The Brunswik Society Newsletter

Vol. 34, Nov. 2019

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http://www.brunswik.org

ISSN 2296-9926

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Imprint
The Brunswik Society Newsletter, ISSN 2296-9926
is published yearly
Editorial staff:
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Foreward

Many thanks to all authors for their contributions!

We are very pleased to present the 2019 Brunswik Society Newsletter. This issue shows impressively that Brunswik's research remains active and will continue to be relevant for future work.

In this newsletter, we used a new structure. The first part includes contributions which report *ongoing or completed research projects*. We added a second section for commentaries that give historical perspective on the various responses to and uses of Brunswik's theories, whether during the time when he was still active, or during the subsequent decades. Brown nicely introduced the link between Brunswik's research and the Q-method, which referred to Brunswik's conceptualization during its development. Our goal with this new section of the newsletter is to encourage discussion and reflection on the role of Brunswik's research in the development of our field – and so we invite you to consider preparing comments for this section for future newsletters. Responses to current research are also welcome.

Within this issue's "ongoing research contributions" section, the report by Breil shows the importance of Brunswik's lens model research on personality judgment due to the fact their meta-analysis is still under way. They also invite personality and nonverbal cues researchers to inform them about their ongoing research. The contribution by Bröder shows the importance and power of a Brunswik approach to analyze metacognitive judgments of learning. This contribution was also part of a symposium presentation on *"Innovations in Judgment Research using Brunswik's Lens Model"* at the Subjective Probability, Utility, and Decision Making (SPUDM) conference 2019, organized mainly by Mandeep Dhami.

Brunswik's research is often applied within the medical field, as with the contributions by Sjödahl and Hamm. Sjödahl used the framework for insight into nurses' handling of hospital patients' psychological needs, as revealed in interviews of critical incidents. Hamm used applied it seeking understanding of how participation in group evaluations leads to changes in individuals' views. Lens model analyses were also conducted in other domains, such as voice persuasion (see Van Zant) and the social outcomes of politically skilled people (see Wang). The Brunswikian framework was also used to understand the effects of a person's self-perception after a romance has ended (see Wu). Moreover, Hammond's Cognitive Continuum Theory was recently applied to evaluate the effect of cognition on phishing email judgments in the contribution by Molinaro.

Brunswik's idea of probabilistic function is nicely historically integrated within the contribution by Kozyreva, making interested readers also aware of a recently published book, *Taming Uncertainty*, by Hertwig and colleagues.

The contributions by Chatterjee, Hinds, and Kaufmann show how Brunswik's approach is also useful for analyzing future environments. This is important considering the increasing amount of data available from which people then have to make judgments and decisions.

Since our last newsletter, sadly Prof. J. A. Athanasou left the editorial team. We would like to thank him from the bottom of our hearts for his enormous work on previous newsletters and collaborations over the last few years.

Although we will miss Jim's support, we are quite happy that a new editorial member, Kylie A. Molinaro, has joined our team. She is an engineer and project manager at the Johns Hopkins University Applied Physics Laboratory. In early 2019, she received her Ph.D. from the University at Buffalo, where her dissertation applied the lens model to the analysis of phishing email judgments. Kylie is looking forward to supporting the newsletter and continuing to broaden her Brunswikian knowledge.

We, the editorial team, hope that the current newsletter will inspire future research and promote an exchange between Brunswikian researchers to further develop Brunswik's ideas. Ideas and active collaborations to improve the Brunswik Society Newsletter are greatly welcomed.

Sincerely,
Esther Kaufmann, Kylie A. Molinaro, and Robert M. Hamm

Thank you to Tom Stewart, the webmaster of the Brunswik Society, for providing web access to the newsletter.

If you're interested in supporting the editorial team and being involved in the next Brunswik Society Newsletter or have suggestions for future newsletters, let us know by emailing Esther Kaufmann (✉ *esther.kaufmann@gmx.ch*). Thank you in advance for your support.

Contributions

The Perceived and Actual Relationship between Nonverbal Cues and Personality: An Overview of Empirical Findings

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When interacting with others, we instantly form judgments about their personalities (e.g., this person is outgoing, this person is arrogant). Generally, these judgments are surprisingly accurate (e.g., Ambady & Skowronski, 2008; Funder, 2012) and are often formed, before any (relevant) verbal information is exchanged. Thus, nonverbal cues (i.e., the way people look, talk, move, or gesture) are of utmost importance when investigating the accurate judgment of personality traits.

Here we will provide a brief summary of the chapter by Simon M. Breil, Sarah Osterholz, Steffen Nestler, and Mitja D. Back, "Contributions of Nonverbal Cues to the Accurate Judgment of Personality Traits," which will appear in the Oxford Handbook of Accurate Personality Judgment (preprint available at: psyarxiv.com/mn2je). In this chapter, we present an overview and meta-analytical results of nonverbal cues and how they are related to the accurate judgment of personality.

Nonverbal cues can be divided into three domains of dynamic cues: face (i.e., facial expression), body (i.e., body language), and tone (i.e., paralanguage; e.g., Hall, Schmidt Mast, & West, 2016), as well as more static, appearance based cues (e.g., body shape, choice of clothing; e.g., Naumann, Vazire, Rentfrow, & Gosling, 2009). The role of such cues in explaining potential accuracy in personality judgments can be best illustrated via the lens model (Brunswik, 1952, 1956; Osterholz, Breil, Nestler, & Back, in press): That is, perceivers use available cues in the environment to form judgments of personality traits that are not directly observable. Consequently, in order for accurate personality judgments, there need to be nonverbal cues available that are a) valid indicators of the actual personality trait (cue validity) and b) utilized accordingly by perceivers (cue utilization).

In this research, we meta-analyzed and summarized empirical results regarding the validity and utilization of nonverbal cues when judging personality traits. We identified 65 studies that investigated the relationship between nonverbal cues and actual (i.e., self-reported) and/or perceived personality. We included only studies with real targets and cues that were sampled with respect to their natural range and covariation (i.e., no manipulation). Nonverbal cues were clustered into 37 relatively distinct categories relating to the four areas of facial expression (e.g., cheerful facial expression, dominant facial expression, eye contact), body language (e.g., gestures,

self-touch, closed arms), paralanguage (e.g., ease of understanding, powerful voice, pitch), and appearance (e.g., attractiveness, stylishness, eyeglasses).

Table 1: Meta-Analytical Results: Cue-Validities and Cue-Utilizations.

