

# PSYCHOSTATISTICS

Newsletter of the Quantitative Methods Section of CPA

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## QUANTITATIVE METHODS SECTION OF CPA

### Website:

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

### Listserv:

qmcpa@yorku.ca

## Message from the Chair

I served as the first Chair of the Quantitative Methods section six years ago and it is my honour to again serve in that role for 2018. Those six years have brought many changes to quantitative methods in psychology. The so-called replication crisis, traceable to Daryl Bem's research findings published in 2011 in support of extrasensory perception and triggered by prominent instances of data fraud, continues to haunt psychology. Subsequent failures to replicate seemingly well-established psychological findings persist, although one is beginning to see suggestions that we as a discipline have weathered the worst of the crisis (see Nelson, Simmons & Simonsohn, 2018). Quantitative methods have received arguably a disproportionate amount of the blame for the replication crisis, specifically our overreliance on null hypothesis significance testing. That overreliance has led to claims such as *p*-hacking (i.e., questionable practices to attain statistical significance) and publication bias (i.e., the reluctance to publish research results unless they meet the  $p < .05$  threshold). Not surprisingly, presentations in our Quantitative Methods section

have addressed these concerns, and the crisis served as our section's theme at CPA's 2016 conference in Victoria.

Those concerns notwithstanding, quantitative methods remain an essential part of the research enterprise in psychology. All undergraduate and graduate students in psychology are exposed to statistics. Many (but not all) researchers in psychology employ quantitative methods to determine if something was found, to ascertain how important that something might be, and to communicate what that something is to others. New quantitative methods appear regularly. The Quantitative Methods section's featured speaker last year was Georges Monette who spoke on MCMC estimation and Bayesian methodology, new quantitative methods that are rapidly gaining favor with both methodologists and applied researchers.

It was this long-standing interest in quantitative methods that spurred the creation of this section six years ago. As noted by David Flora, the section

chair in 2017, our section is of interest to those for whom quantitative methods is their major research interest as well as those for whom quantitative methods is a side interest such as myself. However, there is a third group who may have no love for statistics but employ them as tools in their research. Frequently the members of the third group are applied researchers. In that vein, the Canadian Psychological Association is holding their annual convention in conjunction with the International Congress of Applied Psychology (ICAP) in Montreal at the end of June. Not only will our section be hosting posters, workshops, and talks pertaining to quantitative methods, but some of those presentations will be given by members of ICAP. This year's convention should prove to be particularly interesting. I hope to see you there in Montreal or perhaps in 2019 when CPA returns to Halifax.

Don Sharpe  
Chair, QM Section

## Message from the Student Rep

“Of all the tools I’ve acquired as a student, learning *R* has unquestionably been most useful.”

My name is Mark Adkins and I am a PhD student studying quantitative methods at York University. It’s been my pleasure to be the current student representative for the Quantitative Methods section.

I remember the first time I attended the annual CPA conference in Vancouver back in 2014 as an undergraduate. It was at that conference that I first got exposed to this wonderful area within psychology. With my background in psychology, computer science, and philosophy it felt like a perfect fit for me. I attended every QM talk I could (despite many of them being well beyond my understanding at the time), including a workshop on *R*. I was hooked! I just could not get enough.

As a graduate student, not much has changed. As I continue to gain a greater understanding of the

interplay between methodology, statistical analysis, and theory, I am just as excited today as when I first discovered this world back during my first conference. Although not everyone’s journey will be the same as mine, I want to encourage students and researchers alike to never lose their curiosity and passion for our craft. Never stop learning!

