# Undergraduate Statistics in Psychology: A Survey of Canadian Institutions

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**Abstract**

Questionnaires examining the content of undergraduate statistics courses were sent to Canadian post-secondary institutes offering major degrees in psychology. Responses received from 59% of the institutions suggest that several basic statistical procedures constitute a small core content covered in almost all undergraduate statistics courses and that the incorporation of computer applications is relatively common.

Most undergraduate students with a major in psychology have had at least one or two courses in basic statistics. A course in statistics is the single most preferred course in terms of admittance into graduate school (Norcross, Hanych, & Terranova, 1996; Purdy, Reinehr, & Swartz, 1989; Smith, 1985). Thus, most psychology undergraduates are expected to have been exposed to certain core statistical concepts. This expectation can influence the content of graduate statistics courses and the expectations that supervisors have about the statistical sophistication of new graduate students.

Aiken, West, Sechrest, and Reno (1990) recently assessed the statistical training of psychology graduate students; however, no similar in-depth investigation has been undertaken for undergraduates. Giesbrecht, Yell, Scialfa, Sandals, and Ehlers (1997) surveyed 17 instructors of statistics and research methods courses from a variety of disciplines. Their results indicated considerable agreement across disciplines about the relative importance of statistical topics in a hypothetical introductory statistics course. However, these results have limited applicability for the present study since they were based on a cross-disciplinary sample obtained from a single post-secondary institution and they dealt with the relative importance of topics in a hypothetical course. The focus of the present study is on the actual curriculum in the statistics courses required by undergraduate psychology departments in Canada.

In April 1999, questionnaires[1] were mailed out to the chairs of the 51 Canadian post-secondary institutions that offered undergraduate degrees with a major in psychology.[2] A cover letter requested that the survey be completed by the person(s) responsible for instructing the statistic courses offered by the department. Respondents had the option of completing and submitting the actual questionnaire they had been mailed, or they could respond to an online version of the same questionnaire. Within three months, 30 (59%) of the surveys had been returned with only a small percentage of these (viz., 20%) being submitted online.

## Survey Findings

Ninety-seven percent of the responding departments offered undergraduate courses in statistics. The single department that did not offer statistics courses did, however, require undergraduate students majoring in psychology to take two statistics courses offered by the mathematics department.

Departments required varying amounts of mandatory statistical instruction to obtain a major degree in psychology. Thirty percent of the institutes required a one-semester course, 60% required two semesters of statistics courses, and 7% required three semesters of statistics instruction.

Class sizes varied dramatically across institutions, ranging from 18 to 178 students per class with a median of 60 students per class. Incidental responses indicated that in the larger classes there was typically some kind of additional instructional support (e.g., teaching assistants); however, this question was not included in the questionnaire.

There was also a fair degree of variation across departments in terms of the text book used in the mandatory statistics courses. The only texts that were used at more than two institutions were editions of David Howell's two texts (e.g., Howell, 1998, 1999) which, combined, were used in 20% of the institutions.

Ninety percent of respondents included questions that involved calculations in their in-class exams, whereas just 53% of respondents used multiple-choice questions

1 An online version of the questionnaire can be seen at: http://statsurvey.cjb.net/

2 The list was obtained from *The Directory of Canadian Universities* (Association of Universities and Colleges of Canada, 1996).

TABLE 1
Topics Covered in Non-Mandatory Statistics Courses

| Topic | % Covering | Topic | % Covering |
|---|---|---|---|
| Factorial ANOVA | 74 | *t* tests | 37 |
| Repeated Measures ANOVA (univariate approach) | 68 | Basic Probability | 32 |
| Multiple Regression/ Partial Correlation | 63 | Discriminant Function Analysis | 32 |
| One-Factor ANOVA | 58 | Non-Parametrics | 32 |
| ANCOVA | 58 | MANCOVA | 26 |
| Confounded ANOVA | 47 | Path Analysis | 26 |
| Simple Correlation/Regression | 42 | Matrix Algebra | 21 |
| Principal Components/Factor Analysis | 42 | Canonical Correlation | 11 |
| MANOVA | 42 | Linear Structural Modeling | 11 |
| Descriptive Statistics | 42 | Loglinear Analysis | 11 |
| Repeated Measures ANOVA (multivariate approach) | 37 | Meta Analysis | 5 |

in their in-class exams. Only 13% of the respondents used take-home exams in their evaluations. Finally, 10% of the respondents indicated that they incorporated some type of research project into their student evaluations.

