

Seven Reasons to Pursue Advanced Quantitative Training

November 27, 2013

At the graduate level, quantitative methods are arguably the only common training across the subdisciplines of psychology; your first-year sequence of statistical training likely included biological, clinical, cognitive, developmental, personality, and social psychology students. While we all get trained in the basics of analysis of variance (ANOVA) and multiple regression, forging a stronger psychological science requires improving the analytic tools of psychologists. Here are seven compelling reasons why everyone should pursue additional training:

- 1. *You are limited by the analytic tools you possess.*** As a researcher, your vision is constrained by how you can think about and utilize data. Psychological processes are complex and rarely fit neatly into groups. It is painful to watch scholars limited to ANOVA force people and processes into groups in order to fit an inappropriate “analytic shape.” Data analytic tools and theoretical innovation are complementary: Learning newer, more sophisticated analytic tools expands the way you can think about questions. Try to imagine designing a house without a ruler or compass, or actually building a house without a level. The tools you have impact your output; better tools produce better outputs. Theoretical innovations often directly follow from advances in methodology, and Nobel Prizes are more frequently awarded for methodological contributions than for theoretical ones. Do not limit yourself; stay current with advances in data analytic tools.
- 2. *Reality is complex.*** It goes without saying that behavior and mental processes are complex, and psychological scientists aim to understand and model this complexity. Sophisticated analytical tools get you closer to modeling our multivariate and hierarchical world. Since many variables operate within and outside of people, it makes sense to model relationships among multiple variables simultaneously. Multivariate analysis of covariance (MANCOVA), path analysis, and structural equation modeling are among the many tools useful for this purpose. Human behavior and mental processes occur within a variety of contexts (e.g., behaviors nested within a person, people within groups, people and groups within cultures), and we can model rather than ignore context variance in data. With the advent of multilevel modeling (for an introduction, see Luke, 2004), researchers are able to investigate multilevel phenomena, including but not limited to individual differences and behavior, shared group memberships, aggregated sociocultural and political variables, ecological variables, and cross-level variable interactions. For example, understanding how progressive taxation relates to subjective well-being requires that we also account for the wealth of nations that people live within, personal income, and the interactions of these predictors. Variables nested within and between people and contexts uniquely and collectively contribute to psychological phenomena; we achieve a more precise and nuanced understanding of the world by embracing rather than ignoring its complexity.
- 3. *A conclusion is only as good as its statistical analysis.*** Statistical tests and models are accompanied by assumptions, and these assumptions are violated more often than we would like. If assumptions are violated, our conclusions are more or less useless: garbage in, garbage out. Advanced, or less conventional, analytic tools typically allow more flexibility in handling and circumventing the assumptions of conventional analyses. When issues of data distribution arise,

nonparametric statistics are your friend. If there is reason to suspect nonindependence of observations, such as data from dyadic pairs, model the data via multilevel modeling. Have some subjects missed sessions or provided responses at uneven time points in your panel study or treatment program? If so, you can utilize the flexibility of longitudinal data analysis instead of the traditional, more restrictive repeated-measures ANOVA approach. Techniques such as latent growth curve modeling allow researchers to model the extent and rate of change over time. Such techniques eliminate the need to remove subjects with missing data at one or more time points or assume that longitudinal data from different subjects were collected at the same time.

