Procedures Training Periods/Research Projects and Scientific Review
Master’s Programme Biomedical Sciences 2018-2019

1. Master’s Internship Committee and Examination Board
The Master’s Internship Committee is responsible for evaluating the applications of training periods and the Scientific Review. The Master’s Internship Committee oversees the scope and width of the training periods. The Master’s Internship Committee is also responsible for the Interim and Final Evaluation and the Interim Assessment (see below). The Committee recruits a reviewer (second reader in Course and Examination Regulations (OER)) to review the reports on the training periods and the Scientific Review. This reviewer is well-known in the field of the research performed by the student, but has not been involved in the actual project. The members of the Master’s Internship Committee are responsible for the review of the (research) proposal of the second training period. Members of the Master’s Internship Committee are appointed as examiner by the Examination Board to determine final grades of training periods, Scientific Review and the (research) proposal.

Finally, the scope and width of the Master’s programme of the student will be evaluated by the Examination Board, who is responsible for certification.

2. Objective of the training periods/research projects
In the Master’s degree programme Biomedical Sciences the future profession is amongst others introduced by means of participation in academic research through training periods or research projects. During his/her training period, the student carries out research activities in order to explore a particular (bio)medical field with a view to adding knowledge to his/her current knowledge. The student is also expected to show initiative, independence and enthusiasm. The project coordinator (first supervisor in Course and Examination Regulations (OER)) is a researcher holding a doctor’s degree. The supervisor gives the student insight into the field, encourages enthusiasm for research in general and for research in the specific field in particular, helps the student to solve problems and teaches him/her to use fresh insights for the exploration of new paths of research. In order to achieve this objective the student familiarises him/herself with the existing knowledge in the field to which the research question pertains. He/she carries out individual research in order to obtain answers to the research questions and participates as a member of the research team, in the departmental and/or laboratory consultations and in the work discussions. The student reports in writing and orally on the results obtained.

3. Choice of training period
3a. Location of a training period
The student him/herself is responsible for finding a training period and there are various ways to find a training period:
- In the modules ‘training period folder’ (‘Stageklapper’) or Career orientation on Blackboard, many research projects can be found that are suitable for students of Biomedical Sciences.
- The student can contact a department, e.g. via the study coordinator of that department (for info see departmental websites and Blackboard module Master BMS General info). The coordinator will indicate the possibilities within the department and will refer the student to possible supervisors for the training period for more specific information.
- The student can contact the education coordinator of a medical research profile (see profile info on LUMC website).
- The student can contact a researcher directly (see research info on LUMC website).
- For a master’s training period outside the LUMC the student can contact researchers directly (for info see (university) websites and PubMed). A training period outside the LUMC can in principle be carried out
wherever high quality biomedical research is conducted and quality supervision of the student is guaranteed. In the Netherlands, this includes universities, companies and medical centres such as TNO laboratories, Sanquin (Blood Supply Foundation), the National Institute of Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milieuhygiëne), the Netherlands Cancer Institute (Nederlands Kankerinstituut), the Netherlands Institute for Brain Research (Nederlands Herseninstituut) and many other institutions. Equally good universities and institutions can be found abroad. There are many possibilities for research projects for master’s degree students both in and outside Europe, e.g. LERU (League of European Universities) and Ivy League universities in the USA. The student should always contact DOO Internationalisation, through the Education Service Point at e-mail esp@lumc.nl, for general info regarding internships outside the Netherlands. For more information, see the Leiden university master Biomedical Sciences website. If the student would like discuss his/her plans for the training period, he/she may make an appointment with one of the members of the Master’s Internship Committee via research-project@lumc.nl.

3b. Subjects for a training period
The student chooses the topics for training periods/research projects, as well as the department or laboratory where the training period is to be conducted. The student is expected to select those topics and departments for the Junior Research Projects (JRP) I and II which are part of disciplines listed below. The student is asked to cover a diverse spectrum of research disciplines and diseases in his/her total master’s programme to gain experience in multiple areas of research. In addition, gaining experience in several different research methodologies is mandatory. The scope and width of the Master’s training periods will be guarded by the Master’s Internship Committee.

In order to take into account the required diversity of topics covered in the training periods and FOS courses while planning his or her Master’s programme, the student can make use of the categories listed below.

