PSYCHOLOGY 300B (A01)
Spring 2017 (CRN 22672)
Statistical Methods in Psychology: II

Professor
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Teaching Assistant
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Lectures
Monday & Thursday 11:30 AM - 12:50 PM
Cornett B143

Optional Text Book

Registration
Students are responsible for ensuring that they are properly registered in this course. The deadline for adding courses this term is January 20. Students will not be added to the course after that date. Students will not automatically be dropped for non-attendance of classes, so students deciding to drop the course must do so themselves.

Course Objectives
The purpose of this course is to provide an understanding of the basic statistical analyses applied in psychological research. For each type of analysis that is discussed, students will be expected to develop an understanding of the logic or theory underlying the analysis, the computational procedures, the circumstances under which it is appropriate to apply the analysis, and the correct interpretation of the results of the analysis. Evaluation techniques reflect these objectives.

Evaluation
(a) Examinations (85%)
You are responsible for attending examinations as scheduled. This responsibility includes the April final exam, so DO NOT plan your April travel until the exam schedule is final. If you miss one midterm exam for a valid, documented reason (e.g., illness, accident) you will be assigned a score based on the class average for that midterm and on how well you do, relative to the rest of the class, on the remaining examinations. No make-up exam will be given. Unexcused missed examinations will be assigned a score of zero. If you miss both midterms, you will be dropped from the course at the professor's discretion. If you miss the final examination, you must apply to write a deferred examination (see the on-line UVic Calendar). The final examination is cumulative with some emphasis on topics in the last part of the course.

(b) Research proposal (5%) and report (10%)
Each student is to propose her or his own hypothetical experiment using a design that is appropriate for either a one-factor or a two-factor analysis of variance (complexity of the design will influence the assigned grade). A description of the proposed study (research proposal), developed by the student, is to be submitted in printed form in class no later than February 27. A deduction of 15% will be applied to proposals submitted after 1 PM on February 27. Proposals will not be accepted after 4:30 PM, March 6. Details regarding what must be included in the proposal are given below. A plausible set of hypothetical data will be provided to each student based on this proposal. Students will analyze their data set and write a research report in the form of a journal article following APA format. The report is to be submitted in printed form IN CLASS no later than March 23. A deduction of 15% will be applied to reports submitted after 1 PM on March 23.

Exam writing contract. When you enter the classroom to write any of the exams, you are to be mentally and physically able to write the exam. If any condition exists that prevents you from writing the exam, you are to report to UVic Health Services to document the problem, and you are not to come to the exam site. If you write an exam, you are in effect stating that you are physically and mentally able to write the exam. You then forfeit the right to make any claim after the exam is over that you were not able to write it.

Scheduled dates for the examinations and their contribution to the final course grade are:

Exam 1: Monday, January 30 (22%)
Exam 2: Monday, March 6 (23%)
Final exam: April 7-25 (40%)

In January 7th, plan your April travel.
Reports will not be accepted after 4:30 PM, March 30. Reports must be submitted in printed form. Electronic submissions will not be accepted. Full details are presented below.

**Course Outline**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Text chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review of essential concepts and introduction to Bayesian analysis</td>
<td>–</td>
</tr>
<tr>
<td>Testing hypotheses about two population means</td>
<td>14</td>
</tr>
<tr>
<td>Power to detect an effect</td>
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*** Examination 1 about here ***

| Analysis of variance: Hypotheses about more than two population means | 16           |
| Analysis of variance: Two independent variables and the concept of interaction | 17           |

*** Examination 2 about here ***

| Analysis of variance: Repeated measurement of subjects               | 18           |
| Analysis of frequencies                                              | 19           |

**Research Project Details - READ THOROUGHLY AND CAREFULLY**

*Overview of Stages of the Project*

Both components of this project (proposal and final report) are treated as a form of "take-home examination", in that the professor will not review preliminary drafts, but he will answer questions to clarify the assignment, verify that proposed variables are reasonable, etc. Examples of previous high-scoring proposals and final reports will be posted on the course web site.

