PSYC 3201– Statistics & Psychometrics

Unit of Study Code: PSYC3201

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Format of Unit: 2 x 1 hour lectures/week x 13 weeks
1 x 1 hour tutorial/week x 12 weeks
Tutorial sizes: maximum of 20 students per group

Credit Point Value: 4 Credit Points

Qualifying: 8 credit points of Second Year Psychology including PSYC 2112

Assessment:
Classwork:
10% Tutorial test (to be held in Tutorial 4, week 5
(23 August – 27 August)
15% Assignment (1,000 words)
Due Date: Wednesday 6 October (week 10)

Examination:
25% short answer questions (Statistics)
50% short answer questions (Measurement & Psychometrics)

Evaluation of teaching and learning: Date: week 13 of semester
Type: questionnaire

Unit of study general description:
The Statistics section of this course deals with the design and analysis of experiments in psychology for which some form of analysis of variance is appropriate. Tutorials will involve the use of statistical packages on computer as well as hand calculators. Students should bring a calculator to all tutorials.

The Psychometrics section of the course deals with the statistical theory of psychological test scores and with the logic of quantification in psychology with applications to unidimensional scaling.

University of Sydney - Administrative Guidelines & Syllabus for Senior Psychology, 2004 page 12
Teaching outcomes:

(1) Ability to calculate and interpret a one way analysis of variance, including tests of contrasts.
(2) Demonstrate an understanding of the problem of multiple comparisons and control of the Type I error rate.
(3) Ability to calculate, analyze and interpret data from factorial designs including ANOVA and contrasts.
(4) Understanding of issues involved in the treatment of data involving repeated measurements.
(5) Ability to carry out computer-based analyses for ANOVA and contrast testing, and to interpret the results appropriately.
(6) Understanding of Classical Test Theory and its applications to the reliability and validity of psychological test items and total test scores.
(7) Understanding of the concept of scientific measurement and the logic of scientific quantification, including the Theory of Conjoint Measurement.
(8) Understanding of how the Theory of Conjoint Measurement may be applied to unidimensional scaling in psychology.

Evidence of learning:

The quality of students' performance in tutorial tests, in a written assignment, and in written examinations will be taken as evidence of learning.

SYLLABUS

Section 1. Statistics.

The one way fixed effects ANOVA model: partitioning variation and degrees of freedom. Expected mean squares and the formation of F ratios.

Asking focused questions: testing contrasts. Planned orthogonal contrasts. Trend analysis.

Controlling the Type I error rate with multiple comparisons: the Scheffe procedure and the Bonferroni procedure.

Factorial designs: The two way ANOVA model with fixed effects. Partitioning between-group variation into main effects and interaction effects. Main effect and interaction contrasts for a two way ANOVA design.

Decision-wise vs family-wise control of Type I errors.

Repeated measures or within-subject variables. Differing approaches to the analysis of repeated measures data. Planned contrasts for designs involving repeated measures data.

Section 2. Psychometrics.

Concept of Measurement: approaches to measurement in Psychology; operationism; representationalism and the classical approach.

The Logic of Quantification: distinction between quantitative and non-quantitative variables; fundamental and derived measurement; conjoint measurement.

Unidimensional scaling; Coombs' theory of unidimensional unfolding; single-peaked preference functions and the method of ratings.

Psychological tests, response patterns, and test scores. Item and test statistics.

The Classical Theory of Psychological Test Scores: axioms, definitions, and some of their consequences; applications of the theory; problems with the interpretations of true score and error score; the different kinds of reliability and validity.
TIMETABLE

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<thead>
<tr>
<th>WEEK</th>
<th>LECTURES</th>
<th>TUTORIALS</th>
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<tbody>
<tr>
<td>1</td>
<td>One-way ANOVA</td>
<td>One-way ANOVA</td>
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<td>2</td>
<td>Contrasts: Formulation and Testing</td>
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<td>3</td>
<td>Contrasts: the problem of multiple comparisons</td>
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<td>4</td>
<td>Two-way ANOVA</td>
<td>Contrasts</td>
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<td>5</td>
<td>Contrasts for 2-way ANOVA designs</td>
<td>**Test: Contrast computer work</td>
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<td>6</td>
<td>Repeated measures data</td>
<td>Contrasts for 2-way ANOVA</td>
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<td>7</td>
<td>Repeated measures / The logic of quantification</td>
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<td>8</td>
<td>The concept of measurement</td>
<td>Quantity &amp; measurement</td>
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<td>9</td>
<td>Conjoint measurement</td>
<td>Conjoint measurement</td>
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<td>10</td>
<td>Unidimensional scaling</td>
<td>Unidimensional unfolding</td>
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<td>11</td>
<td>Response patterns &amp; item statistics</td>
<td>Item statistics</td>
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<td>12</td>
<td>Classical Test Theory</td>
<td>Classical test theory</td>
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<td>13</td>
<td>Test reliability, its estimation &amp; test validity</td>
<td>Test reliability</td>
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TEXT

There is no set text. (Note that Maxwell & Delaney (1990) is especially useful for all parts of Section 1 (Lectures 1 – 13); Michell (1990) for Lectures 14 – 20; and Magnusson (1966), for Lectures 21 – 26).

REFERENCES

Section 1. Statistics.

Harris, R.J (1994) *ANOVA: An analysis of variance primer*. Itasca, Ill.: Peacock


Section 2. Psychometrics.