1. Type of research
   a. Mainly statistical; Computer analyses (“dry”)
   b. Mainly bench work; Technical applications (“wet”)

2. Disease/clinical entity
   a. Ageing
   b. Neurological Diseases
   c. Cancer
   d. Cardiovascular diseases
   e. Infectious diseases
   f. Haematological disorders
   g. Chronic inflammatory disorders including allergy and autoimmune diseases
   h. Transplantation
   i. Metabolic disorders
   j. Congenital malformations

3. Discipline
   a. Bioinformatics
   b. Genetics
   c. Epidemiology
   d. Cell Biology
   e. Molecular Biology
   f. Physiology
   g. Pathology
   h. Regenerative Medicine
   i. Immunology
   j. Neurosciences
   k. Microbiology
   l. Anatomy/Developmental Biology

4. Methods
   a. DNA/RNA
   b. Protein / Proteomics
   c. Cell culture
   d. Statistical models
   e. In vivo functional (including clinical)
   f. Imaging
g. Microscopy  
h. Functional Genomics  
i. Animal models

By selecting at least one item per category, all research in- and outside the LUMC can be described and together they cover a very diverse range of topics from very fundamental molecular biology to predominantly patient-related research.

The student is encouraged to design his/her Master’s programme in such a way that during the whole programme as many as possible, although not necessarily all items have been crossed off. For each training period the student will mark one item under (1), and maximally two items under (2), (3), and (4). The profiles for items (2) and (3) thus obtained, preferably do not overlap between JRP-I and JRP-II; profiles for category 4 should combine to a wide experience in multiple methods. Item 1a can only be selected once (i.e., for either JRP-I, or JRP-II). Item 1b can be selected for JRP-I and JRP-II. This will be checked by the Master’s Internship Committee before the student can start with JRP-II. For FOS courses, the student cannot mark items under (1), while under (2), (3), and (4), in total maximally three items can be marked for each FOS course. Before certification, the examination Board will determine whether a sufficient depth and width in the programme has been attained by the student.

The training period within the M- (Management) and C- (Communication) specializations can be done in a company or institute, provided that it is related to a biomedical topic. The student him/herself is responsible for finding a training period position in a company or organisation. The Coordinator M-, C-, and E (Education) specializations will be the LUMC supervisor of such a training period and can be consulted for advice on finding an internship. The abovementioned criteria for diversity will be applied less stringent for the M-, C-, and E specializations.

4. Entry requirements
Students who have been admitted to the Master with a deficiency (maximum of 15 credits) are not allowed to start with a FOS or training period within the field of that deficiency. This is monitored by the Master’s Internship Committee. Before starting Junior Research Project II the Directorate of Education must have received the final version of the report (and preferentially also the final grade) of Junior Research Project I. Furthermore, the course How to write a research proposal must have been successfully completed prior to JRP-II. The (research) proposal for JRP-II has to be written and submitted to the Student Administration of the Directorate of Education via the on-line system KL-APP prior to the start of JRP-II.

5. Procedure of application and approval

5a. Junior Research Project I (Appendix I)
The on-line system KL-APP is used for application of JRP-I. The internship application form in KL-APP can be accessed by the student via https://klapp.lumc.nl/portal/ (an example of the application form is posted on the Blackboard module Master BMS). The project coordinator should provide the student with the information, necessary to fill in the on-line form. The student should ask approval for the internship four weeks prior to the intended starting date of the internship by submitting the form to the Master’s Internship Committee. The project coordinator will receive information on his/her account and access to KL-APP via the student administration, after the form has been submitted by the student. The project coordinator has to approve the application via KL-APP. The student and supervisor(s) will be informed of the approval or disapproval of the training period by the Master’s Internship Committee via KL-APP. The training period may commence once the application has been approved.

5b. Junior Research Project II (Appendix II and III)
Prior to writing a research proposal, students from the R specialization send the JRP-II application form via KL-APP, as indicated above, at least six weeks before the training period is due to begin and should take into account the time necessary for writing the research proposal. The student will be informed whether or not the training period position has received approval of the Master’s Internship Committee. Following this, the student will write a research proposal about the subject that is to be studied in JRP-II, in consultation with the project coordinator.

Prior to the start of the JRP-II Management or JRP-II Communication, a proposal for the M and C training period is written in consultation with the supervisor of the company or organisation where the training period
is to be conducted, together with the Coordinator M-, C-, and E specializations. Before the start of the training period this proposal, together with the completed training period form must be submitted for approval to the Master’s Internship Committee, by sending an email to the Student Administration. (cc. to supervisors to indicate their consent). The student and supervisor(s) will be informed about the approval or disapproval of this (research) proposal and training period form. In the event that one of these (or both) is disapproved, the student will be advised about additional information that needs to be supplied. The training period may commence once it has been approved.