In the first stage of the project, each student is to propose his or her own experiment, within the design constraints discussed below. A brief description of the proposed study is to be submitted by **February 27**. The proposal must be submitted in printed form. The proposal constitutes the first stage of the research project. Late submission of a proposal will lead to a deduction of 15%. Note that late submission of the proposal will mean a delay in making a data set available to the student, and less time for the student to analyze the data and prepare the final report.

In the second stage of the project, a set of plausible data will be generated for each student and these data will be inserted into a text file that will be accessible over the internet at web.uvic.ca/psyc/masson/DataFiles. Each file will be identified by the last four digits of the student's registration number. Students will be advised when the data files are ready. Students will analyze the data using the statistical package **R** and prepare a written report for submission in printed form by **March 23**. Instructions on using **R** are available on the course web site and will be reviewed in class. The final report is to be prepared according to APA format and is to include title page, abstract, introduction, method, results, discussion, references, and a table or a figure. All sections are to be double spaced. Output from **R** showing the results of the statistical analyses is to be attached to the report.
Stage 1: Proposal (due February 27; 5% of course grade)

Your proposal is to be based on an experiment that you devise. The issue you choose to study may be from any area of psychology that is of interest to you, but be sure that your study ties in with some relatively recent psychological literature (published in refereed journals) on the topic of your choice. To help stimulate creativity, you are advised not to use either exercise or stress as independent or dependent variables in your study unless you have a good theoretically based reason for doing so. Do not use these variables just because they happen to come to mind without much thought. Your goal is to show how your results influence theories about how psychological processes affect your dependent measure. A good source for nifty topic ideas is the journal Psychological Science (available in the UVic library in printed form and on-line). The articles in this journal cover a wide range of topics and they are short and scientifically rigorous. Another constraint is that the design of your study must be one of the following: (a) one independent variable with three or four independent samples or levels (to be analyzed by a one-factor ANOVA and relevant pairwise comparisons), or (b) two independent variables with independent samples consisting of either a 2 x 2 or a 2 x 3 design (to be analyzed by a two-factor ANOVA and relevant tests of simple effects or pairwise comparisons). In either case, you must also designate one and only one dependent variable (i.e., each subject gets exactly one score). The study you propose is to be a new study that is related to existing research. You should include in your proposal a brief description of related prior research and include at least two references related to that research taken from peer-reviewed psychology journals. These articles will show you how a research report is organized. Marks on the final report will be awarded, among other things, on the basis of the complexity of the design you use and how well your experiment is integrated with existing literature on your topic (see the Marking criteria section below). This latter fact means that the proposal represents a very important part of your project. It lays the foundation for the conceptual ideas to be discussed in your final report and for the design of your experiment. For example, be very careful in your choice of variables. Be sure that you have a clear and interesting theoretical motivation for examining the variables you select (e.g., do not include gender as a factor just because you want to have a 2-factor design). If you select variables off the top of your head without giving the issue serious consideration and without consulting relevant literature, you are likely to wind up with a conceptually impoverished report and disappointingly low mark as a result.

To ensure competency in using R to compute analyses you also must append to your proposal a printout from an ANOVA computed using R and applied to a data set called prop.txt, which will be available on the course web site. In addition to computing the ANOVA using the aov function, you are also to use the describeBy function to produce the descriptive statistics for the data and the pairwise.t.test function to compute pairwise comparisons between condition means. Use of all these functions is explained in the instructions on using R that are posted on the course web site.

Your proposal is due in printed form by February 27. The penalty for late proposals (those submitted after 1 PM on February 27) is a deduction of 15% of the total possible score. Late reports will not be accepted after 4:30 PM, March 6.

Your proposal is to contain the following information.

(a) A title page with your name and student number on it, along with a tentative title for your project.