Cue	Neuroticism	Extraversion	Openness	Agreeableness	Conscientious-ness
Cheerfulness	**-.11** [-.18, -.03] -.24 [-.46, .02]	**.15** [.09, .21] **.54** [.32, .70]	.02 [-.06, .09] **.38** [.29, .46]	**.10** [.02, .19] **.53** [.39, .64]	.09 [-.04, .22] **.28** [.10, .44]
Eye contact	-.07 [-.19, .07] **-.14** [-.24, -.04]	.03 [-.02, .09] **.21** [.11, .31]	-.07 [-.20, .06] **.13** [.00, .26]	.00 [-.08, .08] **.24** [.10, .36]	.06 [-.05, .17] **.20** [.04, .34]
Eyebrow movements	.31 [-.55, .85] -.01 [-.19, .18]	-.04 [-.17, .10] .07 [-.24, .37]	-.08 [-.26, .10] .09 [-.05, .22]	.09 [-.08, .26] -.04 [-.14, .07]	-.17 [-.70, .47] .15 [-.04, .32]
Gestures	-.03 [-.12, .07] -.12 [-.25, .02]	**.18** [.11, .24] **.35** [.22, .46]	.03 [-.07, .13] .08 [-.01, .17]	-.05 [-.27, .17] -.03 [-.28, .22]	.03 [-.14, .20] -.01 [-.22, .20]
Self-assured posture	-.01 [-.16, .14] - .40 [-.64, .09]	.15 [-.01, .31] .25 [-.30, .67]	.10 [-.03, .23] .25 [-.07, .52]	.07 [-.20, .33] .14 [-.34, .56]	**.16** [.04, .29] **.31** [.14, .46]
Tension	**.13** [.02, .23] **.29** [.00, .53]	**-.16** [-.24, -.08] **-.42** [-.58, -.23]	-.04 [-.13, .05] -.16 [-.26, .05]	-.02 [-.26, .23] **-.30** [-.50, -.06]	.01 [-.19, .20] .21 [-.11, .50]
Self-touch	-.01 [-.14, .13] .17 [-.29, .57]	.04 [-.03, .12] .07 [-.08, .22]	.02 [-.16, .21] .02 [-.10, .13]	-.02 [-.22, .19] -.10 [-.37, .19]	**-.21** [-.34, -.07] **-.22** [-.35, -.09]
Fluent speaking (vs. nervous)	**-.10** [-.20, -.01] **-.32** [-.40, -.24]	.10 [-.03, .22] **.22** [.14, .31]	-.02 [-.13, .08] **.21** [.12, .29]	.15 [-.07, .35] .10 [-.27, .44]	.06 [-.10, .21] **.27** [.08, .43]
Powerful voice	-.07 [-.19, .04] **-.28** [-.41, -.13]	**.22** [.13, .30] **.36** [.25, .46]	-.07 [-.24, .10] .10 [-.03, .23]	-.02 [-.22, .18] -.02 [-.11, .16]	.10 [-.04, .24] .01 [-.13, .15]
Amount talking	-.13[-.32, .07] **-.11** [-.19, -.03]	**.23** [.15, .32] **.31** [.15, .45]	**-.17** [-.32, -.02] .06 [-.01, .14]	-.11 -.10 [-.35, .16]	.22 **.25** [.16, .33]
Attractiveness	**-.14** [-.22, -.06] **-.33** [-.45, -.19]	**.20** [.14, .27] **.47** [.37, .56]	-.03 [-.14, .09] **.56** [.21, .78]	**.10** [.02, .18] **.32** [.19, .44]	.11 [-.01, .23] **.21** [.06, .35]
Babyfaceness vs. maturity	-.01 [-.12, .10] -.01 [-.26, .24]	.08 [-.04, .21] .06 [-.07, .19]	06 [-.02, .14] **.17** [.01, .31]	.04 [-.08, .16] **.33** [.17, .46]	.06 [-.10, .21] .06 [-.29, .40]
Neatness	**-.10** [-.17, -.02] **-.15** [-.24, -.05]	**.21** [.15, .27] **.25** [.18, .32]	-.07 [-.22, .09] **.32** [.12, .49]	**.13** [.03, .24] **.18** [.05, .30]	**.23** [.15, .31] **.50** [.37, .61]
Stylishness	-.04 [-.11, .03] **-.15** [-.28, -.02]	**.22** [.14, .31] **.32** [.21, .41]	.00 [-.13, .14] **.18** [.06, .29]	.00 [-.11, .11] -.01 [-.11, .09]	.08 [-.01, .17] .07 [-.11, .25]
Dark clothes	**.19** [.05, .32] .08 [-.07, .21]	-.12 [-.28, .04] -.11 [-.27, .06]	.09 [-.01, .19] .05 [-.05, .15]	.27 [-.23, .65] -.19	-.13 -.21

Note. Ns range from 100 (one included sample) to 1789 (17 included samples). First row: cue-validity. Second row: cue-utilization. 95% confidence intervals (CI) in brackets. The effect size and confidence interval (CI) estimations are based on a random effects model (empty CI cells included only one study). Significant relations in bold.

Overall, and for all traits, there were at least a few cues that allowed for accurate glimpses into one's (self-reported) personality. Furthermore, perceivers generally were able to identify these valid cues. However, observers often overestimated the actual size of cue-personality relationships. Furthermore, there were many cues for which the included studies did not provide evidence for validity, but that were nevertheless used for judgments. These cues, thus, might represent some sort of common bias/inaccurate stereotype when judging the respective traits. Please see Table 1 for results concerning 15 selected cues. Further and more specific results are presented and discussed in the chapter.

On the Open Science Framework page of this chapter (osf.io/9p64g), we have uploaded a full table with all studies and all individual correlations for interested readers. As this list does not aim to be fully comprehensive and should be regarded as a preliminary documentation of the existing work, we have also included a sheet in which additional relevant studies can be added. We hereby invite all readers to contribute to a more exhaustive documentation on personality (judgments) and nonverbal cues.

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Using the Lens Model to Analyze Metacognitive Judgments of Learning

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Despite a long tradition of Brunswikian thinking in the metamemory literature (e.g., Koriat, 1997, 2015; Koriat, Ma'ayan, & Nussinson, 2006; see also Dunlosky & Tauber, 2014), the lens model as a regression-based analytic tool has not been applied to this domain. We argue that such an analysis may offer new insights.

Metacognition research investigates people's knowledge about their own cognition such as learning and memory. Since these beliefs form the basis of how people control their cognitive processes, effective regulation of behavior depends on the accuracy of metacognitive judgments. For example, if I know that I tend to forget items during shopping, I will write a grocery list to compensate for this perceived deficiency. Judgments of learning (JOLs) are a particular type of metacognitive judgment in which participants predict the probability of recalling recently studied items in a later test. Accurate JOLs would enable people to allocate more resources to materials that require more effort to learn. One important aspect of JOL accuracy is therefore resolution, meaning the ability to differentiate between items that will and will not be remembered at the test. Measures of resolution include the within-subject, across-item Goodman-Kruskal gamma correlation between recall and JOLs, which is conceptually similar to the *achievement* in classical judgment studies. Surface measures of resolution, however, are conflated with many influences, such as the unreliability of JOLs and memory performance. Hence, the relatively low achievement values reported in metacognition research might underestimate true competence. We applied Brunswik's lens model to both memory performance (the environment part of the model) and JOLs (the judgment part of the model) to achieve a more fine-grained view of metacognitive ability at the individual level.

Methods. Eleven JOL experiments (from Undorf, Söllner, & Bröder, 2018; Undorf & Bröder, *in press*; as well as experiments not yet published) were reanalyzed with the lens model. Five experiments used a free recall task for single words, two involved word pairs in a cued recall paradigm, and four used photographs of scenes in a picture recognition task. In all cases, several cues were experimentally varied (e.g., emotionality or presentation frequency of words or the color or contextual distinctiveness of pictures). Some of the cues were valid predictors of memory performance (e.g., word concreteness), but others were not (e.g., font size of words at study). JOLs were assessed for each item during the study phase, and then completed a recall or recognition test. Memory performance and JOLs were analyzed with multiple regressions using the manipulated cues, as well as other cues derived from normed databases as predictors. Tucker's (1964) lens model equation was applied, yielding separate estimates of the matching index *G* (the correspondence between cue validities and cue utilizations), the respective reliabilities of memory performance and judgments,

R_e and R_j, and the nonlinear component *C,* which represents all systematic covariation between judgments and criterion not linearly modeled by the cues.

Results. All measures showed considerable individual variability. However, in all experiments, the matching index *G* was at least as large or larger than the Goodman-Kruskal gamma correlation, typically used for assessing metacognitive competence. Hence, when judgments and memory performance are cleaned from inherent noise, estimates for metacognitive competence are higher than surface measures.

Furthermore, much to our surprise, the nonlinear component *C* was generally much higher than observed in the usual lens model studies on judgments about the external world (according to meta-analyses by Karelaia & Hogarth, 2008; Kaufmann & Athanasou, 2009). In our study, mean *C* was 0.19. We interpret *C* as reflecting idiosyncratic item-person-interactions that normally evade experimental control and measurement. Some items may have a particular relevance for some people, independent of their cue values. For example, the word "percentage" is neither emotional nor concrete, and it is, on average, remembered worse than more concrete and emotional words such as "torture". However, "percentage" might be highly relevant for a person who just learned that he or she failed to achieve the percentage of points needed to pass an exam. This item-person interaction would affect the person's memory and JOL. This systematic covariation, however, does not show up in the cue-based linear regression analysis.

The interpretation of *C* representing this idiosyncratic relevance is corroborated by two experimental conditions in which JOLs were elicited *before* the presentation of the to-be-judged item at study (just providing cue values). This procedure prevents item-person-interactions and indeed yielded a *C* index close to zero.

Conclusion. The standard surface measures of metacognitive competence conflate various sources of variance, such as true cue knowledge, idiosyncratic strategies, and simple error variance. Brunswik's lens model approach provides a unique way to disentangle these variance components and thus achieves a much clearer picture of metacognitive competence than surface correlation measures. A main advantage is the lens model's ability to estimate the nonlinear component *C*, which presumably reflects idiosyncratic strategies that are often elusive and evade researchers' attention. Thus, although the lens model can be usefully applied to the metacognitive domain (as shown here), metacognitive judgments are systematically different from other judgments in that they rely more heavily on idiosyncratic cues. A conceptual introduction into a lens model analysis of metacognitive judgments and scripts for analysis in R and SPSS accompanies Bröder and Undorf (2019).