Students from the Health specialization fill in the JRP-II application form in consultation with the project coordinator and submit it via KL-app at least four weeks before the training period is due to begin. The student and supervisor(s) will be informed of the approval or disapproval of the research project by the Master’s Internship Committee. The training period may commence once the training period has been approved. They do not write a research proposal.

5c. Elective Junior Research Project
For all specializations it is allowed to perform an extra training period in the elective area. The same rules apply for application, approval and assessment of this training period as for JRP-I. A minimum length of 12 weeks (= 17 credits) is advised, but students can deviate from this in their application.

5d. Scientific Review (Appendix II)
For the R specialization a supplementary (but separate) Scientific Review is written. The subject of the Review is related to but not the same as the subject of JRP-II (or JRP-I). The student fills in the Review application form in consultation with the project coordinator and submits it via KL-APP to the Student’s administration of the Directorate Education (DOO) at least six weeks before the end of JRP-II (or JRP-I). The student and supervisor(s) will be informed of the approval or disapproval of the subject of the Scientific Review by the Master’s Internship Committee.

For the C-, M-, H- and E specializations a Scientific Review can be written in the elective area. The same rules and forms apply as for students from the R specialization. However, a subject can be chosen that is not related to a research training period.

All communication with the Master’s Internship Committee goes via the e-mail address: research-project@lumc.nl of the Student’s administration of the Directorate Education (DOO) or via KL-APP.

6. Credits, duration and extension of master research projects
6a. Credits
In the first year of the Master’s programme, a training period lasting 20 weeks JRP-I (29 credits) is carried out, regardless of the specialization chosen.

After completion of JRP-I, a second training period (JRP-II) can be started, lasting:
- 28 weeks (R specialization: 40 credits),
- 18-29 weeks (M specialization: 26-42 credits),
- 16-24 weeks (C specialization: 23-34 credits),
- 14-28 weeks (H specialization: 20-40 credits, depending on previous education of the student (OER))

Students who choose an E specialization complete their training period (2 times 15 credits) as a biology teacher at a secondary school. In this case a proposal is not written. N.B. The procedures with respect to the Specialisatie, Praktijk and Portfolio in the Education specialization (lerarenopleiding) are governed by the ICLON portfolio handleiding and specialisatie handleiding, instead of the procedures laid down in this document.

6b. Duration and extension
A training period of e.g. 20 weeks may not exceed these 20 weeks. Both the student and the project coordinator must observe this period, which is known in advance, even if extension of the training period will possibly yield the results expected. JRP-I and JRP-II are concluded with a written report and an oral presentation. The report must be written during the designated period.
If a student wishes to make use of the elective area to apply for a possible extension of the training period, he/she should approach the Master’s Internship Committee at least a month before the original completion date. With respect to extension, the following guidelines apply:

For Junior Research Project I:
- Research specialization: JRP-I may be extended with a maximum of 8 credits;
- Health specialization: JRP-I may be extended with a maximum of 8 credits;
- Management specialization: JRP-I may be extended with the maximum of the elective area;
- Communication specialization: JRP-I may be extended with the maximum of the elective area;
- Education specialization: JRP-I may be extended with the maximum of the elective area;

For Junior Research Project II:
- Research and Health specialization: JRP-II may be extended with the maximum of the elective area;

To calculate the credits, the following formula is used: 1 wk = 1.43 credits and subsequently credits are rounded off to whole numbers.

For more information, see the Course and Examining Regulations (OER) at the Leiden university master Biomedical Sciences website.

7. Responsibilities of the student
The student is expected to find a subject for the training period him/herself. A subject or subjects is/are proposed which is/are aimed at answering a question in (bio)medical sciences. For JRP-II an extensive (research) proposal is written by the master’s degree student. During the training period the student is expected to conduct individual research in which the available time should be adequately divided between reading the relevant literature, carrying out the (research) activities, analysing the results and writing a training period report. In addition, the student is expected to be actively involved in the (research) group and to be socially motivated. For consultation the student should report to the project coordinator and other members of the (research) group who have been authorised by the project coordinator to provide concrete assistance to the student.