Of all the tools I’ve acquired as a student, learning *R* has unquestionably been most useful. Despite a steeper learning curve than other statistical software, the time I’ve invested in it has paid for itself many times over. The sheer amount of freely available resources is astounding, and they are just waiting out there for anyone willing to invest the time and energy. There are workshops, online courses, and many great podcasts to learn from. One last bit of *R* advice, I highly recommend that both new and seasoned users check

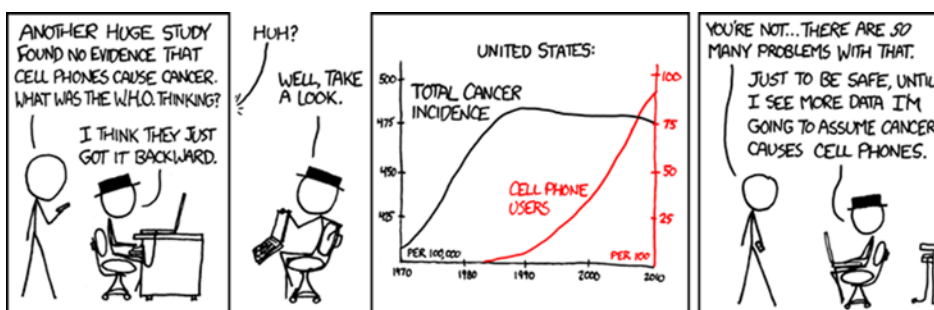
out the *tidyverse*. It’s an amazing set of packages which share an “underlying design philosophy, grammar, and data structures”. I wish I was aware of it when I was first learning *R*.

As everyone starts to prepare for the upcoming conference, I highly suggest you get onto Twitter and get connected with the QM community. It’s a fantastic way to keep you apprised of what is currently happening in our field as it unfolds in real time. You can quickly get a sense of both the practical and theoretical problems researchers are dealing with, along with solutions to problems you might encounter yourself at some point in your career.

I look forward to meeting many of you in June. Feel free to email me if you any questions, I would love to help in any way I can.

Mark

## QM Laugh



## Did You Know?

There are 29 non-student members of the Quantitative Methods Section ... not exactly the *N* of the Clinical Section, but has been increasing steadily since the Section began 5 years ago

## Visual Insights



### Visualizing Meta-Analytic Results with Forest Plot Variants

Forest plots are a useful tool for graphing meta-analytic results. Traditional forest plots (Figure 1a) report each study's 95% confidence interval (CI) with a single line, while a square in the center of the line represents the weight assigned to the study within the meta-analysis. Studies with a large sample size and smaller standard deviation correspond to a smaller CI, increased precision, and therefore have a larger weight within the meta-analysis. Diamonds in traditional forest plots represent the summary effects of multiple studies. The center and length of the diamond correspond to the magnitude of the effect and upper/lower limits of the CI, respectively.

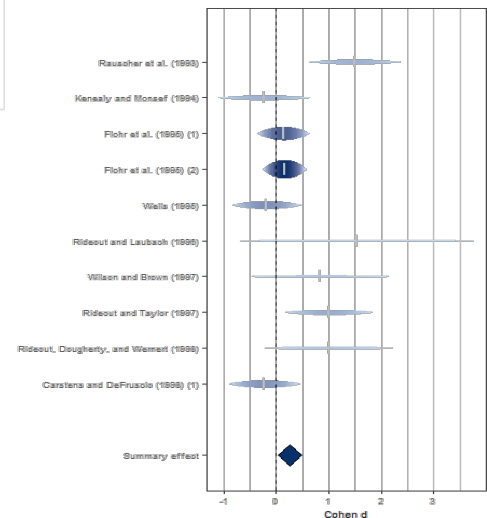
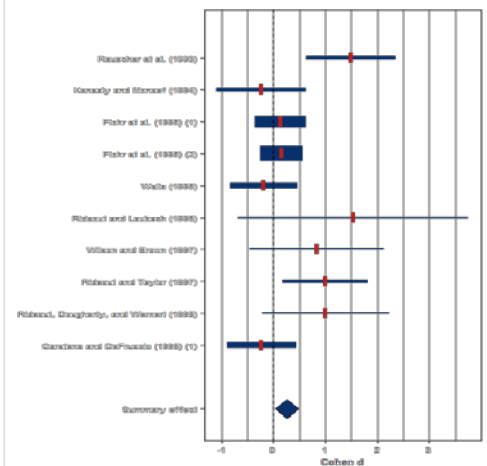
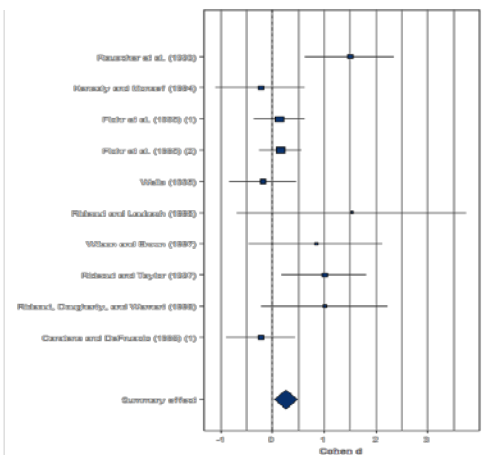
Traditional forest plots are commonly criticized for: (1) smaller studies attracting undue attention due to their relatively longer CIs, (2) the confidence interval lines not reflecting the variation in plausible values along the length of the interval, and (3) boxes for more heavily weighted studies obscuring individual point estimates due to their larger size in relation to the CI (Schild & Voracek, 2014).

