHS emphasis and is not more closely related to another subject. While SEHS incorporates knowledge from a variety of different fields, in particular biology, chemistry, physics and psychology, the extended essay must have a strong emphasis on human health and performance in relation to sports and exercise. The topic chosen must allow for an approach that distinctly relates to an analysis of the development of human performance in sports or exercise or an understanding of the role of exercise or nutrition in improving or maintaining health and managing disease.

Though essays that deal with the physiological responses to exercise may prove a particular case in point, emphasis should be placed on the application and relationship between the exercise and relevant bodily responses and should not be applied to the biological structure of the anatomy. Similarly, when choosing a topic that has psychological content, the extended essay should focus on sports, health or exercise components and their application in that field and not on the broader implications of clinical or medical treatment.

Some topics may be unsuitable for investigation because of ethical or safety issues. The extended essay investigation must comply with the IB animal experimentation policy. Experiments in which the student is likely to inflict pain on, or cause undue stress to subjects or compromise their health are not appropriate. An experiment involving human subjects must be with their or their guardian’s written permission. It is recommended that all test subjects complete a Physical Activity Readiness Questionnaire (PAR-Q) or similar readiness questionnaire prior to partaking in rigorous exercise to ensure that they are suitable candidates for the investigation. Experiments involving body fluids must not be performed due to the risk of the transmission of blood-borne pathogens. Studies that require access to, or publication of, confidential medical information are also not appropriate.

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

The following examples of titles for SEHS extended essays are intended for guidance only. The pairings illustrate that focused topics (indicated by the first title) should be encouraged rather than broad topics (indicated by the second title).

- “The effect of energy drinks on recovery times in middle-distance runners” **is better than** “Energy drinks and exercise”.
- “A study into the effect of pre-performance routines on basketball free throws” **is better than** “How can one enhance the performance of an athlete by using different techniques of psychology?”
- “A study into the effect of fluid intake on thermoregulation in female high school soccer players” **is better than** “Thermoregulation in soccer players”.

- “A study into the most effective angle of release for javelin throwing” **is better than** “The mechanics of throwing”.
- “A study into the correlation between the body fat readings obtained by using callipers and a bioelectric impedance monitor” **is better than** “Body composition of athletes”.

The topic chosen for study should be presented in the form of a research question, followed by a statement of intent outlining the research approach to be used in answering the question. In this way, the approach to the topic chosen may be even further clarified. Some examples of this could be the following:

Topic	Personality types and sport
Research question	Is there a specific personality type more suited to contact sports?
Approach	A group of 50 rugby players is asked to complete Cattell's <i>16 Personality Factors Questionnaire</i> . An analysis of the results and comparison to published data are carried out to determine whether a specific personality type (according to Weiner's model) is suited to contact sports.
Topic	The effectiveness of plyometric training
Research question	Will a short-term, eight-hour plyometric training programme have a beneficial effect on the explosive ability of volleyball players?
Approach	Using a digital jump mat, measure the pre- and post-test standing high jump of 10 high school volleyball players. In order to measure this five of these volleyball players carry out a short-term high-intensity plyometric training programme; the remaining five players carry out a short term training programme that does not include plyometric training. The pre- and post-test data from both groups is compared.
Topic	Humidity and training
Research question	Can a training programme in high humidity have an impact on the fitness of a road cyclist?
Approach	Using a digital heart-rate monitor, pre- and post-exercise heart rates and recovery times are measured for five road cyclists. The cyclists' heart rates and recovery times are measured. These cyclists then carry out a programme of training in 90% plus humidity and 30°C plus temperature, after which heart rate and recovery time data is once again collected. The pre- and post-training data is analysed and compared to published data.
Topic	Skill transfer
Research question	What is the effectiveness of bilateral transfer training on skill development in basketball players aged 11–12?
Approach	Two small groups of basketball players are asked to complete six training sessions. One group will practice with their dominant hand only, the other using a bilateral approach to training. Both groups are then tested in a skills circuit to determine if teaching bilateral skills at an early age has any benefit.

