APRIL 2022 COURSE

Difference Testing and R Training

Taught by Dr. Daniel Ennis, Dr. Benoît Rousseau, and William J. Russ

April 5 - 8, 2022

We begin our training program with a special day devoted to the open-source software, R. Due to the extensive capability of the software, made possible by contributions of many open users, R scripting and programming has become an essential tool in data analysis and reporting. We will explain what R is, data structures used in R, how the software can help you compute simple and advanced analyses, how to engage with the numerous graphic tools available in R, and how to interface the software to external tools such as Excel and PowerPoint.

On Wednesday, we will focus on the science of measuring sensory differences. The standard approach to investigating whether sensory differences exist or not is to use appropriately powered discrimination tests and rely on the *p*-value from a null hypothesis of no-difference. While this might be a suitable approach when trying to demonstrate that a sensory difference exists, it lacks a philosophical and statistical foundation when research needs to establish a sensory "match." In this course, we will depart from this tradition and describe a more reliable approach supported by decades of research using the Thurstonian modeling framework and a consumer relevant action standard.

Using a scenario that begins with a proposed formulation change, we follow the project's path starting with the application of Thurstonian theory to resolve conflicting difference test results. We then describe a typical power approach to a risk-management program involving the tetrad method, optimal panel sample sizes, and a consumer-relevant internal action standard. The internal action standard is based on consumer research. We proceed by outlining limitations of the traditional approach to study equivalence and describe a more reliable direct test using the same action standard. The takeaway from the course is that participants will be able to generate superior recommendations for optimal panel sample sizes based on a company's preferred risk profile. Attendees will participate actively in the journey outlined in this course through a series of exercises and the use of the *IFPrograms*® software.

TUESDAY

April 5, 9am - 5pm ET

- **Welcome and introductions**
- **Introduction to R**
  - R and RStudio®
  - How to write scripts
  - Useful commands
  - Functions for statistical analyses
  - Packages and libraries
- **Data Analysis**
  - Importing data (Including CSV, XLSX, SPSS, SAV, etc.)
  - Data wrangling, cleaning, and manipulation
- **Scripting and Project Managment**
  - Writing custom functions
  - Data Structures
  - Visualization
  - Data export
- **Project Organization and Managing Workflow**
  - Git and GitHub (version control)

WEDNESDAY

April 6, 9am - 5pm ET

- **Introduction to Difference Testing**
  - Methodological and analytical review of sensory measurements
  - Overview of sensory discrimination testing
  - Background to workshop's illustrative scenarios
- **Project 1: Flavor improvement of a chocolate-based snack**
  - Introduction of the 2-AFC and 3-AFC methodologies – ***IFPrograms exercises***
  - Standard statistical approach: Binomial test and 95% confidence level
- **Project 2: Ingredient change of a baked good product – Product "match"**
  - Introduction of the duo-trio and triangle methodologies
  - Finding inconsistencies and low confidence in experiment conclusions – ***IFPrograms exercises***
- **Proportion of discriminators in the population:** Background and why it is misleading
- **Introduction of a theoretical structure for sensory measurements**
  - Illustrative examples based on peered-reviewed research
  - Expanding a purely statistical state-of-mind by incorporating decision processes – ***IFPrograms exercises***
  - Thurstonian Theory: Introduction of a standardized measure of sensory difference, δ, and of its estimate d'

(Wednesday, Thursday, and Friday outline continues on the next page.)