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Scalable Human Decision Making with Crowdsourcing

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We address the problem of producing more accurate judgments or more optimal decisions by combining the judgments, made independently or dependently, by multiple people. Issues here are how accurate the combined judgment is, and whether to assess the relative accuracy of individuals so that their inputs might be included or overweighted in the combined decision.

We draw on a variety of tools. First, Brunswik's (1952) lens model (extended to the analysis of clinical judgments by Hammond, 1955), has been intensively studied in the domain of human intelligence and decision making. It offers a way of analyzing the relation between an individual's (or a group's) judgment or decision and the optimal one, if that is available. This provides measures of various aspects of individuals' judgment ability that can be used to weight their contributions to a joint judgment. Second, Dawid and Skene made a substantial contribution to the problem of aggregating different people's judgments when a criterion is missing, by developing a method to estimate the individual error rates (Dawid & Skene, 1979). This too allows appropriate weighting of individuals' contributions to the aggregate. Third, Bayes' model of decision making separates the task of judging the state of the world into the prior probability and the impacts of the particular pieces of evidence available. This permits the use of a hybrid process such as using many people's judgments to assess the prior and using more objective data and Bayes' theorem to make the adjustments.

As judgment analysis deals with obtaining consensus of multiple opinions, it has found numerous applications with the growth of the World Wide Web. Researchers have established that it can also be used for the type of tasks where no prior experience about the ground truth is available (Chatterjee, Mukhopadhyay, & Bhattacharyya, 2017a).

Crowdsourcing, often used for collecting opinions from common people (referred to as the crowd), is a new paradigm of employing distributed human intelligence. This has become an imperative approach towards scalable human decision making (Chatterjee & Bhattacharyya, 2017). As crowdsourcing is a model of collective intelligence, what we encounter is more than individual human intelligence. Therefore, crowdsourced decision making processes offer a novel problem domain that can be investigated with a variety of approaches.

While there have been numerous studies on judgment analysis for decision making, such problems have received a new momentum with the recent developments in crowdsourcing. The current decade witnessed accelerated research in this new and challenging domain of scalable human decision making. Chatterjee, Mukhopadhyay, and Bhattacharyya (2019) reviewed the literature on state-of-the-art methodologies in this domain. Our review identified five main problem domains that should be investigated

to better understand using human decisions collected through crowdsourcing to obtain a consensus judgment. These include:

- Independent opinions received from the crowd
- Large-scale ambiguous opinions received from the crowd
- Dependent opinions received from the crowd
- Constrained opinions received from the crowd
- Streaming opinions received from the crowd

We anticipate these new challenges will encourage researchers from other domains to contribute to this area. Some of these include choosing the termination criteria for an opinion collection process, the analysis of biases, understanding the decision making process using partial information, and finding suitable models for streaming opinion analysis (Chatterjee, Mukhopadhyay, & Bhattacharyya, 2019). One of the relevant issues in human decision making is to judge the final decision when the partial opinions of other human beings are revealed to them. Moreover, there is also the interesting issue of determining the optimal number of opinions to be displayed to the crowd to extract the best possible answer from them.

Similarly, there are many challenges to studying how human perception behaves while clustering tasks over a set of objects assigned to them. This is exacerbated when considering the existence of dual characteristics among the objects. More specifically, it requires a vast amount of human annotation to resolve this dilemma. Along with that, the dynamic nature of the decision makers is also a crucial factor in deriving the final judgment.

To a large extent, decision making processes do not only depend on the decision makers, but are also affected by the environment (i.e., how the opinions are collected from the crowd). For example, if the opinions are collected from the crowd in two phases (hiding and revealing others' opinions), the collected opinions differ from the single opinion collection model (Chatterjee, Mukhopadhyay, & Bhattacharyya, 2017b). Moreover, there may be constraints between opinions that require further attention (Chatterjee, Mukhopadhyay, & Bhattacharyya, 2017c). Overall, the classical theory of Brunswik's lens model can contribute to many promising research avenues in the domain of crowdsourcing based decision making processes (Bose & Paradice, 1999).

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Use of the Lens Model to Understand the Relation Between the Judgments of Individuals and their Consensus Judgment after Discussion

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We describe the application of Lens Model analysis to data from participants in expert panels convened by medical specialty societies for the review of proposed guidelines for clinical practice, which the societies might endorse. The work is part of an Agency for Healthcare Research & Quality (ARHQ)-supported project studying the guideline panels' group judgment process, with special attention to the panels' use of a framework (Grading of Recommendations Assessment, Development, and Evaluation, GRADE, see Guyatt et al., 2011) intended to guide their deliberations to focus on factors that are normatively relevant for such decisions. Ben Djulbegovic is the PI on the project, *Evaluation of the Group Decision-making Process of Clinical Guidelines Panels,* and he engaged psychologists Jason Beckstead and Rob Hamm to provide lens model analysis and other input.

The expert panel process. A specialty society seeks suggestions for possible guidelines that the society may adopt and encourage its members and others to follow. In preparation for expert panel meetings, the panel members are sent the proposed guidelines, justifications, and the publications that provide evidence regarding each. Then they meet, discuss each proposal, review its evidence with respect to the GRADE structure and its 10 criteria, and come to a consensus on whether to recommend the society adopt that guideline.

The collected judgment-related data. Before the panel meeting, panel members were asked to evaluate each proposal, rate it on four of the GRADE criteria [1) **evidence certainty**: overall (across all studies) quality of the evidence of treatment effects; 2) **value certainty**: overall certainty or lack of variability in the evidence about how much people value the outcomes that are at stake; 3) **benefit-harm balance**: overall balance between the desirable and undesirable effects of the intervention (does this favor the proposed intervention, or the status quo comparison?); and 4) **costs**: the resource requirements to implement the proposed treatment], and state their recommendation on a five-point rating scale (strongly recommend, weakly recommend, no recommendation, weakly oppose, strongly oppose). During the panel meeting, they made such judgments individually, and jointly, for ten criteria (the most important four which we measured, plus others) but we do not have those data. We have only the panel's consensus recommendation for each proposal. Several days after the panel meeting, individuals again were asked to rate the criteria and state their recommendation.

These data were collected from a total of 13 expert panel meetings, convened by three medical societies and the UK's National Institute for Health and Care Evaluation

(NICE). We had data on from 2 to 56 proposals, provided by from 9 to 19 individual panel members.

The Lens Model analyses. The nature of the data made impossible a prototypical Brunswik Lens Model analysis. There was no objective criterion. We opted to use the group consensus judgment as a target to compare the individuals' judgments to. Most of our participants made a relatively small number of judgments, so describing individuals' judgment policies with linear regression was highly unstable. This was particularly the case with the pre-panel-meeting judgments, for which many of the recommendations were "neutral," so there was little variation to explain. Therefore, we chose to analyze multiple experts' judgments together to describe the judgment policies, rather than individual respondents' judgments. Though this can be done within a panel, or within a specialty society, our initial analyses simply analyzed all panelists together, either before the panel meeting or after.

Early experience made clear to us that panelists felt overburdened when asked to make 11 judgments about each of 10 or 20 proposed guidelines, so we selected only the four GRADE criteria judged to be most important. The effect of this choice on lens model parameters would be to reduce the size of *G*, modeled knowledge, and to increase the size of *C*, knowledge used by the judge but not captured by the lens model.

Typically, the researcher has an independent measure of the criterion and of all the cues, but in this study, the cue measurements (GRADE dimensions) were provided by each participant individually. We analyzed this using the participant's own perception of the GRADE dimensions. These measurements were taken at two times, before and after the meeting, while the measurement most pertinent to the criterion (the panel consensus recommendation) would have been the consensus judgments of the 10 GRADE criteria. In relating the panelists' pre-meeting recommendations to the panel meeting consensus, we used the panelists' pre-meeting judgments of the GRADE criteria as cues; for the post-meeting recommendations, the cues were their post-meeting GRADE dimension judgments.

Because the proposed guidelines and panelists are crossed, and nested within the panel, we used a variety of ways to control for this, from simply having the panelist as a category in an ANOVA, to using various specifications of linear mixed models. Lens model results have been fairly similar.

Results. The individual panelists' pre-meeting recommendations about the proposed guidelines correlated 0.45 (N = 307) with the consensus recommendations, and 0.50 (N = 382) with their own post-meeting recommendations. The post-meeting recommendations correlated 0.67 (N = 1150) with the panel consensus. Thus, we see that participating in the panel meetings changed and enriched panelists' understanding of the evidence and impacts of the proposed treatments. Their individual judgments of the four GRADE dimensions, before and after they participated in the panel discussions, showed the following stability (correlation): evidence certainty (0.09), value certainty (0.24), benefit-harm balance (0.45), and costs (0.31), all with N = 382. The stability of their judgments of evidence certainty was not statistically significant.