8. Responsibilities of the project coordinator (first supervisor)
The project coordinator is expected to assist the student in drawing up a (research) protocol (for application for approval of JRP-I and JRP-II) and in creating a (research) environment which allows the student to perform optimally. This implies that the project coordinator is available for consultation on a regular basis during the training period, and that he/she ensures the availability of equipment, reacting agents and/or other facilities, such as approval by the DEC and MEC, that are needed to enable the research to be completed. The project coordinator is expected to encourage the student’s enthusiasm for the field and to guide the student in the course of the (research) project. The project coordinator is allowed to delegate tasks to post-docs, PhD candidates and analysts, but this does not relieve the project coordinator of his/her responsibilities with respect to the success of the student’s training period.

For a training period outside the LUMC, there should be competent supervision locally and a LUMC lecturer with expertise in the field of research concerned acts as internal supervisor. The student will send regular updates to his/her internal supervisor.

For the M-, C- and E specializations, internal supervision is carried out by the Coordinator of these three specializations.

Before the start of a project/training period, internal and external supervisors are informed in writing by DOO on their tasks and responsibilities by means of the “Checklist for training period/research project supervisors”.

9. Evaluation and interim assessment
In the fourth week of the training period and at the end of the training period evaluation forms are filled in by the student and the project coordinator. After 12 weeks an interim assessment form is filled in by the student and the project coordinator. All forms are available via KL-APP. In the unlikely event that problems should
occur, the student will first discuss these with the project coordinator. In those cases in which a conflict cannot be solved by mutual agreement, the Master’s Internship Committee will be informed of the conflict. After hearing the student and the project coordinator, the Master’s Internship Committee will give an advice which is binding for both parties. In cases of fraud and misconduct the Examination Board will always be informed and will act according to the Course and Examination Regulations (OER). The Directorate of Education will monitor whether all forms have been submitted and will send reminders to supervisor and student. The final grade of an training period will only be posted in USIS when all evaluation and (interim) assessment forms have been submitted.

For the M- and C specializations, monthly updates and the interim assessment form are sent to the Coordinator M-, C-, and E specializations.

For a training period outside the LUMC, the student will also send regular updates to his/her internal supervisor.

10. Students’ Symposium
Master’s degree students present the results of their training period to an audience of students, supervisors and other interested persons during a symposium which they organise themselves. The students are supervised by lecturers of Communication in Science in the organisation of this symposium.

11. Reporting (written and oral)
The report of JRP-I (all specializations) and of JRP-II (R and H specialization) is structured as a scientific publication according to the guidelines provided in Appendix IV of these procedures.

Guidelines for the writing of the Scientific Review are provided in Appendix V.

For the C- and M training period, the proposal stipulates how the reporting is to be done, with the emphasis on quality and professionalism. The format of the reporting depends on the location and the subject of the training period. This is discussed with the project coordinator of the company or organisation where the training period will be carried out, and the Coordinator M-, C- and E specializations, prior to the start of the training period. In addition to the content-wise report a reflective report is written (info on Blackboard module of the Master BMS general info).

At the end of the training period an oral presentation is given to the (research) group. This presentation is part of the assessment.

The lecturers of Communication in Science provide writing support for the JRP reports and the Scientific Review and supervise the student in the professional set-up of the training period reports and presentations.

12. Assessment
The student is assessed according to the criteria on the training period assessment forms (available via KL-APP). The final assessment will be carried out by the project coordinator. Besides the project coordinator a reviewer (second reader) will be involved in the assessment of the report and the Scientific Review. This reviewer is an expert in a relevant field of science appointed by the Master’s Internship Committee. Communication in Science also assesses the written reports of JRP-I (all specializations) and JRP-II (R and H specialization), and the Scientific Review). In all cases, the final grade is determined by an examiner of the Master’s Internship Committee.

More information on the assessment procedure is provided on the Assessment form Junior Research Project and Assessment form Scientific Review (KL-APP and Blackboard module of the Master-general info).
JRP1 in KL-app (all specialisations)

At least 4 weeks before start of internship

Application form JRP1

Rejected

Rewrite application form

Approved

Approval notification

CIS feedback

Project coordinator feedback and plagiarism check

Write report & give presentation

Start

week 4: Interim evaluation to MIC

week 12: Interim assessment to MIC

Finish

Report to MIC

All JRP1 assessment forms to MIC

Final JRP1 evaluation form to MIC

Final grade is determined by examiner MIC

Assessment internship

Project coordinator

Assessment final report, plagiarism check

CIS

Assessment report

reviewer

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Appendix II: JRP2- Research in KL-APP

At least 6 weeks before start of internship

Application form JRP2

Rejected

Rewrite application form

Project coordinator feedback

Approved

Approval notification

Write research proposal (form)

