

PSYCHOSTATISTICS

Newsletter of the Quantitative Methods Section of CPA

Message from the Chair

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QUANTITATIVE METHODS SECTION OF CPA

Website:

<http://www.cpa.ca/aboutcpa/cpasections/quantitativemethods/>

Listserv:

qmcpa@yorku.ca

It is an exciting time to be a member of the Quantitative Methods (QM) section, and the ensuing years hold much promise for what I find to be very thoughtful members of QM. The last Conference held in Ottawa showed from posters, presentations, workshops and discussions the vitality of this section. We were honored with a very informative guest speaker Dr. James Ramsey of McGill University. His topic on Psychometrics was fundamental and particularly informative as QM members negotiate the line between measurement models and probability. The room was packed and the presentation very well received.

The theme of this conference in Victoria in some ways continues to open “the can of controversy” over best practices for measurement, the role of significance in our studies, and replication. Dr. David Trafimow editor of Basic and Applied Psychology and the Journal of General Psychology will present why he dislikes significance testing. Dr. Scott Hofer, Chair of the Quantitative and Qualitative section of the American Psychological Association, will present an

invited talk on applying good measurement and good theory with large data sets. Dr. Hofer will also moderate a symposium consisting of Dr. Stephen Lindsey, editor of Psychological Science, Dr. Lorne Campbell, Kaitlyn Wiener and myself as collectively with the audience we probe deeper into these issues. One of the exciting things about a small venue is that speakers cannot isolate themselves from members who wish to engage in further conversation.

We are probably all aware that the American Statistical Association (ASA) released a statement in early March on inferential statistics and particularly p values. There was not universal agreement on all points, but it looks like a reversion to Fisher’s thinking and every psychologist should be familiar with these principles. It is somewhat ironic that the Math-Stats group led by Neyman and Pearson expanded a particular and legitimate role of inferential statistics in quality control to scientific research (to the horror of Fisher) and now are

correcting the scientific community. Thus, I expect QM members to be considering when error rates are legitimate and not and when probability is appropriate. Are effect sizes solid or misleading in selected areas? In any event, hopefully it should be a fruitful meeting for all interested.

Below are statements about p values on which a majority of ASA members could agree. [www.amstat.org/newsroom/pressreleases/...](http://www.amstat.org/newsroom/pressreleases/)

1. P-values can indicate how incompatible the data are with a specified statistical model.
2. P-values do not measure the probability that the studied hypothesis is true, or the probability that the data were produced by random chance alone.
3. Scientific conclusions and business or policy decisions should not be based only on whether a p -value passes a specific threshold.
4. Proper inference requires full reporting and transparency.
5. A p -value, or statistical significance, does not measure the size of an effect or the importance of a result.
6. By itself, a p -value does not provide a good measure of evidence regarding a model or hypothesis.

I look forward to seeing you in Victoria.

Michael Bradley

Message from the Student Rep

My name is Teresa Allan and I am this year's student representative for the Quantitative Methods section, now in its 4th year as an official section of the Canadian Psychological Association.

First, I would like to thank all of the existing members of this section for their hard work and dedication to the exploration and development of novel and innovative quantitative methods. I would also like to welcome this year's new members to the section. Please join us if you can in lovely Victoria, BC, in June. There will be a number of quantitative events - more than any previous year as we continue to grow! There will be workshops, posters, and symposia at this year's convention as well as the annual business meeting.

I would also like to take advantage of having space in a national newsletter to speak to our undergraduate

student members on the importance of evidence-based practice and evidence-based research. At the core of each of these is an understanding of research methods and quantitative analyses. Whether your future psychological pursuit is to be strictly a clinician, strictly a researcher, or to defy convention as I do and dedicate many hours to both, solid methods must underlie what we do.

However daunting it may seem, statistics is very useful and is essential in the decision-making processes ahead - whether it be exploring a data-level differences in brain activity during specific cognitive tasks, testing a new statistical algorithm, or deciding which psychosocial intervention or combined treatment is the most likely to provide your client with the most relief from their distress. Having a quantitative background has been an essential part of both the therapeutic work I

do and for my current exploration of human resilience. Gaining as much statistical knowledge as possible at the undergrad level is certainly an asset – and if you are reading this, you have already begun that exciting journey!

Because I continue to have a foot in both fields (and love every minute of it) I also have an extremely busy year ahead and will not have the free hours needed to be next year's student representative and that means all CPA student affiliates are welcome to join us at our annual business meeting and who knows, you may leave Victoria as the CPA 2016-2017 QM Section rep!

