IN THIS ISSUE

- **Technical Report**
  Derived Preference from Applicability Scoring
  The advantages of applicability scoring over direct preference.
  (pages 3-4)

- President’s Message ............................................... 1

- **UPCOMING WEBINARS:**
  September 20th ..................................................... 2
  Derived Preference and Difference from Applicability Scoring
  December 13th ...................................................... 2
  A Three-Step Approach to Characterizing Consumer Segmentation via Machine Learning

- 2018 Student Award .................................................. 2

- **NOVEMBER 6 - 9 Course:**
  Principles of Categorical Choice Models ...... 5, 6, 7
  A Foundation for Difference, Rating, and Hedonic Testing

*Alighting on derived preferences... (pgs. 3 & 4)*
President's Message

Derived Preference from Applicability Scoring

The technical report in this issue considers whether it is feasible to develop an analog measure of preference based on sequential monadic testing. The power of the method is compared with direct preference with a no preference option.

I hope you are making plans to attend our November Course taught at The Greenbrier in White Sulphur Springs, WV (details on pgs. 5-7.) Whether you have been working in your field for 20 years or 20 months, you will benefit from considering some new perspectives and from interaction with other attendees away from the demands of the office. You will return refreshed and inspired with new ideas, and a deeper foundation in the basis for the methods you commonly use.

Best regards,
Daniel M. Ennis
President, The Institute for Perception

To download previously published technical reports and papers from our website, become a colleague at www.ifpress.com

WHAT WE DO:

- **Client Services**: Provide full-service product and concept testing for product development, market research, and claims support
- **Education**: Conduct internal training, external courses, and online webinars on product testing, sensory science, and advertising claims support
- **IFPrograms™**: License proprietary software to provide access to new modeling tools
- **Research**: Conduct and publish basic research on human perception in the areas of methodology, measurement and modeling

WEBINAR CALENDAR:

**SEPTEMBER 20, 2018** ....................................... 2:00 PM EDT, 75 minutes
- Derived Preference and Difference from Applicability Scoring

**DECEMBER 13, 2018** ........................................... 2:00 PM EST, 75 minutes
- A Three-Step Approach to Characterizing Consumer Segmentation via Machine Learning

COURSE CALENDAR:

**NOVEMBER 6 - 9, 2018** ....... The Greenbrier, White Sulphur Springs, WV
- Principles of Categorical Choice Models
- A Foundation for Difference, Rating, and Hedonic Testing

**APRIL 9 - 11, 2019** ...................... The Greenbrier, White Sulphur Springs, WV
- Advertising Claims Support: Case Histories and Principles

**MAY 7- 9, 2019** .................... The Williamsburg Lodge, Colonial Williamsburg, VA
- Current Topics: SYMPOSIA and Master Classes

Detailed information and registration for all courses and webinars are available at www.ifpress.com

To Contact Us...  • www.ifpress.com  • mail@ifpress.com  • 804-675-2980

7629 Hull Street Road  • Richmond, VA  23235
WEBINARS in September & December

September 20th at 2:00 ET

**Derived Preference and Difference from Applicability Scoring**

*Taught by: Dr. Daniel Ennis and Dr. Benoît Rousseau*

Applicability scoring involves declaring that a statement applies, or does not apply, to an item. In survey research the method is called “forced choice CATA” and was shown to lead to deeper processing of the statements than regular CATA.

In this webinar, we explore the possibility of deriving preference and other pairwise attribute information from applicability scoring, and we compare it with data from typical preference testing with a no preference option. This approach provides greater discrimination sensitivity compared to direct paired preference and can also be applied to non-hedonic statements.

December 13th at 2:00 ET

**A Three-Step Approach to Characterizing Consumer Segmentation via Machine Learning**

*Taught by: Dr. John Ennis and William Russ*

Throughout consumer research, the challenge of identifying and explaining consumer segmentation arises again and again. Specifically, when we seek to discover new product opportunities, to improve existing products, or to better understand the market within which our products operate, it is valuable to have a nuanced understanding of individual consumer differences together with knowledge of the key signals that drive those differences.

In this webinar, we explain how machine learning techniques are well-suited to overcome this challenge, and provide a three-step process for explaining consumer segmentation using these tools. No prior knowledge of machine learning is assumed.

Now accepting applications for the

**2018 Institute for Perception Student Award**

All entries must be postmarked or emailed by Saturday, JANUARY 19, 2019

For complete award details and application form, go to: www.ifpress.com/student-award

Resources on www.ifpress.com

The Institute for Perception is primarily a full service marketing research and consulting company, and through extensive research, teaching, and experience working in the field for decades, we have amassed quite the collection of educational information.