Write report & Give presentation

Write Scientific Review

Plagiarism check by CIS

CIS internship report assessment

CIS Scientific Review assessment

Final report & Scientific Review to MIC

Scientific Review All forms to MIC

JRIP2 All forms to MIC

Final JRP2 evaluation form

Final grades are determined by Examiner

End date – 6 weeks: send in application form Scientific Review

week 12: Interim assessment to MIC

week 4: Interim evaluation to MIC

Research proposal assessment form to MIC

Final research proposal to MIC

CIS feedback

Project coordinator feedback

Assessment internship report & Scientific Review

Reviewer(s)

Assessment internship & Scientific Review

Project coordinator

CIS
Appendix IV - Guidelines for Writing a Research Project Report (3120310PPY and 3120330PPY)

General format
The function of the Junior Research Project Report is to report on research performed during the internship. Reports of Junior Research Projects 1 and 2 should follow the format of original research articles published in a biomedical journal. The text should be divided into the following sections: Abstract, Introduction, Methods, Results, and Discussion. Subheadings may be necessary within some sections to clarify their content.

Layout
The paper should be written in Times New Roman, 12 point font and double-spaced. All pages should be numbered.

Title page
The title page should contain the following information:

- Research project title, in accordance with the title given in the research project proposal
- Student’s name and number
- Stage of research - Junior Research Project I or Junior Research Project II
- Start and end date of the Junior Research Project
- Name of supervisor
- Departmental affiliation

Abstract
The abstract should provide the context or background for the study and should state the study’s purpose/aim, basic procedures (study subjects, laboratory animals or cell lines, observational and analytical methods), main findings (giving specific effect sizes and their statistical significance, if possible), and principal conclusions. It should emphasize new and important aspects of the study or observations.
Length: Max 250 words.

Introduction
The Introduction sets the context for the study, provides relevant background information and states the research question addressed. The introduction section should:

- Locate your study within the existing field of relevant research
- Justify your study (identify the need for your work; how its contributes to or challenges existing research)
- State the purpose or aim of your study

Provide only relevant references, and do not include data from your own research.
Length: maximum 1000 words

Methods
The Methods section should provide enough information for a competent researcher to repeat your study and reproduce the results.

- Selection and description of cell lines or participants: Clearly describe your selection of the observational or experimental participants (patients or laboratory animals, including controls), including eligibility and exclusion criteria and a description of the source population. The guiding principle should be clarity about how and why a study was done in a particular way.
- Technical information: Identify the methods, apparatus (give the manufacturer’s name and location in parentheses), and procedures in sufficient detail to allow others to reproduce the results. Give references to established methods; provide references and brief descriptions for methods that have been published
but are not well-known; explain new or substantially modified methods. Identify drugs and chemicals used, including generic name(s), dose(s), and route(s) of administration.

- **Statistics:** Describe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to verify the reported results. When possible, quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Avoid relying solely on statistical hypothesis testing, such as P values, which fail to convey important information about effect size. References to the design of the study and statistical methods should be to standard works. Define statistical terms and abbreviations. Specify the computer software used.

**Results**
The Results section should present and illustrate your findings. Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat all the data in the tables or illustrations in the text; emphasize or summarize only the most important observations. Extra or supplementary materials and technical detail can be placed in an appendix where they will be accessible but will not interrupt the flow of the text.

When data are summarized in the Results section, give numeric results as the absolute numbers from which any derivatives (for example, percentages) were calculated, and as the derivatives if appropriate. Restrict tables and figures to those needed to explain the argument of the paper and to assess supporting data. Use graphs as an alternative to tables with many entries; do not duplicate data in graphs and tables.

**Discussion**
The discussion should answer the question posed in the Introduction. It should explain how the results support the answer. The discussion should emphasize the new and important aspects of the study and the conclusions that follow from them. Link the conclusions with the goals of the study. The discussion should consider how the research performed in the study contributes or adds to work done in that field. Strengths and limitations of the study should be stated. Implications for future research and clinical practice should be suggested. Avoid conclusions not adequately supported by the data.

Length: The Discussion should be between 900 and 1500 words.

**Acknowledgements**
The acknowledgements section should specify any substantial help received from organizations or individuals, whether they provided grants, materials, technical assistance, or advice. Concisely thank those who went out of their way to help, and describe their contribution.

**References**
Direct references to original research sources should be provided whenever possible, rather than references to review articles that may not reflect original work accurately. Small numbers of references to key original papers often serve as well as more exhaustive lists.