- 4. *Learning now promotes learning later.*** Without continued practice, it is unlikely that you will retain everything you were taught in an advanced quantitative course. However, the bulk of this education is about learning how to learn. The introduction and initial exposure provide you with the knowledge to read articles, chapters, and entire books later on your own. Your courses should reinforce good data habits as well. In other words, advanced quantitative training will give you “legs to stand on” when you need to learn a new skill or figure out how to best analyze a dataset. Expanding your formal quantitative training will make you a more independent scholar.
- 5. *Advanced analytic tools encourage research productivity.*** We do not always have the resources to collect large amounts of data. If you find yourself at a college or university with fewer resources for data collection, more sophisticated data analytic tools can help you stay active in research. Many organizations (e.g., Pew Research Center, General Social Survey) provide free access to large and longitudinal datasets. Using advanced analytical tools (e.g., structural equation modeling, multilevel modeling, and latent growth curve modeling), researchers can efficiently test multifaceted hypotheses without collecting data. Conducting a meta-analysis also sidesteps the need to collect your own data; instead, you can contrast and combine the results reported by others to better estimate effect sizes and examine variable relationships, moderators, and overarching theoretical patterns. Although access to statistical package software has traditionally been a barrier, powerful open-source packages like *R* (see R Core Team, 2013) are changing academia.
- 6. *You can be a better consumer of research.*** I already discussed the benefits of advanced quantitative training for producers of research, but this training will also make you a better *consumer* of research. The most common types of publication in psychological science are empirical journal articles, and you should not only read them but should be able to understand them. As advanced analytical tools become more readily available to psychologists, familiarity with these tools will be necessary to understand and interpret the results of reported analyses. If you are not able to assess the results for yourself and form your own interpretation of the data, you will be left with only the author’s interpretation.
- 7. *Being savvy with analytical tools will make you a desirable colleague and collaborator.*** It should not come as a surprise that academic psychologists with sophisticated analytic tools are more marketable. We all want colleagues in our department who can explain techniques, teach advanced methods courses, and provide feedback and advice regarding data analysis. Possessing these tools will make you a more attractive job candidate and a valuable collaborator, too. You may be invited to join interesting projects or even added as a consultant on a grant because of your proficiency in particular analytical techniques.

Finally, you should explore the courses available to you intra- and interdepartmentally. Increasingly, business schools and education departments are offering advanced courses of interest to psychologists. Specialty training workshops are also offered on various campuses (e.g., University of Kansas’s “Stats

Camp”), at conventions (e.g., APS-SMEP Methodological Workshop Series), and online. It is important to be aware of these resources if you wish to further your quantitative training. With the age of “big data” upon us, adding sophisticated analytical techniques to your toolbox will prove invaluable.

Acknowledgments

I would like to thank Ana Bridges and William Levine for their input and insightful discussions on quantitative training, and also Allison Skinner for her feedback on an earlier draft of this article.

Student Announcements

APSSC Campus Representatives Program

Join the APSSC Campus Reps Program to promote psychological science at your campus. Visit www.psychologicalscience.org/index.php/members/campus_representative_program

Student Notebook Contributors Needed

The Student Notebook is seeking advanced graduate students to contribute articles on the following topics: (1) developing a programmatic line of research and (2) establishing a research lab. Contact the Student Notebook Editor, Allison Skinner, at apssc.sneditor@psychologicalscience.org.

Student Research Awards

Students submitting research to the APS Annual Convention may apply for the Student Research Awards and RISE Research Awards. Details are available on the general convention submission portal.

APSSC Mentorship Program

The APSSC Mentorship Program is designed to connect undergraduate student affiliates with graduate mentors who are willing to share their experiences and expertise on all issues related to research and graduate school. For more information visit www.psychologicalscience.org/index.php/members/apssc/mentorship_program or contact Undergraduate Advocate Jessica Schubert at apssc.undergrad@psychologicalscience.org.

Authors Needed

The APSSC Undergraduate Update, a bi-annual online publication intended for undergraduate student affiliates, is in need of students interested in writing articles about the following topics: creating and presenting research posters at conferences, the “dos and don’ts” of writing graduate school application essays, living on a graduate student stipend, and other topics relevant to students. Visit www.psychologicalscience.org/index.php/members/apssc/undergraduate_update or contact Jessica Schubert at apssc.undergrad@psychologicalscience.org.

References and Further Reading

Aiken, L. S., West, S. G., & Millsap, R. E. (2008). Doctoral training in statistics, measurement, and methodology in psychology: Replication and extension of Aiken, West, Sechrest, and Reno’s (1990)

survey of PhD programs in North America. *American Psychologist*, 63, 32-50.

Greenwald, A. G. (2012). There is nothing so theoretical as a good method. *Perspectives on Psychological Science*, 7, 99-108.

Little, T. D. (2013). *Longitudinal structural equation modeling*. New York, NY: Guilford Press.

Luke, D. A. (2004). *Multilevel modeling*. Thousand Oaks, CA: Sage Publications.

Oishi, S., Schimmack, U., & Diener, E. (2012). Progressive taxation and the subjective well-being of nations. *Psychological Science*, 23, 86-92.

R Core Team. (2013). R: A language and environment for statistical computing. [Computer software]. Retrieved from <http://www.R-project.org>.