In the spirit of the advancement of sensory and consumer science, we invite you to visit our website where you will find technical reports, presentations, and reprints of our papers to download as a Colleague - joining is free! Our latest books and webinar recordings can also be purchased online for your professional library.
Introduction: Traditional preference testing is expensive with more than two products because of the large number of comparisons that require evaluation. Applicability scoring\(^1,2\) was originally used in product testing partly to develop an alternative method for deriving an analog preference measure in sequential monadic testing\(^3\). Since the method is used sequentially, it can be used for more than two products. When the attribute is liking (the item scored is I like this product), the method allows the separation of like both from like neither which is not provided using a preference question with a no preference option. Therefore, this capability provides more information about the acceptability of both products than can be obtained from a preference test.

Applicability scoring requires the consumer to indicate whether each term or statement ‘applies’ or ‘does not apply’ to the sample evaluated. When it was first used in the sensory field\(^1\) and compared to traditional preference testing, it was found to be comparable in sensitivity.

In this technical report, we extend the learnings from our previous report\(^2\) to illustrate how applicability scoring can be a viable alternative to traditional preference or other paired comparison tests. We will show that theoretically it exhibits a similar statistical power to paired testing, supporting the original comparative testing, and can be executed far more cost-effectively using a sequential monadic design.

Scenario: You work for a major yogurt manufacturer. You often conduct consumer testing to investigate the potential of new prototypes as well as the strength of your products compared to current and new competitors. Your consumer research involves liking ratings on a 7-point hedonic scale, followed by an ANOVA and individual mean comparisons. When few products are involved (2 or 3), you also conduct paired preference testing with all product pairs.

Since your research typically involves 5-10 products, collecting all pairwise preferences, along with product attribute intensities and JAR information, is not an option. You incorporate applicability scoring into your next project. This testing includes six vanilla flavored plant-based yogurts evaluated by 300 regular consumers of plant-based yogurt products. From attribute applicability scoring on individual samples (e.g., ‘I like this product’), you can derive pairwise information for all product pairs without conducting any paired tests. In addition to your standard hedonic and intensity rating scales, the ballot you use includes 15 applicability statements, a subset of which is found in Table 1.

Applicability Scoring and Derived Preference: Applicability scoring is an easier task for consumers to perform than the process of rating products on sets of 7- or 9-point category scales. It is also very efficient and involves the monadic evaluation of a single product. While the applicability scores of the attributes first provide useful information on the profile of each product, the same scores can also be combined by pairs of products to derive pairwise information. When comparing two products, respondents are split into four categories: Those who thought the statement applied to both products, to neither product, and to one product but not the other (2 groups). A typical result is summarized in Table 2.

### Table 2. Data example for the ‘I like this yogurt’ statement.

Using this data, we can conduct a chi-square test (McNemar’s test)\(^2\) between the two counts on the off-diagonal (80 vs. 51) to see if Product 5 and Product 2 differ significantly. We find that they do, \(p = 0.01\). We also note that the derived preference result is 61% in favor of Product 5 (80/131). The similarity of the preference proportion and the derived proportion was discussed in the original tests of this method\(^3\).

While preference information can be derived from applicability data, there is a need for a theoretical analysis to compare the power of the two approaches. Figure 1 summarizes the models that will be used to account for the applicability data and also the preference data. The perceptual distribution of each product is assumed to be normal with a variance of 1. The distributions of the two samples are assumed to be separated by a distance of \(\delta\), with Y liked more/preferred over X. Both of these Thurstonian models have been discussed in detail in previous papers\(^1,4\).

#### Figure 1. Graphical representation of the applicability scoring and paired preference decisions rules.

Figure 1a illustrates the applicability decision rule: The respondent uses a criterion \(c\) on the sensory/hedonic continuum. If the momentary perception is greater than \(c\), the response will be ‘Applies’, otherwise ‘Does not apply’.
The shaded area represents the proportion of times Y will be higher than c, i.e., the proportion of times the statement will apply to Y. We can see that the statement will apply more to Y than X, based on their respective areas above c.

Figure 1b illustrates the preference test decision rule: For the 2-Alternative Choice method, the decision rule is better represented using the Y-X difference distribution which has a variance of 2. To decide whether one product is preferred over the other, the respondent uses a t criterion. If the perceived difference is greater than t, the respondent will choose Y over X if at that moment y > x, or X over Y if at that moment x > y. If the perceived difference is smaller than t, the respondent will answer “No preference”.

Simulations were conducted while varying c, t, δ, and the experiment’s sample size. For each of these scenarios, the power of the method was determined. In the case of the simulated preference testing, the results were tested among those who expressed a preference. Figure 2 shows the power curves for parameters typically found in practice.

