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THE SENIOR EXERCISE IN NEUROSCIENCE

This document contains information regarding the formation of the Neuroscience Senior Exercise committee, the selection of the senior exercise topic, the preparation of the proposal abstract, and the due date of the proposal. It also contains a detailed description of the writing format and the expected contents of the various sections of the final proposal. Consistent with NIH research grants, these sections include: (a) specific aims, (b) background and significance, (c) research design, methods, and analysis, (d) ethical treatment of human/vertebrate animal subjects, and (e) literature cited. This information is available from the Chair of the Neuroscience Program and also from the Neuroscience website.

As stated in the Kenyon College Course of Study and the Neuroscience website, the Senior Exercise for majors in Neuroscience consists of writing an original research proposal, using the somewhat unique format that is appropriate for a scientific grant (e.g., National Institutes for Health). The proposed research does not have to be a project that the student is actually expected to conduct, so it might involve subjects (e.g., primates, hospitalized patients) and sophisticated experimental or clinical equipment (e.g., MRI or PET imaging methods) that are not available at Kenyon. **The final draft of this exercise is due either (a) during the week before Thanksgiving Vacation or (b) the first week after Spring Vacation.** It should be noted that providing the student with the option of completing this exercise during either the fall or spring was a decision made several years ago, following a meeting with the senior majors, faculty evaluators, and the program chair. Everyone agreed that some students might perform better on the Senior Exercise if they had the experience of writing a research proposal during the first semester as one of the required assignments in the capstone seminar (NEUR 471).

The Senior Exercise Committee

The final draft of the Senior Exercise research proposal will be evaluated by a three-member committee which is comprised of the Senior Exercise Advisor, another member of the Senior Exercise Advisor's department, and a faculty member from another department. All three committee members must be affiliated with the Neuroscience Program, however, special exceptions may be granted by the Chair of the Neuroscience Program.

The student's Senior Exercise Advisor need not be the student's academic or Faculty Advisor. Decisions about the members of each student's Senior Exercise Committee are initiated by the student, discussed with the student's Senior Exercise Advisor, Faculty Advisor, and the program chair, and finalized by the start of the student's senior year. The student, with the support of his or her committee, should select a research topic that will be the focus of the research proposal

and also decide on whether the exercise is to be completed during the first or second semester of the student's senior year.

The Senior Exercise Topic and Proposal Abstract

Within the first three weeks of the chosen semester, the student must submit a one- or two paragraph abstract, or summary, of the topic of the proposal to his or her Senior Exercise Advisor, who after consulting with the student, distributes it to the other members of the student's committee. The student is only able to obtain the committee's feedback on the relevance and major issues concerning the proposal topic during the preparation of the final draft of this 300-word abstract, or summary, that is due five weeks into the semester.

This abstract is also used by the faculty to determine if the hypothesis (es) are sufficiently different from previous assignments that have been, or are being, done by the student.

Unanimous approval of the abstract of the proposal by the members of the committee must be confirmed, in writing, on the "Neuroscience Senior Exercise Topic Approval Form." This form can be obtained from the Neuroscience Website or from the Program Chair, and he will keep the final copy of the endorsed form on file.

The student's Research Proposal should describe one (or possibly two) original hypothetical experiment(s). Although it is possible for the topic or hypothesis(es) to be somewhat related to the student's article critique or research proposal for the Neuroscience Seminar (NEUR 471), the student's Honors Project, Individual Study, or a term paper for a course, in all of these cases, the major theme or hypothesis(es) of the Senior Exercise Proposal must be clearly different from these other assignments in terms of involving unique subject populations, methods, measures, and/or analyses. The student's Senior Exercise Advisor and committee members should discuss the proposal with the student, in the preparation of the abstract, to ensure that the Senior Exercise Proposal is not a mere replication of a previous assignment done by the student. As noted before, written approval of the topic as well as confirmation of the originality of the student's proposal is documented as part of the "Neuroscience Senior Exercise Topic Approval Form."

Technical and logistical questions about the format, style, etc. of the actual proposal should be directed to the Program Chair. Because this project is to be considered original work, the student is not permitted to ask his or her Senior Exercise Advisor, or any other faculty member, questions pertaining to substantive issues concerning any of the content of the actual Senior Exercise Research Proposal. However, as mentioned, feedback can only be given in the preparation of the student's abstract that was previously submitted on the Approval Form.

The Format of the Senior Exercise Research Grant Proposal

The student should use the scientific-writing style appropriate for his or her discipline (e.g., American Psychological Association, APA), and avoid the use of the first person as much as possible. All sections of the proposal should be in Times or Times New Roman, 12-point font, and single spaced, with 1 inch margins on all sides of the page, and one blank line between paragraphs. Section headings should be centered and in bold face. Thus, the layout of the proposal should be similar to the remaining sections of this document. The NIH sectional format to be used for this research grant proposal is described below:

Face Page

The following information should appear on this cover page: the student's full name, Neuroscience Senior Exercise, Kenyon College, the date, the names of the Senior Exercise Advisor and committee members, and the title of the proposal. The title should not exceed 56 characters, including spaces between words and punctuation. Choose a title that is specifically descriptive, rather than general. It should be centered in the middle of the cover page and typed in boldface.