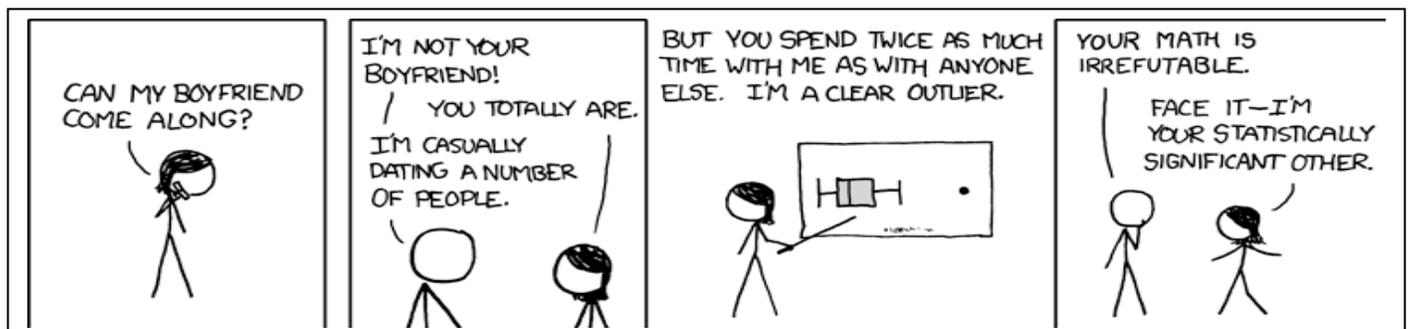
Cheers and best wishes,

Teresa Allan
t_allan@rogers.com

"Gaining as much statistical knowledge as possible at the undergrad level is certainly an asset"

2016 Pre-Convention Workshop: There will be an *Introduction to R* pre-convention workshop at CPA in Victoria. R is gaining popularity among psychology researchers and this is a good chance to get introduced to the software.

QM Laugh



Visual Insights



Using data to tell compelling stories usually means finding a way to visually represent something complex in a simple way. Sounds easy enough but it really is not. More often than not we end up creating large tables of numbers or figures that do a poor job of highlighting our core message. Recently I have been taking some training on data visualization that focuses on the design practices to make tables and graphs more effective. This article will summarize a few key points for you to consider when preparing for a conference or creating your teaching slides or (gasp) you want to share something with the media. It will also showcase one visualization type that when used properly can display a lot of information in a small space.

Take a bit of extra time designing your data visualizations to give your data the power to convey your message and inform your audience. Here are a few tips.

Keep your audience and your take home message in mind when choosing your medium of communication for your data (e.g., table, chart, graph).

Provide a reference of comparison because it helps to communicate the magnitude or significance of the data. This could be your control group or normative data or projections from your model or other representative data.

Reduce the non-data ink and enhance the data ink in your visualization. Non-data ink competes with data ink – you want your data to stand out. Non-date ink includes grid lines, tick marks, background, etc.

Design with visual hierarchy in mind and make use of visual cues. Your design should signal to the reader where to start, which order to continue reading the information, and what is the most important information.

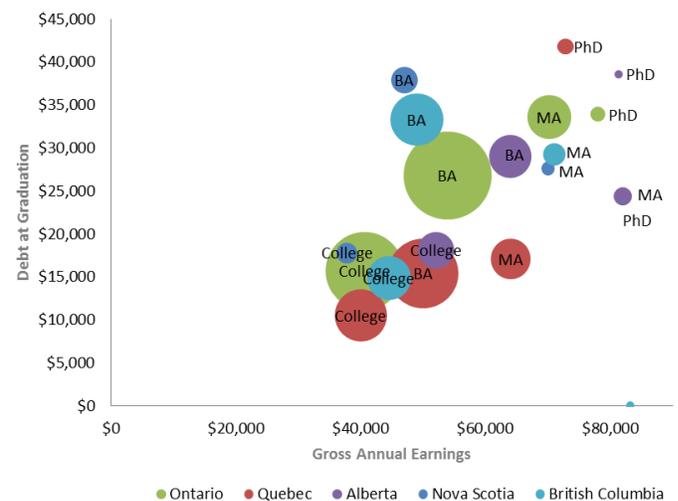
Use vibrant fully saturated bright colours sparingly, only when you want to highlight particular information

If you want to learn more check out the books on data visualization design by Stephen Few.

