

## **7.1 Uppsatsanvisningar (Thesis guidelines)**

# **Guidelines for writing a 15 credit bachelor's thesis in Exercise Biomedicine**

**Author's name**

Year-month-day  
Bachelor Thesis 15 credits in Exercise Biomedicine  
Halmstad University  
School of Business, Engineering and Science

Thesis supervisor: firstname lastname  
Thesis examiner: firstname lastname



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## What is a bachelor's thesis?

A thesis is a critical analysis that answers a scientific question or hypothesis. Your research question should be relevant to the area of biomedicine and/or exercise biomedicine. You need to gather evidence -- from various sources -- to make interpretations and judgments. Your approach/methods should be carefully designed to come to closure. Your results should be clearly defined and discussed in the context of your topic. Relevant literature should be cited. Your analysis should be placed in a broader context, and highlight the implications of your work. In your thesis you need to include a well-reasoned line of argument based on the research questions, including compilation of relevant evidence, setting data in a general/universal context, and finally making a judgment based on your analysis. Your thesis should be clearly written and in the format described below.

Final version of thesis should be typed 1 ½ space, 12 size font, and 2,5 cm left and right margins. Font for running text is size 12, title is size 24, the following subheadings sizes 18, 16, 14. Headings and subheadings are written in bold style and do not use period at the end.

Exception to this rule is when figures and tables are created. Text here is usually done single-spaced and CAN, if the table is large, use reduced font size (never smaller than 10).

For more help with how to write a thesis contact "Skrivpunkten", located on first floor in the Q building or e-mail: skrivpunkten@hh.se

## Thesis structure

### Title Page

Title (including subtitle), author, institution, department, date of submission, name of thesis advisor and name of thesis examiner.

### Acknowledgments (optional)

Advisor(s) and anyone who helped you:

1. technically (including materials, supplies)
2. intellectually (assistance, advice)
3. financially (for example, departmental support, travel grants)

### Abstract

The abstract should reflect the paper written as a single paragraph, with short sentences reflecting each major section of your paper. A good abstract explains in brief sentences why the paper is important, what major methods were used, summarizes the major results and can mention data if appropriate. The final sentences give a conclusion which explains the major implications of your work. A good abstract is concise, readable and quantitative. Length should be approx. 400 words. Abstracts generally do not have citations. In your abstract, use the following subheadings; background, aim/objectives/purpose, methods, results, conclusion.

## Table of Contents

The table of contents list all headings and subheadings with page numbers. The subheadings are indented. Word has a special function to create a table of contents. It will look something like this:

	<b>Page #</b>
<b>Introduction</b>	<b>1</b>
<b>Background</b>	
<b>Subheadings...?</b>	
<b>Aim/Objectives/Purpose</b>	
<b>Specific aims</b>	
<b>Methods</b>	
<b>subheadings ...?</b>	
<b>Results</b>	
<b>subheadings ...?</b>	
<b>Discussion</b>	
<b>subheadings ...?</b>	
<b>Conclusion</b>	
<b>References</b>	
<b>Appendices (optional)</b>	

## Introduction

The introduction should present the research question you are investigating. The research question should be relevant to the area of biomedicine and/or exercise biomedicine and tie into current research with references if appropriate. The introduction section is normally ½-1 pages long. NOTE: Page numbering begins with 1 on introduction page!

Try and include a 'hook' at the beginning of the introduction. This is something sufficiently interesting to motivate your reader to read the rest of the paper, an important/ interesting scientific problem that your paper either solves or addresses. You should draw the reader in, make them want to read the rest of the paper and make it clear what your general research question is. The introduction section can end with a general aim/ purpose, however your actual aim/objectives and specific aims are presented at the end of the background section. The introduction and background are written in the present or past tense when you describe specific studies.

You cannot finish your introduction and background until you know what the body of the paper says. You can start on the introduction and background, but the final version must wait until you have all the results in place.

## Background

The background begins with a description of the chosen topic and should cite previous research in this area. What is already known about the topic and how has it evolved over time? It should cite those who had the idea or ideas first, and should also cite those who have done the most recent and relevant work. All cited work should be directly relevant to the purpose of the thesis. This is not a place to summarize everything you have ever read on a subject.

