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## On reading statistical language studies

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## *Séminaire 1*

### **On reading statistical language studies**

#### **Background**

One of my missions in life is to help people become more literate in reading statistical studies. Most language teachers, when they look at a statistical research study at all, look at the abstract, maybe a little bit at the statement of purpose and research questions and then they see the numbers and tables and start skipping large sections. When they finally stop jumping through the article, they may read the discussion section and conclusions. In short, they read what they can read. The problem with that strategy is that the reader is accepting at face value whatever the author concludes—something no educated person would do if the article were written in straight prose. And, worse yet, since I you do know fairly well how statistical studies work, I realize that many of the statistical studies in our field are not all that good to start with.

Statistical studies became an increasingly real problem for me as I learned more and more about it. At UCLA, in the Education Department, they have very good measurement and statistics courses. I took a long string of courses in statistics and I really got interested, partly because I had a fairly good math background (perhaps related to the fact that I was a musician earlier in life). I really like number crunching and I got fairly good at it. And then I started looking at my own field and I had to ask myself why the quality of the statistical studies was so bad in our field of applied linguistics. After all, statistics is just a form of logic. There is nothing magical about it: the studies are done step by step and a logical argument is presented in writing so the readers can read the report step by step.

One thing that language teachers must realize is that none of these studies is perfect, or even close to perfect; they are all human endeavors. When I see teachers reading the beginning, the discussion, and then the conclusion section of a statistical article and accepting it at face value, I get very upset because I know that much of what is found between the introduction and conclusions is often garbage.

So I have made it my goal to create an audience of people who are willing to look a bit more closely at such studies and do so critically and complain when the studies are bad. Other people like Hatch and Lazaraton, Brian Lynch, and Tom Hudson (also all trained at UCLA) are doing the same sort of thing in various parts of the world. And more and more, the quality of the articles in our field seems to be coming up. The quality of statistical research was often just plain bad in the early eighties, it was pretty bad in the mid-eighties, and it seems to have gotten much better in the late eighties and early nineties. I think that is

because, now, certain people care. I would like you to become one of those people who care. To start caring, you must first understand how statistical articles are typically organized.

## **Conventional organization of a research paper**

American applied linguistics journals generally follow the format and organization described in the Publication Manual of the American Psychological Association (APA, 1994). As a result, most of the statistical articles in our field follow a very standardized organizational outline.

### ***Abstract***

Most journal articles have an abstract that can be very useful in deciding whether or not you are going to be interested in that article. It is probably the most often read portion of articles. An abstract typically contains about 150 words, sometimes less, sometimes a little more. Regardless of their length, these summaries should tell the reader in a nutshell what the study is about, how it was conducted in terms of who was studied, what materials, tests, questionnaires, etc. were used, what procedures were followed, what analyses were used and the general trend of the results.

### ***Introduction***

The introduction section (which may or may not have a heading of its own) should provide the background of the study and answer the question: where does this study fit into the field of applied linguistics? This may be accomplished by simply explaining where the idea for the research came from and describing the setting in which it was studied. Alternatively, a more traditional approach can be used which includes a literature review of related studies (ones that are directly relevant to the research being reported). Either way the reader should be able to tell exactly how the study fits into the field of applied linguistics.

Typically, the introduction of a statistical report will end with a statement of the purpose of the study, which is a paragraph or two that outlines the goals of the study. The statement of purpose itself usually ends with an explicit and clear listing of the research questions being investigated. These questions should tell the reader exactly where the study is headed, *i.e.*, exactly what the researcher is trying to learn.

### ***Method***

The next full section after the introduction is the method section. This section should explain exactly how the study was conducted. In a sense, it is like a recipe that clearly explains the cooking ingredients and steps involved. To

that end, the method section usually includes at least three subsections: participants, materials and procedures.