The bubble chart is a type of data visualization that can represent at least three dimensions of data. The data is plotted as a scatterplot with the size of the dots representing the third dimension. Bubble charts can be created in Excel, R, SPSS, SAS, etc. with varying levels of difficulty and adaptability. The bubble chart I have created below compares the gross annual earnings of graduates (dimension 1) to the amount of debt at graduation (dimension 2). The bubble sizes represent the number of graduates (dimension 3). I have also added colours to represent different provinces (dimension 4) and labels to represent different levels of study (dimension 5). That's a lot of data!

If you want to see an even cooler data visualization using bubble charts check out Hans Rosling's TED talk. He used animation to represent his fourth dimension. You can find the talk and play with the software and data yourself at the site www.gapminder.org.

Provincial Comparison of Annual Earnings and Student Debt After Graduation by Level of Study and Number of Graduates



Source: National Graduate Survey 2010

Thank you to Nicole Aitken for this volume's *Visual Insight*. Send *Visual Insights* ideas to Rob Cribbie (cribbie@yorku.ca), Past Chair of the QM Section

Consulting Corner

Dear Stats Consultant,

I am running a two-way ANOVA and I have a couple questions regarding Type I error inflation: 1) If I am analyzing both main effects and the interaction, should I be dividing up my total probability of a Type I error (familywise α , FW_α) across the three sets of analyses?; and 2) One of my main effects has 3 levels and the other has 4 levels. What is the best FW_α procedure for conducting all pairwise comparisons?

*Sincerely,
Bon Faroni*

Dear Mr. Faroni,

Before delving into the specifics of your questions, the most important thing to consider is that the nature of the multiplicity control depends on the nature of the research. If your research is exploratory, then it might not be necessary to discuss multiplicity control. In other words, if the consequences of making a Type I error are minimal, then would it make

sense to impose multiplicity control and hence reduce statistical power? On the other hand, if there are severe consequences of a Type I error, then the strategy changes and efforts must be directed towards minimizing the probability of a false positive.

Now, to your questions. For Question #1, it is not recommended that researchers analyze main effects in the presence of a significant interaction, so therefore there are only two scenarios, analyze the interaction (single effect) or analyze the main effects (two effects). Typically no multiplicity control is imposed when following up on interactions since the goal is simply to understand the nature of the interaction. Whether to control for multiplicity over the two main effects (or not) is a difficult question. It depends on whether or not the research is exploratory, one's theoretical position on how to define a 'family' for imposing FW_α , etc. If the research is confirmatory and one

subscribes to a conservative FW_α strategy, then some sort of control (e.g., splitting the Type I error probability in half) is necessary. In this case, it is important to ensure that there is sufficient a priori power for detecting effects at level $\alpha/2$ rather than α .

This brings us to Question #2. If there are 3 levels of the main effect and the interest is all pairwise comparisons, then Fisher's Least Significant Difference (LSD) procedure will ensure FW_α control and maximum power. In short, if the omnibus main effect test is significant then each of the three pairwise comparisons can be conducted without adjustment. With four or more levels a more conservative multiple comparison procedure is necessary. Sequential procedures (e.g., Holm) provide strict familywise error control and can provide greater power than simultaneous procedures (e.g., Bonferroni, Tukey).

Sincerely,
Stats Consultant



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Send 'Consulting Corner' suggestions to Nicole Aitken (aitken.n@gmail.com) Communications Direction of the QM Section

QM Section Invited Speakers at CPA 2016

The QM Section has two invited speakers at this year's Convention. The first speaker is Dr. David Trafimow, Distinguished Professor of Psychology at New Mexico State University, Executive Editor of the Journal of General

Psychology, and also for Basic and Applied Social Psychology. The second speaker is Dr. Scott Hofer, Professor of Psychology, Director of the Centre on Aging, and the Mohr Research Chair in Adult

Development and Aging at the University of Victoria. He is President-Elect of Division 5 of the APA and Past President of the Society of Multivariate Experimental Psychology.