Nineteen of the 30 respondents (i.e., 63%) indicated that their departments offered non-mandatory statistics courses, with the number of non-mandatory courses being offered ranging from zero to more than five. The median number of non-mandatory courses offered by departments offering such courses was one. Table 1 provides a listing of the particular topics covered in the non-mandatory statistics course(s).

The results of the survey indicate that there is a fair degree of consistency in the topical content of the mandatory statistics courses offered by undergraduate psychology departments (see Table 2). All departments reported covering basic descriptive statistics and simple one-variable inferential techniques (viz., one-sample z and *t* tests), while 97% of the departments also covered basic probability, simple correlation, and the *t* test for independent groups. Further, 93% of the departments reported covering the *t* test for related groups, the normal distribution, and ungrouped frequency distributions, whereas grouped frequency distributions and the chi-square test for contingency tables were included in the content of 90% of the courses.

Other techniques did not receive such general coverage. Linear regression was covered by only 86% of the departments, and fewer than three-quarters of the departments covered such central topics as the chi-square goodness of fit test, the z test for independent groups, and power.

The extent to which the analysis of variance (ANOVA) was covered varied with the specific type of ANOVA in question. One-factor ANOVA was covered by 83% of the departments; however, the related techniques of post hoc multiple-comparisons and a priori multiple-comparisons were covered by only 69% and 52% of the departments respectively. More complex ANOVA techniques (viz., factorial ANOVA, repeated measures ANOVA, ANCOVA, and confounded ANOVA) were covered in fewer than two-thirds of the mandatory courses.

Perhaps related to the rather sparse coverage of ANOVA in the mandatory courses is the finding that more complex ANOVA topics were those topics most frequently covered in the non-mandatory statistics courses. Interestingly though, it seems that even when more complex ANOVA techniques are covered, they are covered in the traditional way. Specifically, the more traditional univariate approach to repeated measures ANOVA was covered in 68% of the non-mandatory courses, whereas only 37% of the courses covered the multivariate approach to repeated measures ANOVA. This finding is consistent with the pattern reported by Aiken et al. (1990) in their investigation of graduate statistics courses.

Computer applications are incorporated into the majority of courses, with such applications being included in 79% of the mandatory courses and 95% of the non-mandatory courses. Further, SPSS appears to be the most popular computer software by far, with SPSS being the software of choice in at least 70% of the courses incorporating computer applications. Systat was the next most widely used software, with 22% of the non-mandatory courses and 13% of the mandatory covering the application.

There appears to be a small but "core" content in most undergraduate statistics courses. Potential graduate supervisors or graduate statistics course instructors should reasonably expect that undergraduates with a major degree in psychology would have been exposed to

TABLE 2
Topics Covered in Mandatory Statistics Courses

| Topic | % Covering | Topic | % Covering |
|---|---|---|---|
| Descriptive Statistics | 100 | Chi-Square Goodness of Fit | 72 |
| One Sample *t* test | 100 | z test for Independent Groups | 72 |
| One Sample z test | 100 | Post hoc Multiple Comparisons | 69 |
| Basic Probability | 97 | Power | 66 |
| Simple Correlation | 97 | Factorial ANOVA | 62 |
| *t* test for Independent Groups | 97 | A priori Multiple Comparisons | 52 |
| Normal Distribution | 93 | Repeated Measures ANOVA (univariate approach) | 52 |
| *t* test for Related Groups | 93 | Arithmetic Review | 45 |
| Ungrouped Frequency Distribution | 93 | Multiple Regression/Partial Correlation | 35 |
| Chi-Square Contingency Tables | 90 | ANCOVA | 28 |
| Grouped Frequency Distributions | 90 | Non-Parametrics | 21 |
| Linear Regression | 86 | Confounded ANOVA | 14 |
| One-Factor ANOVA | 83 | Repeated Measures ANOVA (multivariate approach) | 14 |
| Binomial Distribution | 79 | | |

basic descriptive and inferential techniques, and that such students would be at least somewhat familiar with the use of computer software (most likely SPSS). However, an expectation that students would have been exposed to somewhat more complex but considerably more common analytic procedures (e.g., factorial ANOVA, multiple regression, and factor analysis) seems considerably less reasonable.

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## Résumé

Des questionnaires examinant le contenu des cours de statistique de premier cycle ont été envoyés à des établissements d'enseignement postsecondaires du Canada offrant des diplômes avec spécialisation en psychologie. Les réponses reçues de 59 p. 100 des établissements suggèrent que plusieurs procédures statistiques de base forment la matière principalement traitée dans presque tous les cours de statistique et que l'intégration des applications informatiques est relativement courante.

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