Topic	Warm-up and performance
Research question	What effect does an athlete's pre-event warm-up have on the performance of a 100m swimmer?
Approach	A small group of competitive swimmers is asked to complete a series of 100m distances over a number of different days in a pool after undergoing a variety of pre-event warm-ups. The warm-ups would consist of a control where the subjects have no warm-up; an aerobic/skill component followed by static stretching; an aerobic/skill component followed by dynamic stretching; just an aerobic/skill component; just static stretching; just dynamic stretching. Data across the conditions is then analysed and compared.
Topic	Rebound qualities of different surfaces
Research question	How does the court surface affect the rebound of a ball that has top-spin and back-spin?
Approach	A ball machine is used to project a number of tennis balls onto three different types of surface at a speed of 40 mph with either top-spin or back-spin. The three surfaces are plexi-cushion, rebound ace and synthetic grass. Video evidence is captured of the nature of the rebound from the side looking for height of rebound and distance of bounce. An analysis of the rebound data for the different conditions is carried out and a comparison is made of the surfaces at this speed.
Topic	Skill learning
Research question	Which methods of practice, both mental and physical, have the most impact on learning to hit a golf ball?
Approach	Three groups of beginner golfers are asked to take part in training sessions where they are practising a putt in golf either physically, mentally or both physically and mentally. All groups are then tested in a putting skills circuit to determine which mode of practice has the most benefit.

Treatment of the topic

Students should point out early in the essay how the research question was arrived at and, if appropriate, how it was narrowed down by briefly outlining related aspects that are not being considered in the essay. Students should be encouraged to formulate one or more hypotheses based on the research question. A single, well-formulated question may give rise to a small number of precise hypotheses.

Essays in SEHS may be based on data collected by the student through experimentation in the laboratory, in the field, through questionnaires or some other appropriate SEHS approach. Alternatively, essays may be based on data or information obtained from literature, ideally from primary sources, and manipulated or analysed in an original way by the student. This data can also be used in conjunction with data collected by the student. Essays that simply restate facts or data taken directly from the sources are of little value. Whichever approach is chosen, the student must ensure that sufficient resources, in the form of data and information, can be obtained in order to allow the topic to be effectively researched.

Essays that involve practical work carried out either 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 hypothesis and methodology were decided and show any approaches that were considered and rejected. 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 equipment carried by 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 in the essay 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 supervisor, must be accompanied by a covering letter outlining the nature and level of guidance provided.

Generating and presenting data should not be an end in itself; analysis using appropriate scientific 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 student should point out the significance of any graphs, tables or diagrams. Since this is often the longest single section of the essay, it is essential that it is well structured and has an obvious logical progression. A clear structure can be imposed on this section by dividing it into numbered and headed paragraphs. This evaluation should show an understanding of the results and an appreciation of their significance in light of the literature that has been consulted.

Where a sports psychology-based topic is chosen it is important to leave room for discussion of conflicting evidence where appropriate. The ability to analyse from different perspectives is very important in this type of essay. It is not always appropriate to include graphs and tables for analysis, but every effort should be made to provide clear pathways as to the outcome of any experimentation.

Students should provide some explanation of anomalies or unexpected outcomes, but this should not form a major part of the discussion. If necessary, modifications to hypotheses presented earlier in the essay should be proposed and a research approach for testing these should be suggested. Some assessment of the outcomes of the research in a future or wider context should be made.

Students are encouraged to undertake a critical evaluation of the work they have done. In this 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 testing in the field via physical experimentation or questionnaires, limitations should be considered, such as those arising from the problem of repeatability and control when using human subjects, as well as the difficulties of generalizing from research based on small group samples or elements that are difficult to control such as weather conditions, prior health of the subjects or effort applied during testing.

Interpreting the assessment criteria

Criterion A: Research question

In an SEHS extended essay, the research question is best stated in the form of a question. The research question should not be understood as a statement of the topic but rather as a precisely formulated question that the research will attempt to answer. For example, a statement of the topic of an essay might be “Factors that affect performance”; the research question based on this topic could be “What are the possible effects of high intensity training programmes on field hockey players?” The research question can then be used to formulate a hypothesis, or hypotheses, which can be tested. The research question should be identified clearly and set out prominently in the introduction. A broad statement of the topic of the essay or a statement of the hypothesis is **not sufficient** on its own to meet the requirement for a research question in an SEHS extended essay.