The background should be relevant and to the point, all facts verified with references. Your references should be mainly peer-reviewed articles, however, it might be relevant for an initial overview to use one or two references from course literature/book chapters. As you introduce the topic you start broad and then systematically and logically narrow down until the final paragraph leads directly into your purpose of the study. In the background you need to include basic biological/physiological information relevant to your topic in biomedicine or exercise biomedicine. You should after each section, explain why more work is necessary (your work, of course). Remember that your thesis is not a review paper. Your thesis contains original work and interpretation/analyses by you. Break up the background section into logical segments by using subheadings.

## Aim/Objective/Purpose

Aim, objective or purpose are different names for the same thing. Choose one and then be consistent!

The aim/objective/purpose is part of the background and should be a subheading. The aim is ALWAYS written in past tense. Your aim of the study should be clearly defined and only include the things you investigated. After your aim, try and specify your research questions one by one for clarity so the reader then easily can follow in the next sections why you do certain things.

*A summary/checklist of what is needed in your introduction and background sections of your thesis:*

- 1. Sufficient background information to allow the reader to understand the context and significance of the question you are trying to address.*
- 2. Proper acknowledgement of the previous work on which you are building. Sufficient references such that a reader could, by going to the library, achieve a sophisticated understanding of the context and significance of the question.*
- 3. The introduction and background should be focused on the thesis research question(s). All cited work should be directly relevant to the purpose of the thesis.*
- 4. Explain the scope of your work, what will and will not be included.*
- 5. A statement of the purpose of the thesis and specific aims*

## Methods

In the methods section you should describe how you collected and analyzed your data. Your choice of methods is directly related to the research question and will vary. Divide the methods section up into subheadings. Since your data collection is already done, the methods section is ALWAYS written in past tense. Citations in this section should be limited

to data sources and references of where to find more complete descriptions of procedures. When you describe equipment used, include the model, manufacturer, city and country in parenthesis. Describe all statistical methods used and what statistical software you used. Also describe which statistical significance level you used. Do not include descriptions of results.

If you have conducted an experimental thesis, the subheadings will probably look as follows:

*Subjects\**

Description of *experimental design, testing procedures, data collection etcetera* (this will often include several different subheadings)

*Ethical and social considerations\**

*Statistical analyses\**

*\*MUST BE INCLUDED in your thesis at Halmstad University.*

*A summary/checklist of what belongs in the methods section of a scientific thesis:*

- 1. Information to allow the reader to assess the credibility of your results.*
- 2. Information needed by another researcher to replicate your experiment.*
- 3. Description of your materials, procedure, theory.*
- 4. Calculations, technique, procedure, equipment, and calibration plots.*
- 5. Limitations, assumptions, and range of validity.*
- 6. Description of your analytical methods, including statistical software.*

## **Results**

In the results section you should describe your results in an objective, logic and structured manner. For clarity, break up your results into logical segments by using subheadings. One way to do this is by presenting your results based on your aim/s and research questions. Only data relevant to the aim/s, (i.e. data that can provide answers to your research questions) should be included. Do not interpret your data here, save that for the discussion. Results are normally written in the past tense.

Research results are presented as actual statements of observations, including statistics, tables and graphs (see below for a more detailed description on how tables and graphs are presented). It is important to also mention negative results as well as positive. Lay out the case as for a jury, telling two parallel but almost identical stories; one presented in running text, one in tables, graphs and diagrams. Present sufficient details so that others can draw their own inferences and construct their own explanations. Key results should be stated in clear sentences at the beginning of paragraphs. It is far better to say "X had statistically significant positive relationship with Y (linear regression  $p < 0.01$ ,  $r^2 = 0.79$ )" then to start with a less informative sentence like "There is a statistically significant relationship between X and Y". Describe the nature (the direction, increase decrease, larger, smaller, etc) of the findings; do not just tell the reader whether or not they are statistically significant.