(b) A brief introduction that might also serve as the foundation for the introduction for your final report. The introduction should cite at least two articles from standard, peer-reviewed, psychology journals. The articles must be relevant to the conceptual foundation of your proposed study.
(c) A method section stating the independent and dependent variables. Be sure to list the names of the conditions represented by the levels of the independent variable(s). Also specify the dependent variable in enough detail to allow sensible numerical values to be generated for your data set. Make sure that your dependent variable is measured on a scale that allows something approximating a normal distribution of scores (e.g., a rating scale, percent correct). A dependent variable that can take on only two values (e.g., conform vs. not conform) cannot be used because there is no way for such a variable to yield a normal distribution of scores. Be sure to indicate what would be the reasonable maximum and minimum values for the dependent variable. Indicate how many subjects are to be tested in each condition, which is fixed at 40 subjects per condition for this project.

(d) A results section describing the pattern of the data you expect to obtain (i.e., which conditions will have larger means than other conditions). Include a table or a figure indicating the expected mean in each condition of the experiment.

(e) References in APA style.

(f) Completed form specifying the variables in your design. There is a Research Project Design Specification form that appears below that you are to complete, and append to your proposal. The form requires you to specify the name of each independent variable, the names of each of the levels of the independent variable(s), the name of the dependent variable, and the minimum and maximum scores that subjects could reasonably be expected to obtain on the dependent variable. Completing this form will help you clearly understand your design and will communicate crucial information that will be used in generating realistic data for you.

(g) A printout of the analysis of the prop.txt data, consisting of the descriptive statistics produced by describeBy, the ANOVA computed by aov, and the pairwise tests from pairwise.t.test.

Remember that the key function of the proposal is to enable the generation of a set of interesting data for you. Be sure to provide adequate information for that purpose. Model proposals, which are idealized versions of student proposals from a previous year will be available on the course web site. You can use these samples as guides to the format and content of your proposal.

Marking criteria. Evaluation of the proposal will be based on 25 marks. These marks will be apportioned as follows:

(a) The completed title page. [1 mark]

(b) A brief introduction that cites at least two articles from standard, peer-reviewed, psychology journals. The articles must be relevant to the conceptual foundation of the proposed study. [2 marks]

(c) A method section stating the independent and dependent variables and listing the names of the conditions represented by the levels of the independent variable(s). Marks depend on clear and consistent definition of variables. [4 marks]

(d) A results section describing the pattern of the data you expect to obtain. Include a table or a figure indicating the expected mean in each condition of the experiment. Marks depend on consistency between variables as described in method section and variables discussed in analysis and consistency between description of expected pattern of results and what is presented in table or figure. [4 marks]

(e) References. [1 mark]

(f) Completed form specifying the variables in the design. Marks depend on completeness of information and consistency with what appeared in methods and results sections. [3 marks]

(g) Output from R based on the prop.txt data file. This must include descriptive statistics produced by the describeBy function, the ANOVA summary table from the aov function, and
pairwise comparisons from the `pairwise.t.test` function. **IMPORTANT NOTE:** The purpose of this requirement is to ensure that students learn to use R well before they begin working on their assigned data sets. If you append R output to your proposal but later ask for help in using R to apply the functions required for this stage of the project, the marks you receive for the R output associated with your proposal are liable to be rescinded. [10 marks]

**Stage 2: Research Report** (due March 23; 10% of course grade)

Stage 2 of the research project is the analysis of data and preparation of a written report. In the case of designs involving one independent variable, data analysis is to consist of an ANOVA followed up by a set of planned or post hoc comparisons that will show which means are different from which. For designs involving two independent variables, the analysis is to consist of a two-factor ANOVA followed by tests of simple effects or planned or post hoc comparisons, if relevant. Note that the design you choose will influence the mark you receive (see the Marking criteria section below). The ANOVA is to be computed using the `aov` package in R. Pairwise t tests for a one-factor design can also be done in R. Other follow-up comparisons and simple effects tests can be computed by hand.

Your written report is to be prepared according to the following instructions. The research report is due in printed form by March 23. The penalty for late reports (those submitted after 1 PM on March 23) is a deduction of 15% of the total possible score. Late reports will not be accepted after 4:30 PM, March 30. The version of the report that is submitted is the version upon which the assigned grade will be based: it is the student's responsibility to ensure that all parts of the report are included in the submitted document.