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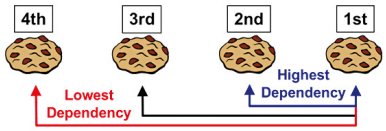
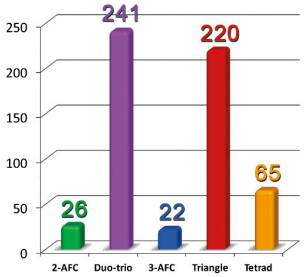
WEDNESDAY *Continued...*

- **Thurstonian structure for sensory measurements**
  - Application of basic principles to intensity and hedonic rating scales
  - Application to ranking and Check-All-That-Apply (CATA) scoring
  - Estimating the size of sensory differences – ***IFPrograms exercises***



- **Back to Project 1 and Project 2**
  - Data analyses and interpretation; resolution of result inconsistencies – ***IFPrograms exercises***
- **Why a difference will always be found: The need to estimate consumer relevance**
  - Preference testing to establish importance/relevance
  - Introduction of the beta-binomial model to handle test replications
  - Application to Project 1 and Project 2 – ***IFPrograms exercises***
- **Beyond the traditional triangle and duo-trio tests: The tetrad method**
  - Illustration of the reason behind the tetrad method's superior statistical power
  - Review of published case studies confirming the tetrad's superiority
  - The importance of giving the proper task instructions

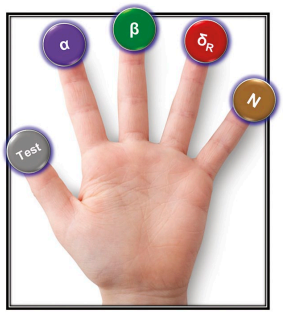


- **Case Study**: A significant consumer preference despite a lack of statistical sensory difference – ***IFPrograms exercises***

THURSDAY

April 7, 9am - 5pm ET

- **Next Step: The limitations of focusing solely on statistical significance**
  - Illustration of the differences in statistical power of common sensory discrimination methods – ***IFPrograms exercises***
  - The need to estimate the importance of a sensory difference: Consumer relevance and δ_R
  - Simulations and estimates of optimal sample sizes – ***IFPrograms exercises***
- **Establishing the size of a consumer relevant sensory difference: Using the same-different method**
  - Overview of the same-different method
  - Are two samples the same or different? The tau criterion
  - Application to Project 1 and Project 2 – ***IFPrograms exercises***
  - Research involving linking internal and consumer panel sensory sensitivities – ***IFPrograms exercises***
  - Building a successful sensory testing program: Type I and Type II errors, methodology, panelists, sample size, consumer relevance (δ_R)

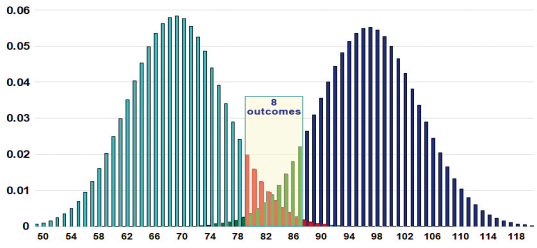


- **Establishing the suitability of a switch to the tetrad method**
  - Review of experimental variables: Training, retasting, memory
  - Beverage research to study the switch from triangle to tetrad – ***IFPrograms exercises***

FRIDAY

April 8, 9am - 1pm ET

- **Latest developments: Difference or equivalence testing**
  - Contrasting difference and equivalence testing
  - Reframing Project 1 and Project 2 in terms of difference *(Project 1)* and equivalence *(Project 2)* testing
  - Potential issues with traditional power concept for equivalence testing: Varying sample sizes – ***IFPrograms exercises***
  - Why the concept of proportion discriminators is also misleading for equivalence testing
- **Theoretical illustrations of the switching roles of α** *(incorrectly rejecting no difference)* **and β** *(incorrectly accepting no difference)*
  - Graphical representation – ***IFPrograms exercises***



- **Practical application of difference and equivalence testing**
  - Revisiting the previous power and sample size considerations of Project 1 and Project 2
  - Why experimental parameters must by modified for equivalence testing *(Project 2)*
  - Development of a broad sensory discrimination testing program for difference and equivalence testing objectives – ***IFPrograms exercises***
- **Review of all covered materials and workshop conclusions**