Record Number of QM Talks at CPA 2015 (Ottawa)

Invited Speaker Presentation

A FRIENDLIER PSYCHOMETRIC THEORY FOR TESTS AND PSYCHOLOGICAL SCALES

Dr. James Ramsay, McGill University/University of Ottawa

Talks

EFFECT SIZES FOR SINGLE CASE CLINICAL INTERVENTIONS

Joo Ann Lee, York University

EVALUATING GROUP LEVEL CLINICAL SIGNIFICANCE: CURRENT PRACTICE AND RECOMMENDATIONS

Rob Cribbie¹, Chantal Arpin-Cribbie², Rebecca Vendittelli¹, Erica Tucciarone¹, ¹York University, ²Laurentian University

LITTLE MORE THAN AN AFTERTHOUGHT? APPLICATIONS OF CHI-SQUARE TESTS IN PSYCHOLOGY

Donald Sharpe, University of Regina

REPLICATION, RELIABILITY AND CONFIDENCE: A MULTIDISCIPLINARY REVIEW OF THE CRISIS IN SCIENCE

Andre Beukers, University of British Columbia

MIXED REGRESSION EFFECTS IN ITEM RESPONSE THEORY APPLICATIONS

Phil Chalmers, York University

CONFIDENCE REGIONS AND EXCHANGEABLE WEIGHTS IN MULTIPLE LINEAR REGRESSION

Jolynn Pek, York University

THE GENERALIZED LINEAR MODEL FOR CONTINUOUS OUTCOMES

Victoria Ng, Rob Cribbie, York University

APPLYING BAYESIAN NON-PARAMETRIC MODELS TO ITEM RESPONSE THEORY

Ran Wei, University of Manitoba

ATTENUATION OF EFFECT SIZES BY FLUCTUATING LEVELS OF MEASUREMENT ERROR

Jacqueline Kanippayoor, Brian O'Connor, Shawna Zuda, University of British Columbia

DREDGING THE OCEAN.20: ITEM RESPONSE THEORY ANALYSIS OF A SHORTENED PERSONALITY SCALE

Joanna Solomon, Acadia University

MODERN APPLICATIONS AND NON-PARAMETRIC MODELING STRATEGY FOR ITEM RESPONSE THEORY

Jacqueline Kanippayoor, University of British Columbia

ARE WE PROVIDING ENOUGH INFORMATION IN THE RESULTS SECTION?

Alyssa Counsell¹, Sunny Duerr², Lisa Harlow², ¹York University, ²University of Rhode Island

PUBLICATION GUIDELINES OVER THE YEARS FOR REPORTING STATISTICAL INFORMATION

Lisa Best¹, Michael Bradley¹, Andrew Brand², Aaron McKenney¹, ¹University of New Brunswick, ²Bangor University

WHERE ARE THE BOYS? IMPLICATIONS OF THE ABSENCE OF MEN FROM PARTICIPANT POOLS.

Sarena Poets, Donald Sharpe, University of Regina

Workshops

CONFIRMATORY FACTOR ANALYSIS: FROM BASIC CONCEPTS TO ADVANCED APPLICATIONS

Dennis Jackson, Chelsea McLellan, University of Windsor

QUANTITATIVE TOOLS FOR COCHRANE REVIEWS

Richard MacLennan, University of Regina

MINIMIZING BIAS AND MAXIMIZING POWER: HANDLING MISSING DATA WITH MULTIPLE IMPUTATION

Steven Carroll, Judith Godin, Janice Keefe, Mount Saint Vincent University, St. Mary's University