**Format.** Your report is to be printed with double spacing and prepared according to American Psychological Association (APA) format. Model reports, which are idealized versions of student reports that received high marks in a previous year will be available on the course web site. You can use these samples as guides to the format of your report and to help you decide what information to include in each of the sections of your report.

**Content.** Your report is to consist of a series of eight sections: (1) title page, (2) abstract, (3) introduction, (4) method, (5) results, (6) discussion, (7) references, and (8) table or figure. One option is for the sections to appear in the order listed here, with sections 1, 2, 3, 7, and 8 starting on new pages. Alternatively, you may opt to place your table or figure in the body of the paper (somewhere in the results section). Your entire report (from cover page to figure or table page) should be about 8-12 pages. As with the proposal, you must cite and discuss the relevance of at least two articles from standard, peer-reviewed, psychology journals. Ordinarily the references cited in the proposal would also be included in the final report, but this is not a requirement. Here are some details about each section.

1. Page 1. This is the title page. The title page is to include a title for your project, your name, and your student number. You are to develop a representative and informative title for the project. The quality of your title will be evaluated.

2. Page 2. Put an abstract of about 120 words on this page. The abstract is a summary of your study and explains what variables you examined, what you found, and what major conclusions you wish to draw from the results.

3. Page 3. Start the body of your report here. This page will be numbered with a 3 and will have the title centered at the top. Then type your introduction. This is to consist of a statement of the purpose of the experiment and predictions that are made by the hypotheses being considered. Start with a discussion of the main issue you are investigating and what you have learned from reading related literature. Then explain what you did in your study and why. Be sure to explain why you chose the independent variable(s) that you did and why you selected the dependent
measure you used. End the introduction by explaining what results you expect to find (your predictions).

(4) **Method.** After the introduction, type your method section, including subsections for subjects (who they were and how many were tested), materials (what stimuli or measurement instruments were presented to subjects), and procedure (what steps were followed in testing the subjects). You will, of course, be making up much of this section (because the study was not actually conducted) but you can use some of your journal article references for guidance. Information about the number of subjects tested is to be based on the data set you receive.

(5) **Results.** When writing this section, you should begin by mentioning what was the dependent variable. Mention that the means (and possibly standard deviations) for each condition are in Table 1 or Figure 1. Give a verbal description of the pattern of means, state the significance level you are using, and provide the results of the ANOVA and any post hoc or planned comparisons or simple effects tests to back up your description (e.g., Four-year olds hit the doll less frequently than seven-year olds, $F(1, 78) = 8.34, p < .05$; or if you used a $t$ test for a comparison between two means, report it this way: $t(78) = 2.89, p < .05$). Remember, this section is for reporting the results, not stating the implications. Save that for the next section. Planned or post hoc comparisons are used to specify which conditions differ from which in a design that has one independent variable with more than 2 levels. For a 2-factor design, tests of simple effects or planned comparisons can be used to investigate an interaction or to determine which levels of a factor differ from one another when a factor has more than 2 levels. Note that you can compute simple effects and pairwise comparisons for two-factor ANOVAs by hand or consult the instructions on using R posted on the course web site for methods of computing these tests with R. For pairwise comparisons, if a difference is not significant and that lack of difference is very important, you may want to estimate how much power your study had to detect an effect of some magnitude (e.g., a medium effect size).

(6) **Discussion.** In this section, you are to describe the implications of the results for the hypotheses and issues discussed in the introduction. Make sense out of the pattern of data you obtained and draw some meaningful conclusions. This is where your selection of variables has a big impact on the quality of your report. If you selected interesting variables that have theoretical implications, you will have interesting things to say at this point and will score well in this section. If you have humdrum, unmotivated variables, you will have little of interest to say and will be marked accordingly.