**Appendix**
Information or data that supports or supplements the research performed (but is not central) may be included in an appendix. Extra information may be deemed necessary by either the student or the supervisor. Examples of supplementary material are
- standard protocols
- supplementary data
- pilot studies

**Tables**
Tables capture information concisely and display it efficiently. Number tables consecutively in the order of their first citation in the text. A brief title should be placed above the table. The Students should place explanatory matter in footnotes, not in the heading. Explain all non-standard abbreviations in footnotes. Identify statistical measures of variations, such as standard deviation and standard error of the mean. Be sure that each table is cited in the text.
Illustrations (Figures)
Figures should be made as self-explanatory as possible. Titles and detailed explanations belong in the legends, not on the illustrations themselves. Figures should be numbered consecutively according to the order in which they have been cited in the text. If a figure has been published previously, acknowledge the original source.

- *Legends for Illustrations (Figures):* Type legends for illustrations with Arabic numerals (1,2,3, etc) corresponding to the illustrations. When symbols, arrows, numbers, or letters are used to identify parts of the illustrations, identify and explain each one clearly in the legend. Explain the internal scale and identify the method of staining in photomicrographs.

- *Units of Measurement:* Measurements should be presented in metric units according to the International System of Units.

Abbreviations and Symbols
Use only standard abbreviations. The spelled-out abbreviation followed by the abbreviation in parenthesis should be used on first mention unless the abbreviation is a standard unit of measurement.

Professional Integrity
The findings, conclusions and hypotheses of other authors that you report on should be fully referenced. Students are required to write in their own words even when describing the work of other authors. Copying passages from other texts word-for-word is a form of intellectual theft (even if a reference is present) and will be reported to the Examining Board as plagiarism.

These requirements are adapted from the Uniform Requirements for Manuscripts Submitted to Biomedical Journals that have been produced by the International Committee of Medical Journal Editors.¹

¹ http://www.icmje.org/urm_main.html
Appendix V - Guidelines for Writing a Scientific Review (3120341PPY)

To conclude your Master’s degree you will write a literature review on a subject related to your JRP-II. The primary aims of this assignment are for you to develop in-depth knowledge of your subject area, reflect on the context of your own research within the wider field and communicate your understanding and assessment of the relevant literature to an audience.

Learning outcomes
The student can:

- identify major developments, issues and debates in the literature
- communicate understanding of and insight into the subject area
- demonstrate critical engagement with the subject through presenting his/her own assessment or interpretation of the literature
- communicate these ideas in a logical, well-argued manner

Scope of the Assignment
A review is an academic paper that provides a critique of relevant literature published on your topic of investigation. A good review provides a comprehensive summary of that field, demonstrating knowledge of and insight into relevant research done in the field. As well as describing this research, the review also provides a critique by, for example, identifying key and innovative studies and, where relevant, weaknesses in studies. The review should, in a well-argued and substantiated manner, include the writer’s own interpretation, evaluation, and conclusions.

Basic Structure
Your review should be in narrative (essay) form and should include a summary, introduction, main body and conclusion. Note that the review should have limited overlap with your JRP-II and is assessed separately. For more specific guidelines about planning, writing and revising your review, please refer to the following pages.

Support
Your internship supervisor will provide guidance on the writing process and will evaluate your review. Communication in Science (CIS) will provide writing support on draft versions. Students should submit a draft of their review to CIS through the Master’s Blackboard page in order to receive feedback before submitting a final version. Contact John O’Sullivan (j.f.osullivan@lumc.nl) to be assigned a CIS tutor. Three times per year, CIS also organises a 1-hour workshop on beginning/writing your scientific review, the Review Start-up Session. These sessions are announced via Blackboard and are open to all masters students.

Assessment
Assessment is based on content, structure, critical skills and communication. Please refer to the assessment forms for more details.
Evaluation: Internship supervisor (90%); CIS (10%)
Length: 7000 words (maximum)
ECTS: 6

The literature review: planning, writing and revising
As a researcher, you likely refer to literature reviews at several points in the course of a study, from the planning stages to the interpretation of your results and the final drafting of an article. Reviews help you understand the state-of-the-art of a particular topic. They may also help point your research in an interesting direction, put your research question in perspective or interpret your results in the context of related work.