In the regressions describing the relation of the recommendations to the GRADE dimensions, by far the greatest weight was given to the benefit versus harm balance.

The table shows standardized regression coefficients using the general linear model procedure, controlling for the panel, question within the panel, and the participant. The upper two rows are the two models in a lens model of the pre-meeting recommendations; the lower two are the models in the post-meeting recommendation lens model. The pre-meeting model suggests that their pre-meeting judgments of evidence certainty influenced the panel consensus recommendation, more than they influenced their own individual recommendations (which, as we noted above, massed at "neither for nor against"). In the post-meeting lens model, this difference disappeared. The regression coefficients for evidence certainty were about the same time. Here the benefit-harm balance had a more dominant influence on the group consensus recommendations than it had on the individuals' post- meeting recommendations.

	Evidence Certainty	Value Certainty	Benefit Harm Balance	Costs
Pre-meeting recommendations	0.01	0.03	0.71	0.04
Panel consensus, predicted by ***pre***-meeting judgments of GRADE dimensions	0.35	0.10	0.43	0.21
Post-meeting recommendations	0.10	0.05	0.33	0.08
Panel consensus, predicted by ***post***-meeting judgments of GRADE dimensions	0.13	-0.04	0.68	0.10

Below are the lens model statistics for the analysis of the agreement of the pre-meeting and post-meeting individual recommendations with the panels' consensus recommendations (r_a). The modeled knowledge *G* is quite large, but the predictabilities R_e and R_s are moderate. The unmodeled knowledge *C,* while smaller, is not negligible.

	r_a	= G	* R_e	* R_s	+ C	* Sqrt(1-Re^2)	* Sqrt(1-Rs^2)
Pre	0.45	0.96	0.47	0.73	0.21	0.88	0.69
Post	0.67	0.99	0.65	0.73	0.37	0.76	0.68

Discussion. Though the data were not ideal for an application of the prototypical Brunswik lens model, we found that the analysis described which GRADE dimensions influenced panelist recommendations, and cast insight on the effects of the panelists on the group consensus, and of the group discussion upon the panelists' subsequent beliefs.

The study was presented at the meetings of the Society for Medical Decision Making in Portland this October, and we welcome suggestions for improving the analysis and interpretation of the data.

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Using Brunswik's Lens Model in Computer-based Personality Predictions

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Our increasing use of the internet and digital devices in recent years has inspired many researchers to explore whether a person's digital traces are indicative of their personality. As such, research has consistently demonstrated that personality can be predicted using certain digital "cues" including Facebook likes (e.g., Kosinski, Stillwell, & Graepel, 2013) profile pictures (e.g., Liu, Preot, & Ungar, 2016) and even smartphone records (e.g., Chittaranjan, Blom, & Gatica-Perez, 2013). Together, these findings highlight the potential to make accurate inferences about an individual entirely from their digital activity and without ever meeting or "judging" them in person. Such possibilities provide great opportunities for researchers to gain new insights into human behaviour, which has attracted the attention of multiple disciplines, most notably psychology and computer science. However, despite the common ground shared by these two fields, both remain disparate in terms of their theoretical backgrounds, methodologies and practice. We therefore suggest that increasing communication between the two areas could help to inform personality research in new and prosperous ways. One particular way is to consider how Brunswik's lens model (Brunswik, 1956) could be applied to computer-based personality prediction from digital traces.

Brunswik's (1956) lens model is widely used as a mechanism to understand which cues are associated with individuals' (or "targets") personalities, and observers' perceptions of their personalities. In traditional personality perception, these cues relate to the way a person dresses, their body language, facial expressions etc. Alternatively, online, or via individuals' digital devices, observers can use digital traces to formulate judgments in a similar way. Some researchers have performed lens model analyses on digital traces to closely examine which cues are associated with their judgments. For example, Back, Schmukle, and Egloff (2008) found that observers' judgments of openness were associated with targets' use of fantasy names in their e-mail addresses. Hinds and Joinson (2019) illustrate how digital traces may be used in Brunswik's lens model using the findings reported by Hall, Pennington, and Lueders (2014) in their research exploring digital traces on Facebook (see Figure 1 below).

Computer-based personality prediction works in a similar way to human perception, where instead an algorithm adopts the role of the observer (Hinds & Joinson, 2019). That is, computers take a set of cues (i.e., digital traces), and analyze them to form a prediction of a target's personality. The key difference is that computer scientists predetermine which cues (known as "features") are used when they design the study. Through an iterative process of training, the algorithm essentially learns to predict personality – the researchers then evaluate how accurately it may then perform in practice through a process called cross validation (Hinds & Joinson, 2019).

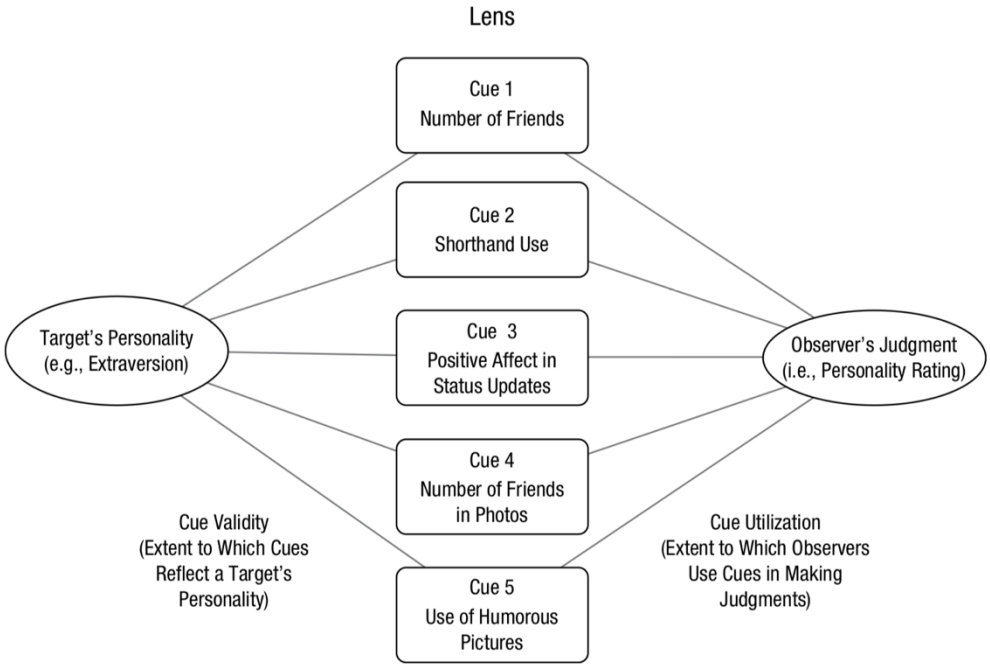

Figure 1: Schematic showing how digital traces can may be associated with targets' and observers' personality predictions in Brunswik's (1956) lens model. The model readily applies to computer-based prediction, where instead the observer is replaced by a computer algorithm.

While such computational approaches provide opportunities to analyze vast amounts of data to fine granularities and at unprecedented scales, they are currently limited in that they seldom test psychological theories on real-life data. One reason this occurs is because computer science is generally concerned with predicting rather than explaining (in contrast to psychology, which mostly seeks explanations for human behaviour, Yarkoni & Westfall, 2017). Thus, the Brunswik lens model could offer computer scientists an ideal way to think about how they design algorithms, and indeed bring new meaning to approaches that were traditionally data-driven. For example, experience-sampling methods offer a means to study personality over time, and in different contexts. The Brunswik lens model could help to meaningfully unpack such behaviours by examining which types of cues are associated with personality in different contexts (e.g., movement patterns throughout different times of day) and in different granularities (e.g., time stamps measured in nanoseconds, Hinds & Joinson, 2019). Such analyses could foster a much deeper understanding of personality, and possibly challenge many of the existing assumptions that we currently hold.

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Are Teachers Prepared to Adapt to a Digitalized Environment?

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The rise of digitalization in schools and classes will lead to an increase in digitalized advice. In light of these changes in our environment, we asked how well teachers are adapted to these changing environmental conditions. For example, would teachers accept advice given by computerized expert models? Such expert-models could be constructed within the Brunswikian lens model framework (see Kaufmann & Budescu, 2017). Therefore, our study is also relevant for future Brunswikian research to uncover the entire potential of Brunswik's lens model approach.