(7) **References.** This section begins on a new page with the heading References centered on the first line. Include a list of references, double spaced and in APA format. A reference is a source that was explicitly mentioned somewhere in your report. If you did not refer to a source, do not include it here.

(8) **Table or Figure.** You are to create your own table or figure (do not make both a table and a figure) in which to present the means of each of the conditions in your experiment. You may either place your table or figure on a new page following the References section, or embed the figure or table in the Results section. In either case, be sure to include an appropriate table title or figure caption. If you decide to produce a figure, it is acceptable to put your figure caption on the same page as the figure. If using a figure, include the standard error for each mean in the form of an error bar. Hand-drawn figures are acceptable. If making a table, do not submit output from a statistical package as the table—construct your own instead. If you present a table, include either the standard deviation or the standard error of the mean with each mean in the table.

Append to your final report a printout of your R analysis (descriptive statistics and ANOVA table) and a copy of any analyses you did by hand so that they can be used to check what you report in your results section.
**Marking criteria.** Evaluation of the research report will be based on 50 marks. These marks will be apportioned as follows:

(a) design selected: 2 marks (1 mark for a one-factor design, 2 marks for a two-factor design)
(b) title and abstract: 5 marks (emphasis on conciseness and appropriateness of information included)
(c) introduction: 8 marks (emphasis on clarity, integration with current literature, and creativity in selection of variables)
(d) method: 5 marks (emphasis on clarity and completeness)
(e) results: 8 marks (emphasis on appropriateness of statistical analysis, verbal description of results, and initiative in conducting appropriate follow-up analyses such as power estimates for important nonsignificant pairwise comparisons)
(f) discussion: 10 marks (emphasis on drawing appropriate conclusions from the reported experiment and integrating these results with the existing literature in an interesting and thoughtful way)
(g) table or figure: 5 marks (emphasis on appropriate organization and accurate presentation of data)
(h) format: 2 marks (emphasis on adherence to basic APA format, including references)
(i) R output and any optional analyses done by hand: 5 marks (include R output for descriptive statistics and ANOVA summary table)

**NOTE:** A good foundation is important--take the time to develop an interesting idea to investigate and find some relevant journal articles. Do not submit your first draft. Set your first draft aside, and read it over later with the idea that you probably can improve it by revising the first version. Also, get a friend to read it over. If he or she cannot understand it, you probably won't get a good mark because the person marking your report won't be able to follow it either. Remember that this project is the equivalent of a take-home examination, so the course professor will not provide the service of evaluating drafts for you, but will be available to answer questions for clarification of any aspect of the project. Be sure to consult the sample proposals and reports that are available on the course web site for additional guidance.
Research Project Design Specification

(Note: for a one-factor design, specify the levels of your factor using Independent variable 1 (you will have 3 or 4 levels); for a two-factor design, if you have a factor with three levels, describe it under Independent variable 1.)

Independent variable 1:

_____________________________________________________

  Level 1: _____________________________________________________
  Level 2: _____________________________________________________
  Level 3: _____________________________________________________
  Level 4: _____________________________________________________

Independent variable 2 (for 2-factor design only):

_____________________________________________________

  Level 1: _____________________________________________________
  Level 2: _____________________________________________________

Dependent variable: _____________________________________________________

  minimum score: _______  maximum score: _______
Prerequisites

Students who remain in courses for which they do not have the prerequisites do so at their own risk. Students who complete courses without prerequisites ARE NOT exempt from having to complete the prerequisite course(s) if such courses are required for the degree program.

Program Requirements

For more information see pages 383-386 of the UVic Calendar 2016-17.

Registration Status

Students are responsible for verifying their registration status. Registration status may be verified using My Page, View Schedule. Course adds and drops will not be processed after the deadlines set out in the current UVic Calendar.

Commitment to Inclusivity and Diversity

The University of Victoria is committed to promoting, providing and protecting a positive and supportive and safe learning and working environment for all its members.