A good review contributes to the scientific discourse not only by presenting “the dry facts” of recent studies, but by offering perspective: a way of considering important recent studies together. In other words, a review

2 It is also possible to write your review on a topic related to JRP-I. It is preferred, however, to write the review on a topic related to JRP-II.
is not just a summary of recently published articles, but is an overview and assessment of current knowledge based on the critique of recent work.

This document is intended to help you in the planning and writing stages of your own literature review. The following sections contain guidelines and suggestions for:

1: planning the review
2: writing the different sections of the review
3: revising your work
You will also find:
4: answers to commonly asked questions
5: resources to consult for additional help

1. Planning the review

When planning a review, your main tasks include the following:
- choosing an area of focus, usually guided by a question
- surveying the literature, identifying important studies in your area
- analyzing those studies in light of your question or particular focus
- synthesizing your analyses – connecting the different parts of your reading and analysis into a unified story

Effective writing begins with good planning. Before you draft the actual review, spend time identifying the studies you want to use, analyzing those studies and thinking about what connects them to each other and to your main topic or question.

As with all writing, planning and composing a literature review is an organic process. As you read, you may need to make your topic broader or narrower, or you may decide to adjust your question. You may return to the literature while writing, as additional questions arise. This organic process is what will enable you to craft a compelling review which contributes to the field and which will be a useful resource for other researchers.

Reading with the review in mind

You will use the literature to discuss a main question or area within the field. While reading, more general questions may help you get started:
- What recent discoveries or advancements have been made in the field?
- What problems are researchers currently trying to solve?
- For what questions has the literature reached a consensus?
- On what questions or topics does the literature not yet agree?
- What is not yet understood?
- Which studies are repeatedly cited? Which seem most controversial?

Keeping these questions in mind as you read can help you find or adjust the main question that will drive your assessment of the literature. Take good notes and maintain a bibliography as you go.

The Walaeus Library offers guidance for conducting more effective literature searches and for keeping track of articles. Visit their Blackboard page or consult a librarian if you need more help with these aspects of the review.

2. Writing the review

Critical approach

In writing a review, you become an authoritative voice. Rather than simply retell recent findings in the field, you decide how to discuss the topic you have chosen, which studies are most relevant and what they tell us when considered together. Throughout the review, you make claims about the current state of knowledge and support those claims with the articles you have studied.
Writing a review, then, requires a critical approach. To answer the seemingly basic question, “What is known, and what remains to be understood?” you must analyze a number of studies and, ultimately, synthesize them. Synthesis is the way you connect different pieces of information, either to discuss an aspect they share or to point out a gap. Through synthesis, you are able to determine the essential subtopics of your review, to substantiate the points you make about those subtopics and to offer readers a way of making sense of the results of various studies together. Synthesis is, in fact, your main task.

Organizing your paper
Because you are synthesizing the literature, your review should be organized not by study but by topic. Planning an outline of your review before you begin writing an actual draft will help you think through the most logical order for subtopics, which articles to discuss where, how to present your topic to the reader and how to wrap up your discussion.

Organizing your paper by subtopics and then linking those topics to each other and to your main question or problem will allow you to compose a literature review that:
- is an assessment of recent and important literature
- has a clear focus and purpose
- is driven by discussion of a topic or of an important question, based on recently published studies
- follows a logical structure, convincing the reader of its points

Guidelines per section

Introduction
The introduction should present the topic in context (what larger area/field/problem does your topic fit into?) and communicate its importance to the reader (why should we care about this topic?). This section also presents your approach to the topic. In other words, the introduction answers the following questions:
- What is this paper about?
- Why does this topic merit a review?
- How will the topic be discussed?

Body
The body of the review then explores the question or problem presented in the introduction. This section should be organized around the subtopics you deem most important, based on the literature. Your goal in each subsection is to communicate to the reader what the literature has to say about this subtopic. When composing the body:

Synthesize
Discuss studies together when possible. The articles you choose to include are support for what you have to say about each subtopic and, ultimately, for your overall message about your topic.

Explain how main points within the body of the review relate:
- to the main topic / problem
- to other points in the body

You may feel you are stating the obvious, but remember that your reader has not necessarily done all the reading you have. As the author of the review, you have determined which studies are most important and why. Go ahead and state the links between points so that your review becomes a cohesive story.

Use subheadings
When you use subheadings, be specific. Rather than using a single, categorical word, try to indicate to the reader what about that topic will be discussed. Remember that subheadings are not a substitute
for in-text language that connects different points; they may be added to a lengthy section to make the structure more visible to the reader.