**Figure 2.** Power comparisons between applicability and preference testing based on δ for c = 0.25 and t = 0.3 with samples sizes of 50, 200 and 500.

Based on these simulations it was found that, for a given sample size, the paired preference results, based on those who expressed a preference (the most powerful method of analysis for preference) was only slightly higher than applicability scoring. This is a valuable finding for a derived preference measure given the advantages in cost and execution of applicability scoring. The first advantage is that applicability scoring does not require pairwise testing and can be obtained in a sequential monadic design involving more than two products. This allows the derivation of a preference analog, or other attribute, in the form of pairwise ratios over all product pairs, as illustrated in our example (80/131 = 61% in favor of Product 5). The second advantage is that the ‘both’ and ‘neither’ categories are also useful to get a measure of the number of consumers who might not have a strong preference between the samples. In the traditional paired preference test with a ‘no preference’ option, these consumers should answer ‘no preference’. However, as has been reported repeatedly, even putatively identical products will result in ‘no preference’ proportions of only about 20%, far from the 100% that would be expected intuitively. Applicability scoring has the potential to reduce this paired preference bias related to demand characteristic (consumers feeling that they should prefer one product over the other). In our example, we would conclude that 56% of the respondents had no meaningful preference.

While this example focused on liking and preference, any other attribute information collected using applicability scoring can be treated in a similar way, providing relative strength insights that may be more sensitive than average rating scores on a category scale.

**Deriving Preference for the Yogurt Samples:** Using the applicability scores you collected for the 6 products over the 15 statements, you create 15 tables summarizing the paired ratios calculated using the 2x2 table off-diagonal as described previously. Figure 3 summarizes the preference proportions from the ‘I like this product’ statements.

**Figure 3.** The circle is green if the product on the Y axis is preferred over the product on the X axis, otherwise red.

**Conclusion:** Applicability scoring has several advantages over traditional preferential choice data collection techniques. These advantages include ease of implementation and execution, generation of an applicability-based attribute profile, derivation of pairwise information from monadic evaluations, information on ‘like both’ and ‘like neither’, and potentially more meaningful preference ratios. Coupled with the theoretical work supporting previous experiments referred to in this report, the method discussed for deriving analog preference and attribute measures deserves further exploration and research to uncover greater insights from sensory and consumer testing.

**References**

Imagine designing a modern bridge without any knowledge of physics. Imagine treating a person for trauma without an underlying foundation in anatomy and physiology.

This is the exact scenario that many sensory and consumer scientists find themselves in when they begin working in industry. Without understanding the models underpinning categorical choice methods, which includes all difference, sensory rating, and hedonic testing, one cannot appreciate the basis for powerful and cost effective tests. Instead, there is a risk of wasting money on tests that are not statistically powerful, a risk of paradoxical results without a clear explanation, and a risk of mere mimicry, without understanding the foundations that underlie one’s professional decisions. In general, universities are not providing the training needed, or the training is not provided in the departments from which future sensory and consumer scientists graduate, so that they may be operating like engineers with little or no background in physics. These professionals are left to mimic the methods of others without understanding the principles.

You will return from this retreat-style course with a deep foundation in the basis for categorical decision making which applies to all of the methods you commonly use. You will then be able to skillfully apply and adapt your knowledge to multiple scenarios you will encounter while working in industry.

Meet Vera Tass and Willet Flie, two fictional characters much like the sensory and consumer scientists described above, who are floundering. Vera and Willet are wasting money on ineffective testing, confused by paradoxical results, and their senior management has tired of pouring money into testing that resolves nothing and seems to always lead to a recommendation to do more testing.

With their livelihoods at stake, these characters bring to life the underlying measurement principles of their fields. Through a series of scenarios, you will begin to see, along with Vera and Willet, how experimental procedures are selected that will best meet your research objectives and lead to timely and definitive management decisions.

### Included in your registration:
- Course instruction combined with computer-based exercises during the course
- Manuals of course slides and software exercises
- Group dinners each evening - Tuesday, Wednesday, & Thursday
- Complimentary webinar – attend an upcoming presentation or choose a past recording
- Three-month free trial of IFPrograms™ software

### Corporate Scenario:
*The scenario begins with a proposed ingredient change. We follow the product study process starting with unresolved conflicting difference test results and then continue as the tetrad test and replicated testing are introduced.*