- *Participants*

This section, also sometimes called the subjects section, is about the people who were the focus of the study. It should explain who the subjects were in terms of their language backgrounds, their language proficiency, percentage of males and females, percentage of graduates/undergraduates, etc. This section should also explain how the subjects were selected and how they were assigned to groups, if any were formed. Were they randomly selected and assigned randomly to groups? Or were they volunteers from intact classes at different times of day? It is important for the authors to tell the readers about such selection criteria. The reader must also think about the size of the group(s) being studied. One rule of thumb for a statistical study to be valid is that there should be a minimum of 30 participants, preferably 30 in each group. Generally speaking, larger scale studies are better. If there are real relationships between measures, or differences in mean performances between groups, etc., they are more likely to show up if the numbers of subjects are large.

- *Materials*

This section should describe any materials that were used in the study. Such materials might include teaching materials, tests, questionnaires, etc. At the very least, such materials should be described in detail. It is also helpful to supply examples of test questions or questionnaire formats in this prose description of the materials. Ideally any materials should be appended right to the back of the article so that other researchers can use them and readers can clearly understand what was used.

The author should also defend the reliability and validity of any measurement instruments or questionnaires that are used. These measures are the primary building blocks of a statistical study. So a study can be no more reliable and valid than the instruments upon which it is based are themselves reliable and valid (for more on the topics of reliability and validity, see Brown, 1988, 1995a, 1995b). Reliability can be defended statistically, using internal consistency reliability coefficients (or other approaches). Validity can be defended logically by looking at each instrument from a content validity perspective or statistically by looking at each from a construct validity perspective.

- *Procedures*

In the procedures section, the author should explain exactly what it was that was done, step by step. This should include discussion of how the groups were formed, what the environmental conditions were (such as noise, space,

time of day, quality of machines used, and other variables) and what was actually done to the students. This section should also include a discussion of how the data were recorded and organized.

### ***Results***

The purpose of the results section is to describe in more or less technical terms how the study turned out. Hence, this section is a technical report on the statistical tests that occurred. The statistical results should be arranged in about the same order as the research questions that they address. Usually, there are statistical tables because such tables are a good way to summarize large amounts of numerical results. However, in our field, readers should expect some prose explanation of those tables along with an explanation of the main statistical procedures that were used in the study.

### ***Discussion***

In the discussion section, the author should provide direct and easy to understand answers to the research questions that were raised at the beginning of the study. This should be done in a straightforward manner with as little technical jargon as possible. In some studies, the research questions themselves will serve as subheadings in this section.

### ***Conclusion***

Authors often use the conclusion section to explain why they think the results turned out as they did and what they think the results mean within the broader context of applied linguistics outlined in the introduction. This is the place where authors often speculate using an abundance of modals such as *might, could, should* or verbs like *appears, seems, feels*, etc. Readers should be very careful in this section to make sure that the explanations provided by the author are logical and justified by the actual findings of the study.

Many authors will end this section with a subsection offering suggestions for further research. In the process of doing research, researchers often find that more questions are raised than answered. As a result, they find themselves using this section to encourage others to do research similar to theirs, or at least on the same general topic and this is the subsection where they can do that by offering a list of potential research questions.

### **In short**

Clearly, the rather standardized organization of statistical studies can be used to help readers understand what a statistical report is all about. Knowing about this structure, readers know where to look in such a report for various types of information. Most readers can understand the introduction section

including any explanation of the background of the study, the literature review, the statement of purpose and the research questions.

In addition, readers should carefully examine and critically read the method section. The description of the participants, materials and procedures should be so clear that readers feel they could themselves replicate the study (*i.e.*, redo it at their own institution). The degree to which the description is not clear enough for replication is the degree to which that description is inadequate.

Because of its technical nature, the results section of an applied linguistics study may not be entirely clear to every reader. However, I feel that authors should make an effort to explain the results in prose so that most readers can understand the statistics. In any case, the discussion should fill any gap in the readers' understanding by directly and clearly addressing the research questions in prose.

In the conclusion section, there is nothing wrong with an author speculating to some degree as to why the results turned out as they did and how these particular results fit into the larger picture of applied linguistics. However, even these speculations must be logical and justified by the study.

I hope that the information given in this article will help teachers to access statistical studies and be just a little bit less afraid of the numbers. Statistical logic is being used increasingly to find patterns in the behaviors of language teachers and students in our applied linguistics journals. As a result, teachers really have no choice but to learn how to critically read and understand such studies. If this article provides one step in that direction, I have succeeded.

*James Dean BROWN*

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