The research on the wisdom of crowds (Galton, 1907) shows that judgments based on multiple opinions are usually more accurate than the "typical" single opinion (see also Meehl, 1954, Budescu & Chen, 2015; Karelaia & Hogarth, 2009; Kaufmann & Wittmann, 2016). Although there is clear evidence that expert models generally lead to better decisions, the acceptance of expert models varies widely (see Dietvorst et al., 2014; Kaufmann & Budescu, 2019; Longoni et al., 2019; Önkal et al., 2009; Yeomans et al., 2019 vs. Logg et al., 2019; Germann & Merkle, 2019). We conducted several studies to test the extent to which teachers considered advice from so-called computerized expert models, if given the chance to take, or ask for, advice from a human being (school counselor) or a model. Teachers have to judge who of two students should be promoted for additional tutoring hours. Additionally, we analyzed whether personal attributes (e.g., Big Five, numeracy) or task attributes (e.g., number of advice sources, task difficulty) influence their advice behavior.

We conducted three experiments with a total 435 teachers. In these experiments, we manipulated the source of advice (computerized expert model or school counselor), the amount of advice (single source advice vs. both advice sources: computerized expert model and school counselor's advice), and the type of advice – if the advice source promote a student (positive) or not (negative).

Our studies showed that teachers are not prone to take the advice of computerized expert models; they consistently prefer human advice. It also seems that the teachers' personal attributes are less important than the task's attributes in influencing whether the teacher takes or asks for advice. Hence, our results echo Brunswik's claim that research on judgment and decision making should focus more on task-relevant attributes. This work was presented at the Brunswik Symposium at the SPUDM 2019 conference and it is summarized in our recent paper, Kaufmann and Budescu (2019).

Overall, our research clearly shows the potential of Brunswik's research in a digitalized environment in which computerized expert models could be used for big data advice in the future. In addition, we are currently investigating whether pre-service

teachers (teachers still in their education program) are also reluctant to consider the advice of computerized expert models or if they – because they grew up in a digitalized environment – are more adapted to it.

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The Interpretation of Uncertainty in Ecological Rationality: From Brunswik's Lens Model to a Systemic View of Uncertainty

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The idea that uncertainty is inherent to human life and knowledge has a long history and can be traced back to ancient Greek and Roman philosophy of skepticism (e.g., Cicero, 45 B.C.E./1933). The most influential contribution to the conceptual comprehension of uncertainty, however, came with the emergence of the modern notion of probability in mathematics and philosophy in the seventeenth century (Arnauld & Nicole, 1662/1850; Pascal, 1654/1998, 1670/2000). The quantitative component of probability theory, which models the degree of confidence after the rules of chance, allowed for classifying uncertainty on a numerical scale from 0 (impossible) to 1 (completely certain) depending on the amount and nature of available information or supporting evidence (see Bernoulli, 1713/2006; Hacking, 1975/2006). Classical probability theory is also responsible for another influential classification: the distinction between aleatory and epistemic uncertainty that stems from the duality inherent to the modern concept of probability, which encompasses both epistemic probability (subjective degrees of belief) and aleatory probability (stable frequencies displayed by chance devices; Hacking 1975/2006). Moreover, from the outset, probabilistic calculus was generally regarded as a normative ideal of rationality (i.e., "reasonable calculus" for "reasonable men", see Daston, 1995) and as the domain-general tool to deal with decisions under risk and uncertainty. In the 20th century, this normative approach was further developed in Bayesian decision theory, expected utility theory, and game theory (Savage 1954/1972; von Neumann & Morgenstern 1944/2007) and became the standard view of rationality in decision sciences, including psychology and economics.

In our article (Kozyreva & Hertwig, 2019), we are concerned with a view of uncertainty that is decidedly different from the one espoused by probabilistic approaches. We argue that the ecological rationality research program not only relies on a normative view of rationality that differs from the standard view in psychology and economics but also implies a different conceptual approach to uncertainty. This approach stems from a tradition in cognitive science that assumes an ecological perspective and takes into account an organism's cognitive capabilities as well its physical and social surroundings. In our paper, we elaborate this conceptual view of uncertainty and its implications. We argue that an ecological interpretation of uncertainty relies on a systemic view of uncertainty that features uncertainty as a property of the organism–environment system.

In order to understand how ecological rationality's view on uncertainty has emerged, we first examine the program's two theoretical sources: Simon's bounded rationality and Brunswik's lens model. In his theory of bounded rationality, Simon defined rationality in terms of adaptation between the mind and the environment (Simon, 1990). He also extended the scope of uncertainty to include the unknown outcome space,

limited knowledge of the alternatives, and environmental complexity (Simon, 1972). Another ecologically oriented psychological approach—Brunswik's lens model—and its adaptations to model judgment and decision making offered a new interpretation of the distinction between epistemic and environmental uncertainty. The lens model depicts how the cognitive process of inference allows an organism to come to terms with uncertainty of the surrounding world (Brunswik 1952, 1957/2001). In the lens model framework, uncertainty concerns the ecological validity of cues (cue–criterion relationships; environmental uncertainty) as well as people's estimates of such relationships (epistemic uncertainty). As Brunswik (1952) pointed out, uncertainty is attributable to both the environment and the organism. On the one hand, there are certain internal limits to human performance in any given task, while on the other hand, human performance can be only as good as the environment allows it to be.

Ecological rationality—a direct descendant of both Brunswik's psychology of organism–environment relationships and Simon's bounded rationality—goes one step further, striving to accommodate the twofold nature of uncertainty in decision making and investigating the adaptive nature of human behavior in the face of uncertainty by inquiring into the strategies people use to tame the inherent unpredictability of their environments. The ecological adaptation of the lens model further develops Brunswik's approach by emphasizing the inseparability of the two parts of the model (criterion and judgment). It defines the environment as inextricably linked to the organism and presents the information search and judgment process as dependent on the structure of the concrete environment. However, rather than taking Brunswik's view of organism and environment as two independent but related systems (e.g., as 'partners' that must come to terms with each other, Brunswik,1957/2001), this perspective regards organism and environment as parts of one shared system. The contribution of the ecological approach thus consists in replacing the dualistic view invoked by distinguishing two major sources of uncertainty with a synthesis of aleatory (or environmental) and epistemic uncertainty. Uncertainty is thus no longer to be blamed solely on the actor or the environment but instead emerges as a property of the mind–environment system (Todd & Gigerenzer, 2012, p. 18). This suggests a systemic view in which uncertainty comprises both environmental unpredictability and uncertainties that stem from the mind's boundaries (e.g., limits in available knowledge and cognitive capabilities; see also Kozyreva, Pleskac, Pachur, & Hertwig, 2019). As a consequence of the interdependence of mind and environment, domain-specific rather than domain-general methods are required to make decisions in the face of uncertainty. Ecological rationality means that specific decision-making strategies fit to particular environmental structures but not to others. It suggests that there cannot be a single universal and domain-general tool—whether Bayesian decision theory, expected utility theory, or game theory—for making decisions. Rather, the concept of ecological rationality is linked to that of the adaptive toolbox which includes a wide range of heuristics as well as other tools for dealing with various sources of uncertainty, such as learning through experience, social intelligence, and aggregation of information — a vision expressed in a new book "Taming Uncertainty" by Hertwig, Pleskac, Pachur, & The Center for Adaptive Rationality (2019).

Our approach is presented in two publications:

Kozyreva, A., & Hertwig, R. (2019). The interpretation of uncertainty in ecological rationality. *Synthese,* 1–31. https://doi.org/10.1007/s11229-019-02140-w

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Applying the Lens Model and Cognitive Continuum Theory to the Analysis of Phishing Email Judgments

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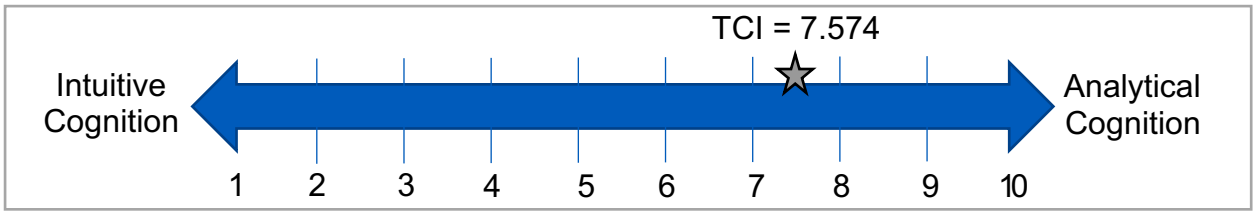
This newsletter contribution provides an overview of Molinaro and Bolton (2019), which is a more detailed description of a portion of Molinaro and Bolton's work described in the 2018 Brunswik Society newsletter. All work described is subset of the work presented in Molinaro (2019) in fulfillment of her dissertation.