In the Event of Illness, Accident or Family Affliction (See UVic Calendar, 2016-17, p. 59-60)

• What to do if you miss an exam other than one scheduled during the formal examination period

Do not apply at Records Services for a “Request for Academic Concession”. Instead submit documentation of the illness, accident or family affliction directly to your course instructor (or designated teaching assistant).

• What to do if you miss an exam scheduled during the formal exam period

Apply at Records Services for a “Request for Academic Concession”, normally within 10 working days of the end of the formal examination period. Records Services will forward the form to the instructor. If the concession is granted the instructor will determine how to deal with the situation (for example, a deferred exam). Where a concession is not applied for or where such application is denied, an N grade will be entered on the student’s academic record.

OR, you can download the Request for Academic Concession form here: http://www.uvic.ca/registrar/assets/docs/record-forms/rac.pdf

• What to do if you require additional time to complete course requirements

Apply at Records Services for a “Request for Academic Concession”, normally within 10 working days of the end of the formal examination period. Records Services will forward the form to the instructor. If the concession is granted the instructor will determine how to deal with the situation. Where a concession is not applied for or where such application is denied, an N grade will be entered on the student’s academic record.
OR, you can download the Request for Academic Concession form here:
http://www.uvic.ca/registrar/assets/docs/record-forms/rac.pdf

**Policy on Academic Integrity including Plagiarism and Cheating**

The Department of Psychology fully endorses and intends to enforce rigorously the Senate Policy on Academic integrity (http://web.uvic.ca/calendar2016-09/undergrad/info/regulations/academic-integrity.html, p. 55-58, UVic Calendar 2016-17). It is of utmost importance that students who do their work honestly be protected from those who do not. Because this policy is in place to ensure that students carry out and benefit from the learning activities assigned in each course, it is expected that students will cooperate in its implementation.

The offences defined by the policy can be summarized briefly as follows:

1. **Plagiarism.** You must make sure that the work you submit is your work and not someone else’s. There are proper procedures for citing the works of others. The student is responsible for being aware of and using these procedures.

2. **Multiple Submission.** Only under exceptional circumstances may a work submitted to fulfill an academic requirement be used to satisfy another similar requirement. The student is responsible for clarifying this with the instructor(s) involved.

3. **Falsifying Materials Subject to Academic Evaluation.** This includes falsification of data, use of commercially prepared essays, using information from the Internet without proper citation, citing sources from which material is not actually obtained, etc.

4. **Cheating on Assignments, Tests, and Examinations.** You may not copy the work of others in or out of class; you may not give your work to others for the purpose of copying; you may not use unauthorized material or equipment during examinations or tests; and you may not impersonate or allow yourself to be impersonated by another at an examination. The Department of Psychology has a policy of not making old examinations available for study purposes. Therefore, use of old exams without the express written permission of the instructor constitutes cheating by the user, and abetting of cheating by the person who provided the exam.

5. **Being an Accessory to Offences.** This means that helping another student to cheat (for instance, by showing or communicating to them answers to an assignment, or by allowing them to view answers on an exam) is an academic offence.

Instructors are expected to make every effort to prevent cheating and plagiarism. This may include the assignment of seating for examinations, asking students to move during examinations, requests to see student identification cards, and other measures as appropriate. Instructors also have available to them a variety of tools and procedures to check for Internet and electronic media-based cheating. In instances of suspected or actual plagiarism or cheating, instructors, following prescribed procedures, are authorized to take steps consistent with the degree of the offence. These measures will range from a zero on the test or assignment or a failing grade for the course, probation within a program to temporary or even permanent suspension from the University.

Rights of Appeal are described in the Policy on Academic Integrity in the University calendar (on p. 55-58 in 2016-17).

**The definitive source** for information on Academic Integrity is the University Calendar (p. 55-58 in 2016-17) (http://web.uvic.ca/calendar2016-09/undergrad/info/regulations/academic-integrity.html)

**Other useful resources on Plagiarism and Cheating include:**

2. The Ombudsperson’s office: http://www.uvss.uvic.ca/ombudsperson/pubsguides/plagiarism.pdf