## Discussion

Start with a few sentences that summarize the most important results. This is a recommendation even if your results are negative or inconclusive. This section contains two major discussion areas; results discussion and methods discussion. First discuss your results, then, at the end you can discuss your methods. The reader is more interested in your results than potential methods flaws! In your results discussion you tie in your results with results from previous research (much of which you mentioned in your background!) to tie up the whole paper from beginning to end. Compare and contrast your results, do the results agree, disagree? Why, why not? This section should be rich in references to similar work and background needed to interpret results. Break up the section into logical segments by using subheads. Make sure it is clear to the reader which statements are based on your collected data and which are interpretation.

*A summary/checklist of what questions and caveats the discussion section should answer:*

- 1. What are the major patterns in the observations?*
- 2. What are the relationships, significant differences or trends among the results?*
- 3. Are there exceptions to these patterns or trends?*
- 4. What are the likely causes (mechanisms) underlying these patterns?*
- 5. Is there agreement or disagreement with previous work?*
- 6. Interpret results in terms of background laid out in the background section - what is the relationship of the present results to the research questions?*
- 7. Multiple hypotheses: There are usually several possible explanations for results. Be careful to consider all of these rather than simply pushing your favorite one. If you can eliminate all but one, that is great, but often that is not possible with the data in hand. In that case you should give even treatment to the remaining possibilities, and try to indicate ways in which future work may lead to their discrimination.*
- 8. What are the things we now know or understand that we didn't know or understand before the present work?*
- 9. Include the evidence or line of reasoning supporting each interpretation.*
- 10. What is the significance of the present results: why should we care?*

The methods discussion is the place to critically reflect over your methods, data collection and analysis procedures. How did the method of choice affect the results? Did unforeseen things influence the results? How well was validity and reliability accounted for?

## Conclusions

The conclusion begins with a short summary of your strongest and most important results that answer to the aim of the study. Include the broader implications of your results. The conclusion shall lead up to recommendations for practical implications and future studies. No references should be present here.



## References

References should be listed in running text and here in your reference list according to a current referencing system. Make sure you are following the same referencing system throughout the thesis. We recommend the Harvard system since it makes it easier for the advisor and examiner to judge your references as they read, but it is not necessary. Do not use footnotes as your referencing system.

Check references carefully and reread reference works prior to publication. The first time you read something, you will consciously remember some things, but may subconsciously take in other aspects. It is important to cross check your conscious memory against your citations.

Proofread your reference list before handing in your draft for your advisor AND before handing in your final version.

## Appendices

- Include all your extensive data in the appendix.
- Detailed description of the intervention or training program/s in whole
- Calculations (where more than 1-2 pages)
- List of equipment used for an experiment or details of complicated procedures.
- Letters of consent/information letters

## Crosscutting Issues

### Order of writing

Your thesis is not written in the same order as it is presented in. The following gives you one idea how to proceed.

1. Write up a preliminary version of the background section first. This will serve as the basis for the introduction in your final paper.
2. As you collect data, write up the methods section. It is much easier to do this right after you have collected the data. Be sure to include a description of the research equipment and relevant calibration plots.
3. When you have some data, start making plots and tables of the data. These will help you to visualize the data and to see gaps in your data collection. If time permits, you should go back and fill in the gaps. You are finished when you have a set of plots that show a definite trend (or lack of a trend). Be sure to make adequate statistical tests of your results.
4. Once you have a complete set of plots and statistical tests, arrange the plots and tables in a logical order. Write figure captions for the plots and tables. As much as possible, the captions should stand alone in explaining the plots and tables. Many

scientists read only the abstract, figures, figure captions, tables, table captions, and conclusions of a paper. Be sure that your figures, tables and captions are well labeled and well documented.