Registration

Difference Testing and R Training

presented Tuesday, April 5 - Friday, April 8, 2022

	FEE
In-person attendance at The Greenbrier	**$1,575***
Live stream attendance via Zoom	**$1,175***
R Training only via Zoom or in-person	**$495**

***** *Includes complimentary R Training on the first day. For academic and multiple registration discounts, please contact us before registering.*

Register Online: www.ifpress.com/april-2022-program

Fee includes:

- Printed manuals of slides and software exercises
- A printed copy of our book, *Tools and Applications of Sensory and Consumer Science* and PDF downloads of the following 2 books: *Thurstonian Models: Categorical Decision Making in the Presence of Noise,* and *Readings in Advertising Claims Substantiation*
- Food and beverage refreshments each day, plus lunch and dinner on Tues. - Thurs. for attendees at The Greenbrier
- A 3-month free trial of ***IFPrograms***® Professional version

Register online at www.ifpress.com/courses where payment can be made by credit card. A fee discount is available for students and multiple registrations. If you qualify for a discount or need information about payment by invoice, please contact **Susan Longest** at mail@ifpress.com or call 804-675-2980 before registering.

LOCATION: The course will be presented at The Greenbrier® in White Sulphur Springs, WV. Nestled in the Allegheny Mountains, this gracious hotel is renowned for its hospitality and service.

LODGING: Lodging is not included in the course fee and participants must make their own hotel reservations. A block of rooms is being held at The Greenbrier at a special rate of **$235** *(plus resort fees & taxes)*. To make a reservation, please call **1-877-661-0839** and mention you are attending the ***Institute for Perception*** course *(**Note:** the special rate is not available through online reservations.)* To learn more about The Greenbrier, *America's resort since 1778*, visit their website at www.greenbrier.com.

TRANSPORTATION: The Greenbrier Valley Airport (**LWB**) in Lewisburg is only a 15 min. shuttle ride from the hotel. Direct flights to LWB are available on United Airlines from Chicago O'Hare (**ORD**) and Washington Dulles (**IAD**). Other airports include Roanoke, VA (**ROA,** 1hr. 15 min.), Charleston, WV (**CRW,** 2 hrs.), and Charlottesville, VA (**CHO,** 2 hrs. 15 min.).

CANCELLATION POLICY: Registrants who have not cancelled two working days prior to the course will be charged the entire fee. Substitutions are allowed for any reason.

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This course has been developed for technical and supervisory personnel involved in all aspects of sensory and consumer research.

THIS COURSE WILL ALSO BE PRESENTED VIA

zoom

If you are unable to attend in person, this course will also be live streamed via Zoom. If you attend virtually, you will be sent a link by email to join the meeting with the speakers and other attendees. All supporting materials will be mailed to you before the event, so please register early to allow for sufficient shipping time.

IFPrograms,® R, and RStudio® Software

The course instruction includes software to perform analyses and exercises. Prior to the course, you will be sent information by email to install R and RStudio® to be used on Tuesday, and *IFPrograms*® to be used Wednesday-Friday. To introduce you to the capabilities of *IFPrograms,*® you will also receive a complimentary 3-month trial of the Professional version used for an extensive collection of sensory and consumer data related analyses. For a detailed listing of *IFPrograms*® features and licensing, please visit www.ifpress.com/software.

(Note: IFPrograms is not required to apply course principles.)

SPEAKERS

For detailed biographical information, please visit www.ifpress.com/april-2022-program

Dr. Daniel M. Ennis
The Institute for Perception
- President

Dr. Benoît Rousseau
The Institute for Perception
- Senior Vice President

William (Will) Russ
The Institute for Perception
- Computational Market Researcher and Lead Programmer

Stephen McIngvale
Molson Coors Beverage Company
- Consumer Technical Insights & Sensory

CFS Certified Food Scientist®

This program qualifies for Certified Food Scientist (CFS) recertification contact hours (CH).

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