Criterion B: Introduction

The purpose of the introduction is to set the research question into context. Some research questions may require some background from other disciplines. However, care should be taken when including information from other disciplines as the essay will only be judged on its SEHS content. For example, a student completing an extended essay on “diabetes and physical activity” must apply their knowledge through the physical activity field and not apply knowledge to the general well-being or medical aspects of diabetes.

Criterion C: Investigation

The way in which the investigation is written will depend very much on whether or not the essay is based on experimental work performed by the student. For essays that are based on data taken from written sources, the student should explain clearly how the data has been selected and should comment on its reliability. For experimental work, sufficient information on the methodology should be provided to allow the work to be repeated. Students should demonstrate that they understand the theory behind any techniques or equipment used. They are also expected to show an awareness of any limitations or uncertainties inherent in their techniques and equipment. This can be helped by the use of recognized standardized tests.

Criterion D: Knowledge and understanding of the topic studied

An SEHS extended essay should be based on specific, relevant and clearly defined aspects of sports, exercise, health or a combination of those sciences. The information and ideas should be presented in a way that provides evidence that these have been understood and applied correctly. Material extracted from the sources should be referenced and incorporated into the main body of the essay in a way that demonstrates an understanding of the subject.

Criterion E: Reasoned argument

Students writing an SEHS extended essay must maintain a reasoned, logical argument that focuses on the research question. Essays that attempt to deal with 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 and to the hypotheses derived from it. An assessment of the extent to which the hypotheses are supported, or the question is answered, by the data or information accessed should form part of the argument.

Criterion F: Application of analytical and evaluative skills appropriate to the subject

The stated conclusion(s) must be based on the data, information and/or 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. Raw 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 and/or techniques should be analysed and critically evaluated.

Criterion G: Use of language appropriate to the subject

Students writing in SEHS 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. Any technical terms that are used should be explained and the student must demonstrate an understanding of these terms by using them appropriately within the text. The student must try to maintain a consistent linguistic style throughout the essay.

Criterion H: Conclusion

The conclusion should relate directly to the research question and should point out the main findings of the research. Field research in SEHS can prove difficult to adequately control and may reveal unexpected outcomes. These should be pointed out, even if they were not part of the original plan. The original research question may not be 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 I: Formal presentation

This criterion relates to the extent to which the essay conforms to current academic standards regarding the way in which research papers should be presented. The presentation of essays that omit a bibliography or that do not give references for quotations is deemed unacceptable (level 0). Essays that omit one of the required elements—title page, table of contents, page numbers—are deemed no better than satisfactory (maximum level 2), while essays that omit two of the required elements are deemed poor at best (maximum level 1). Additionally, if diagrams are poorly presented or if the information shown on the diagram is unclear, one mark should be deducted.

Sports, exercise and health investigations often require the support of referenced material, not only in the form of text or data, but also as diagrams or drawings. Care must be taken to supply references for illustrations taken from sources. Students must avoid the temptation to supply illustrations for their own sake. Illustrative material should only be included if it enhances the argument or supplies information that cannot be easily provided in another way. Original photographs, photocopies or downloaded images that are not labelled or put into the context of the investigation are unlikely to enhance the essay.

Sports, exercise and health investigations often result in large quantities of raw data. Large tables of raw data are best included in an appendix. Processed data that is central to the argument of the essay should be included in the body of the essay and be placed as close as possible to its first reference.

Criterion J: Abstract

The abstract is judged on the clarity with which it states the research question, explains how the investigation was carried out and summarizes the conclusion. However, the quality of the research question or the conclusion is not judged here. If the student clearly states the question (even if it is poor) and includes the other two required elements, then the abstract can still receive full marks.

For a sports, exercise and health investigation, the abstract must include the research question and a conclusion that directly relates to the research question. In addition, the description of how the research was conducted must include a description of the methodology and the scope of the study.

Criterion K: Holistic judgment

Qualities that are rewarded under this criterion include the following.

- Intellectual initiative: Ways of demonstrating this in SEHS essays include the choice of topic and research question, and the use of novel or innovative approaches to address the research question.
- Insight and depth of understanding: These qualities are most likely to be demonstrated as a consequence of detailed research and thorough reflection, and by well-informed and reasoned arguments that consistently and effectively addresses the research question.
- Originality and creativity: These qualities will be apparent by clear evidence of a personal approach backed up by solid research and reasoning.