5. Once your plots and tables are complete, write the results section. Writing this section requires extreme discipline. You must describe your results, but you must NOT interpret them. (If good ideas occur to you at this time, save them at the bottom of the page for the discussion section.) Be factual and orderly in this section, but try not to be too dry.
6. Once you have written the results section, you can move on to the discussion section. This is usually fun to write, because now you can talk about your ideas about the data. If you can come up with a good schematic showing your ideas, do so.
7. In writing the discussion session, be sure to adequately discuss the work of other authors who collected data on the same or related scientific questions. Be sure to discuss how their work is relevant to your work. If there were flaws in their methodology, this is the place to discuss it.
8. After you have discussed the data, you can write the conclusions section. In this section, you take the ideas that were mentioned in the discussion section and try to come to some closure. If some hypothesis can be ruled out as a result of your work, say so. If more work is needed for a definitive answer, say that.
9. The final part of the conclusion a recommendation section. Make recommendations for further research or policy actions in this section. If you can make predictions about what will be found if X is true, then do so.
10. After you have finished the recommendation section, look back at your original introduction. Your introduction should set the stage for the conclusions of the paper by laying out the ideas that you will test in the paper. Now that you know where the paper is leading, you will probably need to rewrite the introduction.
11. You must write your abstract last.

## Figures and Tables

For your figure and table legends (and table data), always use single space. This is an exception to the 1 ½ space rule to use for running text.

- The actual figures and tables should be embedded/inserted in the text, generally on the page following the page where the figure/table is first cited in the text.
- All figures and tables should be numbered and cited consecutively in the text as figure 1, figure 2, table 1, table 2, etc.
- Include a caption for each figure and table, and highlighting the key findings.
- You must make your own tables and figures, including cartoons, schematics or sketches that illustrate a process that you discuss. It is not acceptable to copy and paste from a statistics program.
- Examine your figures with these questions in mind:
  1. Is the figure self-explanatory?
  2. Are your axes labeled and are the units indicated?

3. Show the uncertainty in your data with error bars.
4. If the data are fit by a curve, indicate the goodness of fit.
5. Could data density be increased by eliminating non-data bearing space?
6. Is this a sparse data set that could better be expressed as a table?
7. Does the figure distort the data in any way?
8. Are the data presented in context?

Does the figure caption guide the reader's eye to the "take-home lesson" of the figure?

## Equations

Like figure and tables, equations must be numbered consecutively as well. The placement of the equation legend should be just left of the right hand margin. All units and symbols in the equation must be explained, preferably directly under the equation, unless they have been defined clearly elsewhere. The source of the equation should, as a rule, be mention with a reference. However, if the equation falls into "common use" like common trigonometric and geometric equations like the Pythagorean theorem and equations for the areas of geometric shapes you can write the equation without a reference. If you are not sure, find out how old the equation is. If the equation has been in use for centuries, there's no need to cite a source. A more recent equation (within the last century), probably needs to be credited with a source. See the following examples:

The following equation is from Nobody et al (2013):

$$F_t = F_1 + F_2 \tag{1}$$

Or

$$F_t = F_1 + F_2 \tag{2}$$

As proven by Nobody et al (2013)

## Tying the Text to the Data

"Show them, don't just tell them..." Ideally, every result claimed in the text should be documented with data, usually data presented in tables or figures. If there are no data provided to support a given statement of result or observation, consider adding more data, or deleting the unsupported "observation."

Examine figure(s) or table(s) pertaining to the result(s).

Assess whether:

1. the data support the textual statement
2. the data contradict the textual statement
3. the data are insufficient to prove or refute the textual statement
4. the data may support the textual statement, but are not presented in such a way that you can be sure you are seeing the same phenomenon in the data that the author claims to have seen.

## Editing Your Thesis

Even a rough draft should be edited before sending in to advisor.

### Copy Editing

1. Proof read your thesis a few times.
2. Check your spelling. Spell checkers are useful for initial checking, but don't catch homonyms (e.g. hear vs. here), so you need to do the final check by eye.
3. Make sure that you use complete sentences
4. Check your grammar: punctuation, sentence structure, subject-verb agreement (plural or singular), tense consistency, etc.
5. Give it to others to read and comment.