### Topics
- Ingredient change dilemma: Duo-trio, triangle, and 2-AFC data lead to different conclusions: Gridgeman’s paradox
- The Thurstonian framework underlying all sensory evaluation methods - the science in sensory science
- Difference testing theory: m-AFC, triangle, trio, same-different, degree of difference, and tetrad
- A sensory difference measure, $d'$, from discrimination tests and how to inter-relate methods
- Proportion of discriminators in the population and why it is flawed
- Resolving the corporate ingredient change dilemma and improving management confidence in methodology
- Theory and use of replicated testing to reduce product testing cost
- Establishing optimal sample sizes for sensory discrimination testing programs using Thurstonian principles
- The tetrad test: Why it requires only 1/3 the sample size of the triangle test

### Corporate Scenario:
*The scenario continues as management requests a decision-risk analysis of the entire product testing system. See how the team creates a risk management system and links external data to consumer data to establish consumer relevance.*

### Topics
- The ingredient change resolution leads management to request a decision-risk analysis of the current product testing system
- The 5 cornerstones of product testing: $\alpha$, power, sample size, size of the difference, and protocol
- Relating trained panel and consumer sensitivities
- Establishing an internal sensory program based on a consumer-relevant action standard
- How a risk management program is implemented at a major food company
- What is the best scale to use? Why rating methods involve category choice and determining $d'$ values from intensity ratings data
- A Thurstonian model to scale first-last (or MaxDiff) data

Register for courses online at www.ifpress.com/short-courses
Vera, manager of product testing and sensory quality, struggles with resolving paradoxical results from difference testing for an ingredient change. Willet, manager of consumer insights, grapples with contradictory multivariate mapping results that lead to important managerial marketing decisions. Vera and Willet’s work will resonate with you as they identify sensory consumer segments and use product optimization methods to satisfy consumers. This will help to clarify what to do in similar situations you will encounter as you work in this field.

By observing Vera and Willet grapple with, evolve, and develop new and more effective approaches, you too will evolve and develop, and will return from this retreat-style course with an energized appreciation for how to become a far more effective force in your organization.

The course is not highly technical but provides a window into the fundamental concepts and an extensive link to the technical literature, including our new book *Thurstonian Models: Categorical Decision Making in the Presence of Noise.*

**THURSDAY** (NOV 8, 8a - 4p)  
and **FRIDAY** (NOV 9, 8a - 11a)

**Corporate Scenario:** Issues of sensory segmentation and portfolio optimization arise and the team is challenged to understand why alternative methodologies produce contradictory results.

**Topics**

♦ A conceptual framework for new product innovation
♦ Development of consumer-perceived benefits using Drivers of Liking® category appraisals
♦ Unfolding: Introduction to Landscape Segmentation Analysis® (LSA)
♦ How to identify Drivers of Liking®
♦ Portfolio optimization – finding the best team of products in a portfolio
♦ Blind-branded LSA and determining concept equity vs. product equity
♦ Segmentation based on individual ideals and connecting them to demographics
♦ Alternative method comparisons:
  - LSA
  - External preference mapping (EPM)
  - Internal preference mapping (IPM)
  - Factor analysis
  - Bayesian networks

**WHO SHOULD ATTEND**

- This course has been developed for technical and supervisory personnel who use product tests and surveys.
- You will learn how categorical decision making models are fundamental and foundational to your own professional challenges.

**CONTINUED STUDY**

To enhance your continued studies, you will receive a course manual with all presented slides and our current published books.

*IFPrograms™* software will be used extensively to perform analyses demonstrated throughout the course. You will be introduced to its capabilities and, upon completion of the course, will receive a complimentary 3-month trial of the Professional version. For a detailed description of the software features and licensing, please visit [www.ifpress.com/software](http://www.ifpress.com/software).

*(Please note that IFPrograms is not required to apply course principles.)*
The Principles of Categorical Choice Models
A Foundation for Difference, Rating, and Hedonic Testing

November 6 - 9, 2018 (3.5 days) ................. $1975

* A 20% discount will be applied to each additional registration when registered at the same time, from the same company.
* Academic discount available on request

Course fee includes:
- All course materials and a copy of our latest books
- Daily lunch and food/beverage break refreshments
- A group dinner on Tuesday, Wednesday, & Thursday evenings
- A complimentary webinar attendance or recording
- 3-month free trial of IFFPrograms software (Professional version)

Register online at www.ifpress.com/short-courses where payment can be made by credit card. If you qualify for a fee discount, or would like 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 held in White Sulphur Springs, WV at The Greenbrier®. Situated 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 $195 (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, 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.

Register online at www.ifpress.com/short-courses or call 804-675-2980. **Limited enrollment, register early.**

This program qualifies for Certified Food Scientist (CFS) recertification contact hours (CH). CFS Certificants may claim 18 CH for their participation in this course. For more information, please visit www.ift.org/certification or email lfscs@ift.org.