Give credit
Make appropriate reference to different studies. Do not assume the reader will know you are talking about a certain published article; use citations to remind the reader regularly that this is your assessment of other authors’ work.

Conclusion
As with any piece of writing, the conclusion is your final statement on the topic and your chance to emphasize, once again, its importance to the reader. In the literature review, the conclusion section should draw previous points together in order to offer a final response to the initial problem or question raised in the introduction. The length of this section depends on the extent to which you synthesize and discuss your main points in the body. If you have not already done so, you may want to use this section to offer suggestions for future research, or to summarize what remains to be understood about the topic.

The close of your report may speak to any of the following points:
- reiterating main conclusions being drawn about the topic
- emphasizing gaps in the knowledge
- suggesting future directions for research
- considering the implications and/or potential applications of current work

Your review should come to a formal close, convincing the reader of the importance of the topic and of the perspective you have offered.

3. Revising your review

Once you have written a draft of your review, you may need to adjust your introduction. Have you followed through on your promise to the reader? Do you need to add or change anything in this section to account for your subsequent discussion of the literature?

Another useful revision tool is the outline. Outlining what you have written will help you consider aspects such as order. Would it make sense to move one section earlier? Do you see how you might be able to better link two points?

As you revise the body of the review, keep asking yourself: is the connection clear between this point and the main topic of the review? Does this point support the conclusion I offer at the end of the review?

4. Integrity and plagiarism

From September 2014 all students are required to upload their JRP reports and literature reviews to Blackboard via Turnitin. Turnitin is a plagiarism checker that tests the originality of each report. Students are required to upload their reports twice, once at a formative, draft stage and once when the report/review is final.

Each student must discuss the Turnitin originality report (both draft and final version) with their supervisor. The Turnitin originality report can be either printed or shown digitally to the supervisor via student's Blackboard account.

The supervisor will note on the final evaluation that the originality report has been discussed with the student. Further details can be found on the Blackboard Master’s page under the tab “Student report submission”.

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5. Common questions about writing a literature review

Have I said enough?
This question gets at the issue of topic breadth. A literature review need not be exhaustive; it should assess recent literature published on a topic. That said, if you have trouble finding more than a few studies that address your topic, or you find it difficult to meet the length requirements of your assignment, then your topic may be too narrow. Think about zooming out a few degrees and broadening your topic. What larger question does yours fit into?

If you have the opposite problem – the literature seems endless and it is difficult to sort through all the subtopics you have generated, or if you have greatly exceeded the length requirement of your assignment, then you might consider narrowing your topic. Would focusing on one or two of your subtopics allow you to develop a more thorough, convincing review of the literature? What question within your larger topic seems most urgent?

Can I mention the authors’ names? Do I have to?
In addition to citing a study, you may also refer to the authors of a study in your own text. Mentioning the name can help you emphasize the importance of a particular article, but it is not necessary every time you introduce a study. Remember that you need to give credit but also that your task is to discuss the topic, not the authors.

If you say, for example, “The color blue has been found to have a soothing effect (3),” you emphasize the information but still give credit, referring the reader to your bibliography. If you say, instead, “McDonald et al. found that the color blue has a soothing effect (3),” you emphasize who found this information, perhaps because this was a very important study, or in order to contrast it with another group that found something else. You may also want to use the name every so often as a way of varying sentence structure, if you feel that would bring your paper more to life.

Some writers fall into the trap of beginning every paragraph with an author name. This can be an effective style choice, but then make sure it is indeed a conscious choice. The findings or other scientific information you discuss should be clear and emphasized for the reader – this information forms the story you are telling. If you notice you often start by referring to the author, make sure you are not discussing studies one-by-one, but that you are synthesizing your discussion – connecting the studies to each other and to your main point, topic or question.

Should I follow IMRaD structure?
No! A literature review is not the same as a systematic review. You are synthesizing already published findings, not presenting new data.

6. Additional resources

Of course, the best way to familiarize yourself with the conventions of the literature review is to read examples. Read published reviews in several journals in and outside your particular field of interest. Look for reviews that have had real impact on the field. What did those authors do to establish the importance of their topic? How did they organize their paper and connect their different points?

The following websites offer additional help on writing literature reviews:
http://sarp.stanford.edu/resources/scientific_literature_review.html
http://writing.wisc.edu/Handbook/ReviewofLiterature.html#body
http://www.writing.utoronto.ca/advice/specific-types-of-writing/literature-review

Keep in mind that you can always contact CIS tutors to discuss your work-in-progress.