### Avoiding ambiguity

1. Do not allow run-on sentences to sneak into your writing; try semicolons.
2. Avoid nested clauses/phrases.
3. Avoid clauses or phrases with more than two ideas in them.
4. Do not use double negatives.
5. Make sure that the antecedent for every pronoun (it, these, those, that, this, one) is crystal clear. If in doubt, use the noun rather than the pronoun, even if the resulting sentence seems a little bit redundant.
6. Ensure that subject and verb agree in number (singular versus plural).
7. Be especially careful with compound subjects. Be especially careful with subject/verb agreement within clauses.
8. Avoid qualitative adjectives when describing concepts that are quantifiable ("The water is deep.") Instead, quantify. ("Water depths exceed 5km.")
9. Avoid noun strings ("acoustic noise source location technique").
10. Do not use unexplained acronyms. Spell out all acronyms the first time that you use them.

## Plagiarism

Plagiarism is (among other things) the act of representing another author's work as one's own, and the act of directly using or closely imitating the language and thoughts of another author without authorization or giving credit to the original author. *Plagiarism is prohibited.* Either if it is from a friend's text or from a source online or any other written text. Plagiarism is easy to avoid if you give credit where credit is due. Whenever you cite someone else's ideas or use their language, give the name of the author and the year of publication (Harvard referencing system).

Plagiarism is considered academic dishonesty and is subject to university sanctions according to the Swedish Higher Education Ordinance, chapter 10; ([www.hsv.se](http://www.hsv.se)). This is also regulated by Halmstad University:

<http://www.hh.se/utbildning/arstudent/studentstod/studenternasregelbokreglerforstudier/examinationtentamen/atgardervidfusk.2812.html>

For your thesis, your texts must be checked through the plagiarism program safe assign through Blackboard before handing in to examiner for your thesis defense. You are responsible to submit it yourself.

## Thesis style and length

Final version of thesis should be typed 1 ½ space, 12 size font, and 2,5 cm left and right margins. Font for running text is size 12, title is size 24, the following subheadings sizes 18, 16, 14. Headings and subheadings are written in bold style and do not use period at the end.

The length of the final version of the paper can vary considerably from project to project. As a general rule of thumb, average thesis length is about 20 pages of text plus figures. This total page count includes all your text as well as the list of references, but it does not include any appendices. These generalizations should not be taken too seriously, especially if you are working on a labor-intensive intervention study or complicated methods project.

The most important advice we can give you: **Write for brevity rather than length**. The goal is the shortest possible paper that contains all information necessary to describe the work and support the interpretation. Avoid unnecessary repetition and irrelevant tangents. However, necessary repetition is also part of a paper, i.e., the main theme should be developed in the introduction as a motivation or working hypothesis. It is then developed in the main body of the paper, and mentioned again in the discussion section (and, of course, in the abstract and conclusions).

## Final Thesis after examination

When the examiner has given you the final passing grade and final corrections are completed, you need to go through the following steps in order to register your thesis and receive your grade on “ladok”. First go to Halmstad University webpage and read their instructions:

<http://www.hh.se/english/library/publishandregisterindiva/studentpapers.2913.html>

In summary:

1. You will be sent a Halmstad University official front and last page to include into your final version together with instructions. This must be done on a computer with Adobe Acrobat Reader (use library computers).
2. Assemble first page, your thesis and last page into one unit. This must be done in Adobe Acrobat Pro (use library computers).
3. Send your PDF-final copy to the supervisor and examiner so they have a digital copy.
4. Register your thesis on Halmstad University official website for publications (DiVA). If you think your thesis will be up for publication somewhere else (i.e., in a peer-reviewed journal) you should choose not to make your thesis public and click the “only for archiving” option.
5. When it is registered, you need to contact the examiner/course administrator to

## 7.1 Uppsatsanvisningar, Thesis guidelines

- receive a filled out requisition form for official printed copies of your thesis (see #5).
6. Send/bring your DiVA registered thesis in pdf-file to the janitor's office in the Q-house together with an official requisition form from your examiner/course administrator stating how many copies they need to print.
  7. Deliver one single sided copy to the administration's office (School of Business, Engineering and Science).
  8. Deliver one double sided copy to your advisor and one to examiner.
  9. NOW you will receive your thesis grade. Congratulation!