Posters

USING MULTILEVEL CONFIRMATORY FACTOR ANALYSIS TO COMPARE TWO STATE BOREDOM MEASURES

Patricia Baratta, Jeffrey Spence, University of Guelph

FUNCTIONAL PRINCIPAL COMPONENT ANALYSIS AND MULTIPLE-SET CANONICAL CORRELATION

Ji Yeh Choi, Heugsun Hwang, McGill University

DAILY MENTAL HEALTH AND PSYCHOLOGICAL WELL-BEING AND TESTS OF DIFFERENCES BETWEEN

ATHLETES AND NON-ATHLETES: A MULTIPLE GROUP, MULTIVARIATE MULTILEVEL MODEL

Ann Bowker, Andrea Howard, Cecilia Jorgenson, Carleton University

ENGLISH FLUENCY AND RESPONSES TO A DEPRESSIVE SYMPTOMOLOGY INSTRUMENT

Rachel Fouladi, Alexis Georgeson, Simon Fraser University

EVIDENCE-BASED RECOMMENDATIONS FOR COMMUNICATING RESULTS OF MEDIATION ANALYSIS

Jamie Kim, Jolynn Pek, York University

MAPPING ATTACHMENT: USING A META-ANALYSIS PROFILE (MAP) TO VISUALIZE SEX DIFFERENCES

Michael Bradley, A. Luke MacNeill, University of New Brunswick

QUANTITATIVE ANALYSIS OF RELATED TEXT: THE NOVEL COMBINATION OF LATENT SEMANTIC ANALYSIS

AND MULTIDIMENSIONAL SCALING

James Boylan, Rod Martin, Richard Neufeld, Western University

THE IMPACT OF IGNORING THE LEVEL OF NESTING STRUCTURE IN A MULTILEVEL LATENT CLASS MODEL

Jungkyu Park, Hsiu-Ting Yu, McGill University

*The QM Section
Program for
2016 in Victoria
is available at:*

<http://cpa2016convention.sched.org/>

There were 8 QM posters, 4 QM symposia (14 talks), 3 QM workshops, and 1 QM theory/review at CPA 2015 in Ottawa. The number of presentations at the CPA Convention has grown steadily since the QM section was formed!

QM Graduate Programs in Canada

University of British Columbia

MA/PhD, Quantitative Methods
<http://psych.ubc.ca/graduate/research-areas/quantitative-methods/>
 Contact: Jeremy Biesanz
 Email: jbiesanz@psych.ubc.ca

University of British Columbia

Department of Educational and Counselling Psychology
<http://ecps.educ.ubc.ca/measurement-evaluation-and-research-methodology/mern-graduate-programs/>
 MA/PhD, Measurement, Evaluation, and Research Methodology
 Contact: Bruno D. Zumbo
 Email: bruno.zumbo@ubc.ca

University of Manitoba

MA/PhD Methodology
<http://umanitoba.ca/faculties/arts/departments/psychology/graduate/programs/analysis.html>
 Contact: Johnson Li
 Email: Johnson.Li@umanitoba.ca

McGill University

PhD, Quantitative Psychology and Modeling
<http://www.psych.mcgill.ca/research.html#q>
 Contact: Yoshio Takane
 Email: takane@psych.mcgill.ca

Simon Fraser University

MA/PhD, Quantitative Methods
<http://www.psyc.sfu.ca/index.php?topic=theory>
 Contact: Rachel Fouladi
 Email: rfouladi@sfu.ca

University of Western Ontario

MSc/PhD, Personality and Measurement Program
http://www.psychology.uwo.ca/research/personality_and_measurement/index.html
 Don Saklofske
 Email: dsaklofs@uwo.ca

York University

MA/PhD, Quantitative Methods
<http://qm.info.yorku.ca/>
 Contact: David Flora
 Email: dflora@yorku.ca

Numerous resources related to the study of quantitative methods for psychology can be found on the APA Website. See:

<http://www.apa.org/research/tools/quantitative>

There you will find, among other things, that relative to other areas of psychology there is a much greater chance of getting a job with a PhD in Quantitative Methods!

A list of available executive positions in the QM section can be found on pages 7 and 8

2016–2017 QM Section Elections

Elections for QM Section positions will occur at the QM Annual Meeting during the CPA Convention. If you are interested in running for a position, or if you would like to nominate someone for a position, you can do so by emailing Michael Bradley (bradley@unb.ca) or nominations will also be accepted during the Annual Meeting.

Meet Your 2015–2016 QM Section Executive

Chair:

Michael Bradley
Department of Psychology
University of New Brunswick
bradley@unb.ca



Chair-Elect:

David Flora
Quantitative Methods Program
Department of Psychology
York University
dflora@yorku.ca



Past-Chair:

Rob Cribbie
Quantitative Methods Program
Department of Psychology
York University
cribbie@yorku.ca



Special points of interest:

- The QM Section of CPA was formed in 2013
- The name 'Visual Insights' for the section on p. 3 came from Matt Sigal from York University
- CPA 2016 is in Victoria; CPA 2017 is in Toronto
- Starting with CPA 2016 in Victoria there is a new QM Section student presentation award

Do you want to get involved with the Quantitative Methods Section of CPA?

If so, email any of the members of executive ... we'd love to have you!

If you are not already a member of our listserv, please send an email to Rob Cribbie so you don't miss out on future newsletters, convention news, training opportunities, etc.



Secretary/Treasurer:

R. Nicholas Carleton
Department of Psychology
University of Regina
nick.carleton@uregina.ca



Communications Director:

Nicole Aitken
Department of Psychology
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Student Representative:

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teresaallan@rogers.com