The thick forest plot and the rainforest plot are two novel graphs designed to address these criticisms and improve the way meta-analytic results are interpreted. Thick forest plots (Figure 1b) use the line width of a CI to represent a study weight, resulting in smaller studies attracting less visual attention due to their relatively thinner interval lines. In addition, effect estimates are marked with red ticks of uniform length and thickness, ensuring clear depictions of individual point estimates.

Rainforest plots (Figure 1c) emphasize uncertainty in point estimates by combining raindrop plots and density strips (Jackson, 2008). Raindrops represent mirrored likelihood curves for a study's CI, which illustrate distributional information such as the variation in likelihoods along the length of the confidence interval and changes in size or asymmetries. Study weights are depicted by both the height and colour saturation of the raindrops, with saturation reduced towards the upper and lower ends of each interval. This saturation gradient reflects the principle that the likelihood of a value decreases when it is further from the center of a CI. Effect estimates are marked with white ticks of the same thickness and length.

Schild and Voracek (2014) compared perceptions of the three graphs and found that estimates of between study heterogeneity ( $I^2$ ) were most precise when participants viewed the thick forest plot, followed by the rainforest plot. In addition, participants were more likely to claim that all values within the confidence intervals were equally likely when shown conventional forest plots or thick plots instead of rainforest plots.

Thank you to Nataly Beribisky and Linda Farmus for this issue's *Visual Insight*. Linda and Nataly are graduate students in the Quantitative Methods Program at York University.



## Consulting Corner

Dear Consultant,

I am trying to analyze a 2 x 4 independent groups analysis of variance (ANOVA). I first analyzed the data using SPSS, but since our department is moving away from SPSS and towards R, I thought I would analyze the data with R as well. The problem is that the results across the two programs are very different.

In SPSS, I clicked on "Analyze", then "General Linear Model", then "Univariate". After that I put my dependent variable in the "Dependent Variable" box, and both independent variables in the "Fixed Factor(s)" box.

In R, I used the following code:

```
model<-lm(dv ~ iv1*iv2)
library(car)
Anova(model)
```

The results for the interaction were the same across SPSS and R (and both not statistically significant), however the main effect results were very different.

With SPSS neither of the main effects were statistically significant ( $p_1 = .055$ ,  $p_2 = .069$ ).

With R, the results for the main effects were very different ( $p_1 = .037$ ,  $p_2 = .391$ ). The effect size ( $\eta^2$ ) for the second independent variable is also much larger in SPSS.

What is the reason for the difference?

Sincerely,  
Confused

Dear Confused,

The issue here is that SPSS and R are evaluating different models, even though the differences are hard to spot. More specifically, SPSS and R are calculating the sums of squares (SS) for the main effects differently. SPSS by default uses Type III SS, whereas the *Anova* function from the 'car' package by default uses Type II SS.

The important question is "What SS type is most appropriate?". Generally, Type II SS are recommended for calculating main effects

because they do not violate the principle of marginality. A more straightforward way to say this is that with Type II SS the interaction term enters the model after all of the main effects, whereas this is not the case with Type III SS.

Thus, Type III SS for the main effects are most appropriate in the presence of an interaction, however it is generally recommended that main effects are not interpreted in the presence of an interaction (or more generally that lower order terms are not interpreted in the presence of a meaningful higher order term).