Abstract (final version)

On a separate page, using the present and future tenses, state the specific aims and possible broad, long-term objectives of the proposed research, making reference (without citing specific textbooks or articles) to the health or mental health relevance of the project. Concisely describe the research design and methods for achieving these goals. Avoid long summaries of past studies and the use of the first person. This description is meant to serve as a succinct and accurate description of the proposed work, and it should not depend on the presentation of specific information found in the remaining sections. It is probably easier to write a good abstract after you have completed the other sections of your proposal. Above the abstract have the title of your proposal. **[Limit the final version of your abstract to 350 words. This should be a revised and slightly expanded version of the abstract stated in the Topic Approval Form.]**

Number the pages of all the remaining sections, starting with Page 3, and do not begin each section on a separate page. Use the writing style appropriate for your discipline, and avoid the use of the first person in all sections. However, always cite references by the last name of the first author (using et al. for multiple authors) followed by the year of the publication in parentheses: e.g, Brown, et al. (1997) or (Brown, et al., 1997; Jackson, et al., 1991; Smith & Thomas, 1994). Later, in the Literature Cited section, you should provide the list of complete references, in alphabetical order, using the standard style of your discipline.

RESEARCH PROPOSAL

Specific Aims

Use the present or future tenses in this section, and begin with a short paragraph that provides some of the theoretical and empirical background of the proposed research project. Then, present the broad, long-term objectives and what the specific research is intended to accomplish. That is, list each of your major aims or objectives in terms of specific hypotheses. Each of these listed aims should be explained in some detail, and they should be a logical extension of the literature review that will be presented in the following section. Be sure that you have operationally defined the specific variable(s) that you are manipulating (independent variable) and the variable(s) that you are measuring (dependent variables). In many neuroscience studies, there are one or two manipulated or predictor variables that are examined in terms of several behavioral, physiological, or biochemical measurements. You should not give a complete

description of all of your methodological or procedural details in this section. Rather, focus on what do you intend to do in broad terms and what questions you hope to answer. **[One or two pages are recommended.]**

Background and Significance

Using the past tense, review the theoretical and empirical literature that provides a logical background leading to the purpose(s) of your proposed study. Critically evaluate the existing knowledge in the scientific literature and indicate specific gaps which the proposed research is intended to fill, using the present or future tense. Be sure to state concisely the importance and health relevance of the research, described later in terms of your methodology, by relating what you stated as your specific aims to broad, long-term objectives. In summary, this section should reflect your knowledge of what other scientists have done and why your proposed project is important in terms of its theoretical implications or practical applications. **[Two to three pages are recommended.]**

Research Design and Methods

Using the future tense, give a detailed description of the research design (or strategy) that will be used to accomplish the specific aims of the proposed project. Include how the data will be collected (subjects, equipment, and materials or supplies), analyzed, and interpreted. Be sure that you give precise operational definitions of the specific methods you intend to use to manipulate your independent variables and record or measure your dependent variables. Describe any new approach or methodology (or combination of methods) and explicitly state the advantages over existing methodologies. Discuss the potential difficulties and limitations of the proposed procedures and alternative approaches to achieve your stated aims. As a part of this section, provide a hypothetical sequence of events and time table for the project. Point out any procedures, situations, or materials that may be hazardous and the precautions to be exercised. In summary, this section should indicate the subjects, equipment and supplies, design and procedure, statistical analyses, and other considerations that are involved in conducting the proposed research. **[Three to four pages are recommended.]**

Ethical Treatment of Human/Vertebrate Animal Subjects

If you are using human or other vertebrate animals as subjects, use the future tense in providing sufficient information to show that the proposed research is in compliance with the ethical issues stated in the “Guidelines for the Treatment of Human and Animal Research Subjects.” Some of these issues may have been addressed briefly in your methodology section where you described specific procedures and measures. A copy of these guidelines was distributed in the Research Methods courses (PSYC 401, 403, 406). It can also be obtained from the Program Chair. **[One-half to one page is recommended.]**

Literature Cited

List all references in alphabetical order, according to the last name of the first author. Each reference must include the names of the author(s), year of publication, title of the article or book

chapter, name of journal or title of book, volume number of journal, and page numbers. Use the referencing style that is appropriate for your discipline (e.g., APA style). See the Psychology/Neuroscience Secretary, or any member of the Psychology Department, if you need to refer to the latest edition of the Publication Manual of the American Psychological Association. **[Although there is no page limit for this section, there should be at least 12 primary (i.e., journal) references, with at least 4 from the last five years.]**

Based on the above information, your Research Proposal should be at least 10 single-spaced pages, but it should not exceed 17 single-spaced pages (including the Face Page, Abstract, Ethical Treatment of Subjects, and Literature Cited sections).

The Evaluation of the Senior Exercise Research Grant Proposal

Evaluation of the Senior Exercise is based solely on the student's research proposal. There is no oral examination. Likewise, the student's grade point average is not a factor in evaluating the Exercise. The members of the student's committee will meet to discuss the strengths and weakness of the proposal, after which time the Senior Exercise Advisor will prepare a written summary of the major points that were discussed. In addition, the student will be informed of the committee's decision in terms of one of the following categories: "Rewrite," "Pass," "High Pass," or "Distinction." If a "Rewrite" is required, the student should consult with his or her Senior Exercise Advisor and will be required to submit a revision of the original proposal, using the committee's feedback, by a deadline that is to be negotiated with the student's committee. If a student is required to do a "Rewrite," the evaluation of the revised version will determine the official grade category that is to be entered on the student's transcript. However, a student who is required to do a "Rewrite" cannot receive "Distinction" on the Senior Exercise.

If a prospective or current Neuroscience major has questions about any aspect of the previously described Senior Exercise in Neuroscience, please feel free to contact Prof. Andrew Niemiec, Chair of the Neuroscience Program.