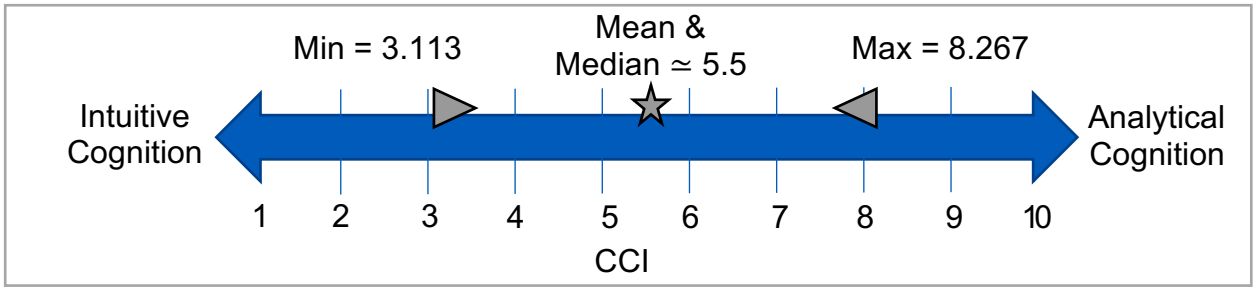
Cybersecurity continues to be threatened by the growing sophistication and occurrence of phishing emails. A successful phishing campaign can have serious, long-lasting, and reverberating effects, especially considering the increase in connected devices. Thus, there is an urgent need to better understand what leads to phishing victimization. While there is a limited body of phishing research that identified cognitive automaticity as a potential factor (Vishwanath, Harrison, & Ng, 2018), more research is needed on the relationship between human cognition and victimization. Furthermore, the characteristics of the environment in which phishing judgments are made have not been considered. This includes understanding how the interaction between environmental characteristics and human cognition affects victimization. The objective of this work was to fulfill these gaps by applying the cognitive continuum theory (CCT) to a lens model analysis of human phishing email judgments. While there are numerous examples of the analyses afforded by the union of the lens model and CCT (Dunwoody, Haarbauer, Mahan, Marino, & Chu-Chun, 2000; Hammond, Hamm, Grassia, & Pearson, 1987), they have not been previously applied to the study of phishing email judgments.

To fulfill this objective, the judgments of 74 participants were analyzed using the double system lens model. In the judgment task, participants were instructed to evaluate 40 emails and sort them into either a "keep" or "suspicious" folder. Twenty emails were legitimate and 20 were phishing; participants were not aware of this distribution. Participants also rated the confidence in each judgment from 1 (not confident at all) to 10 (extremely confident). Independent variables included: the criterion for each email (coded as 1 for a phishing email and 0 for a legitimate email) and the phishing cues for each email (coded as 1 when the cue was present and 0 when absent). Dependent measures included: the judgment the participants made about an email (1 if the participant moved the email to the suspicious folder and 0 if the email was moved to the keep folder), the participants' judgment confidence ratings for each email judgment, and the time to complete the email sorting task. Nine cues were included in the analyses: spelling and grammar errors, generic greeting, URL hyperlinking, lack of signer details, requests for personal information, suspicious sender, poor overall design, suspicious link, and use of time pressure/threatening language. Because the judgment, criterion, and cues were coded dichotomously, logistic regression was used and achievement was calculated with a modified lens model equation (Hamm & Yang, 2017).

The task continuum index (TCI) allows for the task properties to be evaluated and combined to place the task along the continuum from intuition to analysis. The task's location on the continuum provides an indication of the cognitive mode most effective for that task. The TCI score was calculated using the following measures: the number of cues, the redundancy among cues, the standard deviation of cue weights, the degree of nonlinearity in the organizing principle, and the degree of certainty in the task system. These measures were standardized and averaged to result in a value from 1 (intuitive cognition) to 10 (analytical cognition). We hypothesized that the task's TCI score would be oriented towards the analytical side of the continuum (greater than five). This calculation resulted in a TCI score of 7.574, supporting our hypothesis.



The cognitive continuum index (CCI) provides a means of understanding human cognition during a judgment task by placing it along the continuum from intuitive to analytical. A CCI score for each participant was calculated using the following measures: cognitive control, the degree of nonlinearity in the judge's organizing principle, response rate, overestimation, and overprecision. Overestimation is the difference between perceived accuracy and actual accuracy. Overprecision is the difference between average judgment confidence and judgment accuracy. Overestimation and overprecision are from the phishing literature and had not been previously used in a CCI score calculation. These measures were also standardized and averaged to result in a value from 1 (intuitive cognition) to 10 (analytical cognition). Our second hypothesis was that achievement would be positively correlated with CCI score. To test this, a Pearson correlation coefficient was computed between achievement and CCI score. Results of the Pearson correlation indicated that there was a strong significant positive association, ($r(72) = 0.744$, $p < 0.001$), supporting our hypothesis.



Because large differences between CCI and TCI scores are associated with judgment errors, it was also appropriate to investigate the differences between these metrics (Hammond et al., 1987). To do this, the absolute value of the difference between CCI and TCI scores was calculated for each participant ($M = 2.100$, $SD = 1.194$, $Med = 2.032$, $Min = 0.013$, and $Max = 4.461$). Our third hypothesis was that achievement would be negatively correlated with the absolute value of the difference between CCI and TCI scores. Results of the Pearson correlation indicated that there was a strong significant negative association, ($r(72) = 0.741$, $p < 0.001$), supporting our hypothesis.

This work used the lens model and CCT to understand the relationship between human cognition, task characteristics, and phishing victimization. It was the first research to analyze the task characteristics along with user cognition in this domain. The results showed a clear relationship between cognition and achievement and the task was better suited by more analytical cognition. The results have direct implications for combating phishing. By framing and evaluating this problem in the context of both human cognition and task characteristics, more comprehensive and effective mitigation techniques can be developed. Not only can techniques aim to move the human towards more analytical cognition, but other techniques can be aimed at enabling the task to be better supported by more intuitive cognition, with the overall goal of having better correspondence between the two sides. Overall, this work used a novel approach to build upon the previous phishing literature and opens a new avenue for future phishing research.

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A Brunswikian Approach to the Critical Incident Data

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The aim of the present contribution to this year's Brunswik Society Newsletter is to apply Brunswikian concepts to earlier published critical incident data (see Sjödahl, 1992, 2016). Critical incidents can be regarded as a kind of situation sampling (see Flanagan, 1954). For Brunswik it was important to uncover the organization of environmental situations and their interactions (Brunswik, 1956). Our critical incident data was collected by means of semi-structured interviews with 172 nurses. Their total work-cycle was divided into 12 different situational contexts, such as morning routines, the round, examinations, medical treatment, etc. The population to which we intend to generalize our interview results consists of patient-nurse relations with regard to the patients' psycho-social needs: 1) emotional security, 2) personal integrity, 3) self-esteem, 4) need for variation, etc. (Sjödahl, 1992).

The interviews, carried out by five psychology students at the nurses' places of work, were semi-structured and contained a general introduction and follow-up questions (see below). The following two interview instructions were alternated between respondents to get an equal chance for positive as well as negative incidents

Version 1. Can you describe some incident, situation that clearly illustrates how the patient's psychological needs, defined and illustrated below, can be taken into consideration during hospital care? It does not need to be a dramatic or spectacular situation.

Version 2. Can you describe some incident, situation that clearly shows how the patient's psychological needs, defined and illustrated below, run the risk of being neglected during hospital care? It does not need to be a dramatic situation.

Our nurses' own experience of being a hospital patient:

- Never been a patient in hospital care (n = 76),
- Single days up to 14-day stay (n = 68),
- More than 14 days up to 1 month stay (n = 21),
- Longer than 1-month hospital stay (n = 7).