Back to the original question, to get the results to match change the SS type in SPSS to Type II.

Hope this helps.  
QM Consultant



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### Have a Consulting Question?

Email Consulting Corner suggestions to Rob Cribbie ([cribbie@yorku.ca](mailto:cribbie@yorku.ca)), Secretary-Treasurer of the QM Section

## QM Section's 'Student Presentation Award'

Starting in 2016, the QM Section started awarding the best QM student presentation at each annual meeting of the Canadian Psychological Association. The first winner of the award was Alyssa Counsell, a graduate student in the Quantitative Methods program at York University, whose presentation 'Attitudes Towards Statistics and

Statistical Software in Psychology: Implications for Teaching and Student Success' received the highest average score from the judges.

The 2017 winner of the *Student Presentation Award* was Donna Tafreshi, a PhD student at Simon Fraser University. The judges were extremely impressed with

Donna's presentation "A Review of Meta-Analysis Reporting Practices in Psychology".

Starting in 2018, winners of the *Student Presentation Award* will also receive a special invitation to publish their work in the *The Quantitative Methods for Psychology*. Looking forward to all the great presentations!



## QM at the 2017 CPA Convention ... A Look Back at Some Great Presentations

### Section Invited Speaker

**Georges Monette**, Department of Mathematics and Statistics, York University  
*A Frequentist Travels to Bayesland: Field Notes on a Late Rumspringa.*

### Workshops

- **A BEGINNER'S GUIDE TO INCREASING TRANSPARENCY AND REPRODUCIBILITY IN PSYCHOLOGICAL SCIENCE** Kaitlyn Werner, Carleton University
- **INTRODUCTION TO STATISTICAL POWER ANALYSIS** Sean Mackinnon, Dalhousie University

### Symposia Talks

- **WHAT 80 PERCENT OF TEXTBOOKS WON'T TELL YOU: THE RATE OF P-VALUE FALLACIES AND EFFECT SIZE INCLUSION ACROSS INTRODUCTORY PSYCHOLOGY TEXTBOOKS** Ralitza Dimova, Scott Cassidy, Benjamin Giguère, Jeffrey Spence, David Stanley, University of Guelph
- **IS THE RATE OF INCONSISTENCY BETWEEN COMMON TEST STATISTICS AND P-VALUES IN CANADIAN PSYCHOLOGY JOURNALS SIMILAR TO THAT FOUND IN TOP AMERICAN PSYCHOLOGY JOURNALS?** Christopher Green, Sahir Abbas, Nataly Beribisky, Ian Davidson, Julian DiGiovanni, Crystal Heidari, Eric Oosenbrug, York University
- **THE PROBABILITY OF REPLICATING EFFECT SIZE: CAN WE (PARTLY) BLAME INAPPROPRIATE STATISTICAL METHODS FOR THE REPLICATION CRISIS?** Yongtian Cheng, Johnson Li, Rory Waisman, University of Manitoba
- **MIXTURE MODELLING OF THE HEXACO PERSONALITY INVENTORY** Carolina Patryluk, Paul F. Tremblay, Western University
- **A FRAMEWORK TO UNDERSTAND SOURCES OF VARIABILITY AND RESEARCH FINDINGS** Joo Ann Lee, York University
- **CONSTRUCT VALIDATION IN SOCIAL AND PERSONALITY RESEARCH: CURRENT PRACTICE AND RECOMMENDATIONS** Jessica Flake, Jolynn Pek, York University; Eric Hehman, Ryerson University
- **MEDIATION ANALYSIS IN PSYCHOLOGICAL RESEARCH: RECOMMENDATIONS FOR BEST PRACTICE** Jolynn Pek, Joo Ann Lee, Jessica Flake, York University; Rui Zhang, Dickinson College
- **A REVIEW OF META-ANALYSIS REPORTING PRACTICES IN PSYCHOLOGY** Donna Tafreshi, Kathleen Slaney, Simon Fraser University
- **TOO MUCH OF A GOOD THING? (RE-)APPRAISING THE POPULARITY OF META-ANALYSIS IN PSYCHOLOGY** Donald Sharpe, Sarena Poets, University of Regina
- **BOOTSTRAP CONFIDENCE INTERVALS IN META-ANALYSIS—A MORE ROBUST PROCEDURE** Johnson Li, Yongtian Cheng, Jiazhou Bi, Rory Waisman, University of Manitoba