Every reported incident was complemented with open-ended, follow-up questions: 1) How did you first become aware of the situation? 2) Did you take any measures in this situation? 3) Did you act in some way later on? 4) What were the results of the measures you took? 5) Did anyone other than the patient, take part in this situation? 6) Why did you choose to act as you did? Our choice of these questions is built on the assumption that the respondent goes through a pre-decisional as well as a post-decisional stage, i.e., thinking about tentative alternatives may be followed by later post-decisional thinking. The nurses' decision process will be analyzed in Brunswikian terms like cue categories and distal effects of acting, and in terms of intentional as well

as emotional achievements. The relationship between the nurse's purpose (question 6) and reported consequences (question 4) will provide information about the functional value of the decision, while the relationship between reported consequences and our psycho-social need domain (see interview instruction) will provide information about the ecological value of the decision taken.

Variety of Cues. The cue triggers mentioned in the nurses' narratives and answers represent a wide range of information senders (both human and inanimate objects), such as fellow patients, patient's family members, night staff, social workers, physiotherapists, home help, orderlies, medical students, localities such as dayroom, daily newspapers, and discipline rules.

The Complexity of Work Conditions. Our incident sample illustrates in several ways the complexity of nurses' work situations with successive demands to switch between focal and tacit knowledge (Polanyi, 1966). These rapid alternations of attention between different cue senders put great demands on self-control and may in the long run lead to ego depletion, i.e. loss of work motivation (Kahneman, 2012, pp. 42–43). The situation is described by a nurse: "*I walked slowly down the corridor, my mind full of what I had to do. What time should I start my drug round? What time should I start mixing my intravenous medication? What time should I start recording observations on my patients' blood pressure, respiration rate, and neurovascular observations on the post-operative patients.…I could already hear buzzers ringing at the other end of the ward, the linoleum lit up by the flashing orange call bells*" (Case, 2019, pp. 112–113).

The Nurse-Patient Relation – A Mutual Coping Situation Involving Popper's Three World Concepts. A cornerstone in Brunswik's lens model is that the human mind generally strives to represent the external environment. This striving for a valid representation of the outside world, Popper's World 1, has, however, its boundary conditions, i.e., our mental representations are not always valid. This is why Popper makes a distinction between World 1 and World 2, the latter being our subjective world. The human being's ambition to interact and control the environment under stress conditions may result in two different kinds of control: 1) primary control that targets the external world (World 1); secondary control that targets the self (World 2). Loss of primary control, such as the power to influence one's own work conditions, is likely to result in a self-threatening mood, giving room for secondary controls, i.e., behavior that functions as defense against this self-threatening mood, thereby preserving self-esteem and emotional balance.

Nurses' work situations, with rapid shifts between focal and tacit tasks, may function as a dual coping situation, a balance between different goal engagements. The following three conditions are likely to determine the outcome of this coping behavior under stress: 1) the estimated importance of the goals; 2) the attainability of the goal; 3) the possibility of controlling the goal attainment and goal pursuit (Nikitin & Freund, 2019).

Dual coping situations. Seeing the nurse-patient interaction under stress conditions as a mutual adaption process, also involving patients, raises the following question: what are the patient's internal resources and potential options for commitment to desired goals? The patient's situation, like the nurse's, also includes a selection process, meaning that the patient has to accept limited goals and resources, resulting in a loss-based selection or revision of goals, adjusted to available cues, e.g., health

restrictions. These restrictions are likely to be more serious for elderly patients who often suffer from loneliness (Luo et al., 2012). Of the 169 patients in our study 71 are over 60 years of age.

To get a quantitative overview of the nurses' answers to our follow-up questions a category system was constructed according to the following guidelines: 1) items comprising the category system should be exhaustive in that there is always a category in which every behavior of the kind being studied may be classified; 2) categories should be representative for the behavior dimensions intended to be studied; 3) categories should be as mutually exclusive as possible; 4) consideration should be taken to the problem that valid coder inferences are context dependent. For further information about this quantitative classification of qualitative answers see Sjödahl (1992, pp. 24–26).

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How the Voice Persuades: A Brunswikian Lens Analysis

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Persuading others is often challenging because people are wary of others' attempts at influence. When they can diagnose others' intent to persuade, people often defend themselves from influence attempts by ignoring them or counter arguing (Friestad & Wright, 1994). As a result, persuasion attempts often backfire (Campell & Kirmani, 2000).

The persuasion literature has largely focused on persuasion attempts executed through the linguistic content of communicators' messages by manipulating written arguments (Tormala & Petty, 2002), print advertisements (Kirmani & Zhu, 2007), and text-based hypothetical vignettes (Campbell & Kirmani, 2000). For example, people diagnose common persuasion tactics like positively valenced statements (e.g., "exceeds your needs" versus "meets your needs") and rhetorical questions (e.g., "Mizuno shoes are beneficial for you, aren't they?"), both of which cause communicators' persuasion efforts to backfire (Ahluwalia & Burnkrant, 2004; Jain, Agrawal, & Maheswaran, 2006).

In contrast, little work has examined persuasion attempts executed through paralinguistic channels, or nonverbal properties of communicators' voice. Communicators can deliver the same message with a myriad of different nonverbal deliveries by varying acoustic properties like their pitch, volume, and speech rate. Might such shifts actually enhance communicators' persuasiveness? In a forthcoming paper in the Journal of Personality and Social Psychology, we examine precisely this question (Van Zant & Berger, in press). We argue that, although communicators may struggle to persuade others through what they say (linguistic persuasion attempts), they may be relatively effective at persuading others through how they say it (paralinguistic persuasion attempts).

Bringing the Left Side of the Lens Model into the Paralinguistic Persuasion Process. The research on paralinguistic persuasion has almost exclusively focused on how specific cues impact perceivers (i.e., the right side of Brunswik's Lens Model). This work has predominately taken one of two approaches. One is to measure naturalistic variation in speakers' acoustic features and explore correlations between speakers' cues and some measure of persuasion (e.g., Burgoon, Birk, & Pfau, 1990; Oksenberg, Coleman, & Cannell, 1986; Packwood, 1974). The other approach is to manipulate the magnitude of specific cues of interest (i.e., "high" vs. "low" levels of the cue) through either the use of trained actors (e.g., Miller, Maruyama, Beaber, & Vallone, 1976; Woodall & Burgoon, 1983) or the electronic modification of recordings (e.g., Guyer, Fabrigar, & Vaughan-Johnston, 2019; Moore, Hausknecht, & Thamodaran, 1986; Smith & Shaffer, 1991, 1995).

However, by focusing on the right side of the Lens Model, research on paralinguistic persuasion has neglected to consider speakers' active role in the persuasion process. By considering a relatively narrow range of cues (e.g., speech rate

and intonation) and not directly testing whether speakers actually vary the extent to which they display particular cues during active attempts at persuasion, prior research does not address the question of whether persuasion attempts executed through paralinguistic channels actually succeed in the first place. In our research, we address this gap in the literature by accounting for the full paralinguistic persuasion process—beginning with communicators' intent to persuade on the left side of the model. We then expand the model to assess how communicators' intent to persuade causes them to utilize specific acoustic cues that influence perceivers' attitudes and choice.

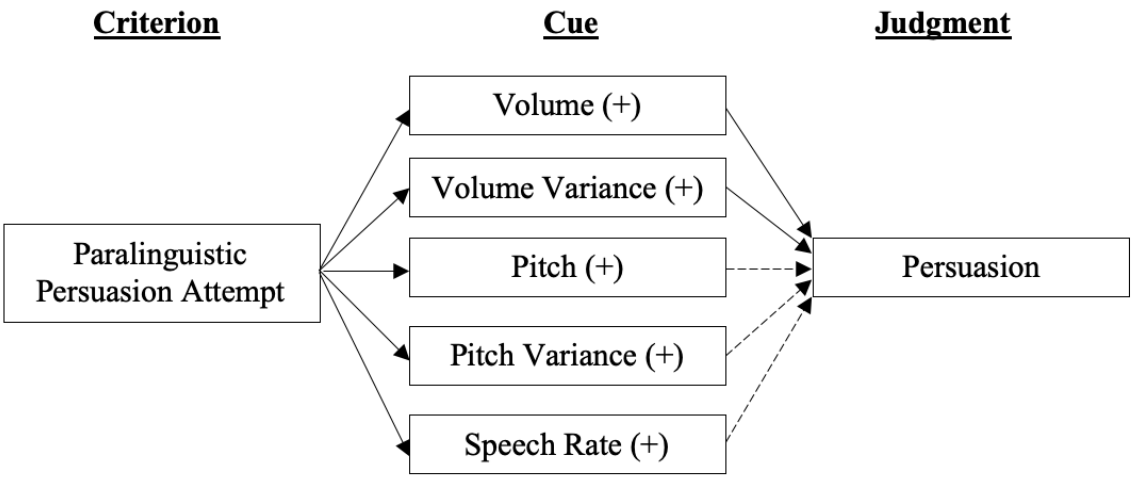
Summary of Methods and Results. In four experiments, we recruited two different samples of participants: (1) speakers tasked with generating stimulus recordings and (2) perceivers presented with a stimulus recording. For the speaker portion of the experiments, we asked a sample of speakers to compose two recordings in a randomized order: One control recording where they were asked to speak as they normally would and another where they attempted to persuade a future research participant who would listen to the recording. Critically, we held the linguistic content of recordings constant within a given speaker. For the perceiver portion of the experiments, we presented a separate sample of perceivers with a randomly selected recording from the speaker portion of the experiment and asked them questions about the recording. This design allowed us to ensure that a sample of perceivers would be randomly assigned to hear either (a) a control recording or (b) a recording where the speaker was attempting to persuade them to hold a particular attitude or make a particular choice.