### Posters

- **INDIVIDUAL PERCEPTIONS OF A MINIMALLY MEANINGFUL DIFFERENCE** Nataly Beribisky, Heather Davidson, Robert Cribbie, York University
- **ISOLATING AND WORKING WITH THE PARTICULAR EFFECT SIZES THAT ARE TROUBLESOME FOR INFERENCE STATISTICS** Michael Bradley, U of New Brunswick, Andrew Brand, Bangor University, UK
- **CONTINUOUS PREDICTORS OF PRETEST-POSTTEST CHANGE: HIGHLIGHTING THE IMPACT OF THE REGRESSION ARTEFACT.** Linda Farmus, Chantal Arpin-Cribbie, Laurentian University, Robert Cribbie, York University
- **UNDERSTANDING MODEL CHOICE AND CONCEPTUALIZATION: AN EXAMINATION OF REPORTING PRACTICES IN PSYCHOLOGICAL META-ANALYSES** Richard Hohn, Kathleen Slaney, Donna Tafreshi, Simon Fraser University
- **BAYESIAN ALTERNATIVES FOR TESTING A LACK OF ASSOCIATION** Joseph Hoyda, Robert Cribbie, Alyssa Counsell, York University
- **THE NEED FOR CONTROL: ILLUSTRATING THE ROLE OF CONTROL GROUP ON EFFECT SIZES** Rebecca Scott, Lana Ozen, Sacha Dubois, Michel Bédard, Lakehead University
- **A STUDY OF CONFIDENCE INTERVALS FOR THE MEAN OF NON-NORMAL DISTRIBUTIONS** Octavia Wong, Jolynn Pek, York University
- **TESTING THE ASSUMPTION OF IDENTICAL DISTRIBUTIONS FOR NONPARAMETRIC TESTS OF LOCATION** David Nordstokke, University of Calgary; Colp Mitchell, Rocky View Schools

The program for this year's CPA Convention in Montreal can be found at:  
<https://events.decorporate.ca/ICAP2018/abstract/event-schedule.php>



## QM Graduate Programs in Canada

### University of Alberta

Centre for Research in Applied Measurement and Evaluation  
<https://sites.google.com/ualberta.ca/crame>  
 Contact: Dr. Mark Gierl  
 Email: mark.gierl@ualberta.ca

### University of British Columbia

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

MA/PhD, Measurement, Evaluation, and Research Methodology  
<http://ecps.educ.ubc.ca/measurement-evaluation-and-research-methodology/>  
 Contact: Bruno Zumbo  
 Email: Bruno.zumbo@ubc.ca

### Carleton University

MA, Specialization in Data Science  
 PhD, Concentration in Quantitative Methods  
<https://calendar.carleton.ca/grad/gradprograms/psychology/>  
 Contact: Andrea Howard  
 Email: andreahoward@cunet.carleton.ca

### University of Manitoba

MA/PhD Methodology  
<http://home.cc.umanitoba.ca/~psycarea/programs/quantitative/index.html>  
 Contact: Johnson Li  
 Email: Johnson.Li@umanitoba.ca

### McGill University

PhD, Quantitative Psychology and Modeling  
<http://www.mcgill.ca/psychology/research-0/quantitative-modelling>  
 Contact: Heungsun Hwang  
 Email: heungsun.hwang@mcgill.ca

### Simon Fraser University

MA/PhD, Quantitative Methods  
<https://www.sfu.ca/psychology/areas/hqt.html>  
 Contact: Rachel Fouladi  
 Email: rfouladi@sfu.ca

### Trent University

MSc, Applied Modeling and Quantitative Methods  
<https://www.trentu.ca/amod/>  
 Contact: Dr. Marco Pollanen  
 Email: marcopollanen@trentu.ca

### York University

MA/PhD, Quantitative Methods  
<http://qm.info.yorku.ca/>  
 Contact: Rob Cribbie  
 Email: cribbie@yorku.ca

Thank you to Andrea Howard, Chair-Elect of the QM Section, for collecting the info on QM Graduate programs in Canada

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

*<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.

“To call in the statistician after the experiment is done may be no more than asking him to perform a post-mortem examination: he may be able to say what the experiment died of.”

Ronald Fisher

## Quantitative Methods Research Award

The primary mission of the Quantitative Methods Section of the Canadian Psychological Association is the promotion of Quantitative Methods for Psychology in Canada. The development of the Section can be said to be the first event to that end, and more recent developments such as the *Psychostatistics* newsletter are helping to further that mission.

With regard to the mission, more specifically the Section attempts to promote *excellence* in quantitative methods. For example, the *Student Presentation Award* that came to fruition in 2016 rewards students for excellence in the promotion of quantitative methods through their presentations at the Annual Meeting of the Canadian Psychological Association.

Starting in 2017, the QM Section has a new award that recognizes the best research article published during the calendar year. From the Section by-laws, here are the tenets of the award:

*This annual (calendar year) award will recognize excellence in a research study focusing on quantitative methods for psychology and published in a refereed scientific journal by a researcher in Canada (i.e., a researcher working at an institution in Canada, or an individual from outside Canada who is a member of the Section). The publication date of the article must match the award year. Nominations for this award can be submitted by any Section member and should be sent to the Chair of the section by April 1 (for the previous calendar year's award). Nominations will be voted on by the executive and the award will be presented at the CPA convention.*

It took a couple years of discussion and debate among Section members to determine an acceptable set of parameters for the award, but the award is now official and the first call for nominations was held in early 2018 for the 2017 calendar year.

Nominations for the award were outstanding and the task of selecting a winner was extremely difficult for the Executive Committee. The inaugural winner of the Quantitative Methods Research Award will be announced at the Business Meeting of the QM Section.

### QM Laugh x2

A psychology student was very hung over for the final exam in statistics. He was relieved to find that the exam was a true/false test. He had attended a few lectures and did remember the professor once performing a coin-flipping experiment. Since his brain was pretty mushy, he decided to flip a coin to get the answers for each question on the exam. The professor watched the student as he was flipping the coin...writing an answer...flipping the coin....writing an answer, on and on. At the end of the exam, everyone else had left the room except for this one student. The professor walked up to his desk and angrily stated: "Listen, it is obvious that you did not study for this exam. If you are just flipping a coin for your answers, why is it taking you so long?"

The student looked up and replied bitterly: "Shhh! I am checking my answers!"

### QM Section Executive Elections

Elections for QM Section positions on the Executive will occur at the QM Annual Meeting during the CPA Convention. Positions are available for both students and faculty/researcher. If you are interested in running for a position, or if you would like to nominate someone for a position, you can email executive members or nominations will also be accepted during the Annual Meeting.

A list of available executive positions in the QM section can be found on pages 8 and 9.

## Meet Your 2016–2017 QM Section Executive Team

### Chair:

Donald Sharpe  
Department of Psychology  
University of Regina  
*sharped@uregina.ca*



### Chair-Elect:

Andrea Howard  
Department of Psychology  
Carleton University  
*andreaHoward@cunet.carleton.ca*



### Past Chair:

David Flora  
Department of Psychology  
York University  
*dflora@yorku.ca*



### Special Points of Interest

QM Section of CPA was formed in 2013

Don Sharpe was the first chair of the section

CPA 2019 is in Halifax, CPA 2020 is in Calgary, and CPA 2021 is in Ottawa



**Want to Get Involved?**

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 ([cribbie@yorku.ca](mailto:cribbie@yorku.ca)) so you don't miss out on future newsletters, convention news, training opportunities and more!



**Secretary/Treasurer:**

Rob Cribbie  
Department of Psychology  
York University  
*cribbie@yorku.ca*



**Communications**

**Director:**

Kaitlyn Werner  
Department of Psychology  
Carleton University  
*kaitlynwerner@cmail.carleton.ca*



**Student Representative:**

Mark Adkins  
Department of Psychology  
York University  
*madkins@yorku.ca*