Across the experiments, we found evidence consistent with paralinguistic persuasion. Speakers reading a given message were more effective at influencing others' attitudes and choice in a desired direction when they recorded it while attempting to persuade others than they were when composing control recordings. Further, in one of our studies, we found that paralinguistic persuasion attempts can be uniquely effective even when speakers' attempts to persuade through the linguistic content of their recordings are not. In the study, we asked speakers to compose their own message reviewing a task before prompting them to record themselves reading the same message twice (one control recording and one recording where they attempted to read in a persuasive manner). However, in addition to varying speakers' attempts to persuade through their vocal delivery, we also randomly assigned them to either write their message in a manner that could persuade others (linguistic persuasion attempt condition) or to a control condition where they were simply prompted to write the message as they normally would. We then recruited a separate sample of perceivers to listen to messages that varied both with respect to whether a speaker was attempting to (a) persuade at the time of writing the message and (b) at the time of recording the message. Ultimately, we found that speakers' attempts to persuade at the time of their vocal delivery of the message made them more effective at influencing perceivers, but that their attempts to persuade at the time of writing the message did not impact their persuasiveness.

Further, we found evidence that these effects were driven by speakers' tendency to project confidence while engaging in paralinguistic attempts. Across studies, speakers' attempts at paralinguistic persuasion led to perceivers rating them as more confident and certain in the attitudes they were expressing in their message. Although perceivers could readily detect speakers' intent to persuade from their recordings,

speakers' ability to project confidence during their paralinguistic attempts made their messages appear to be sincere reflections of their attitudes.

A Lens Analysis revealed that speakers displayed a number of acoustic cues while attempting to persuade others. However, as summarized in Figure 1 below, their tendency to speak louder and with greater variability in volume while engaging in paralinguistic attempts were primarily responsible for enhancing their persuasiveness. This finding indicates that speakers' attempts at persuasion cause them to vary their speech patterns, which results in them using volume cues that enhance their persuasiveness.



Note: Dashed lines represent non-significant associations between cues and persuasion. Positive relationships indicated by (+).

Figure 1: A Brunswikian Lens Model of Paralinguistic Persuasion.

Conclusion. Taken together, these findings suggest that because they signal confidence, paralinguistic persuasion attempts are effective even when they are diagnosed. Beyond *what* to say, focusing on *how* to say it can increase influence. For additional information we refer to Van Zant and Berger (in press).

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Political Skill and Outcomes in Social Life

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Political skill, or the ability to achieve social and organizational goals, has been extensively studied in the context of professional life but rarely in social life. To understand what kinds of behaviors politically skilled people use to achieve outcomes in social life, we sought to create several lens models (a concept developed by Egon Brunswik). Lens models lay out how two theoretically related things (e.g., A and B) each relate to a set of variables or "cues." This makes it easy to compare A and B by identifying where both relate to a cue, where only one relates to a cue, and where neither relate to a cue.

In our study, 77 participants filled out a modified version of the Political Skill Inventory (Ferris et al., 2005) with workplace references taken out, and then interacted with a partner (1 of 10 confederates randomly chosen) for five minutes on video. Names of participants were given to the confederate partner ahead of time so they could confirm zero prior acquaintance. The videos were shown to 40 raters who rated each participant on likeability or on intelligence, and to 4 coders who recorded the frequency of 10 behaviors for each of the 77 participants (speaking about the partner, speaking about themselves, asking questions, initiating new topics, making eye contact, time spent speaking, sounding confident, using humor/telling stories, smiling/laughing, and leaning in). Participants also nominated up to 10 friends (397 in total) to rate the participants on outcomes like intelligence, likeability, closeness, and social skill (the latter three outcomes correlated highly so they were averaged into one variable labeled "positive sociality").

Once the data were collected, we correlated the observed behaviors to self-reported political skill and to judged likeability or judged intelligence in separate lens models. We found politically skilled people initiated more new topics to successfully appear likeable, and sounded more confident to successfully appear both likeable and intelligent. We believe both behaviors portray feeling comfortable in social situations, which may be the impression political skilled people were striving for to appear more positively. Furthermore, political skill positively correlated with friend-rated positive sociality while controlling for traits similar to political skill (e.g., extraversion) suggesting that political skill has a robust relationship with desired outcomes in social life. See Wang and Hall (2019) for the full article.

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When *We* Should Be *Me* – Brunswik's Organism-Environment Model Applied to Person Perception in a Romantic Relationship Context

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The ending of a committed romantic relationship can be stressful and have far-reaching impacts on one's well-being (Larson & Sbarra, 2015), in part because it signals the dissolution of an attachment that partners had formed with each other (Ainsworth, 1989). Existing studies of relationship dissolution have examined factors associated with psychological adjustment following a breakup or divorce (e.g., Sbarra & Borelli, 2013; Wang & Amato, 2000). For instance, one study found that people with an independent sense of self have better psychological adjustment following relationship dissolution (Mason, Law, Bryan, Portley, & Sbarra, 2012), perhaps because they are able to regain self-concept clarity apart from their ex-partners. However, extremely little is understood regarding individual differences in the strength or degree of attachment to a previous partner, and the degree to which differences in attachment strength predict adjustment after relationship dissolution. If one is unable to recover from a relationship dissolution, they may be at a disadvantage in subsequent partner selection. Current research demonstrates that individuals with ties to ex-partners lack engagement with and emotional availability for their current partner (Adler-Baeder & Higginbotham, 2004). Therefore, the current study investigates interdependence and perceived unity in self-concept following relationship dissolution by examining participants' use of first-person plural pronouns in natural language use – *we-talk* (i.e. *we, us, our*; Agnew, Van Lange, Rusbult, & Langston, 1998)—operating under the assumption that greater frequency of first-person pronoun use indicates a more interdependent sense of self.

In this investigation, we brought the person perception framework to the study of people's adjustment to relationship dissolution. In so doing, we were motivated to expand on the current understanding of how people adjust to a breakup or divorce. Additionally, we sought to contribute to our knowledge regarding people's perception regarding strangers' attachment to their former partners, which may have implications for subsequent partner selection. To our knowledge, no prior studies had been conducted on person perception regarding attachment strength to former partners, yet this is a topic of much discussion in popular media (Bruk, 2018).

Brunswik (1943) argued that when we cannot perceive actual characteristics of organisms, we rely upon cues to inform us of individual differences across environments (in this case, across people). Guided by this conceptualization, which later gave rise to the organism-environment model (Brunswik, 1956), we collected and transcribed stream-of-consciousness (SOC) speech samples from a group of participants (henceforth referred to as *targets*, because they subsequently provided stimuli that were used by another set of participants, referred to as *judges*, as a source of information

about the *targets*). In these speech samples, recently separated participants (*targets*) described their recent experience with a breakup (N = 161) or divorce (N = 132), as well as their self-reported strength of attachment to their ex-partners. Next, we provided these transcribed SOC texts to laypeople (henceforth referred to as naïve *judges*). The naïve judges read the narratives while imagining they were the targets narrating these experiences. Using a modified version of the WHOTO scale (Fraley & Davis, 1997; Hazan & Zeifman, 1994), naïve judges then provided ratings on the strength of attachment for each target's narrative as though they were themselves the target.

Interestingly, our findings revealed that naïve judges' rating of targets' attachment to previous partners were strongly positively associated with targets' own ratings of their attachment to their partners (r = .66, p < .00001). In other words, with very little information about the targets, naïve judges were highly accurate in their perceptions of targets' strength of attachment to their former partners. In addition, we identified specific linguistic patterns associated with strength of attachment. Targets with stronger attachment to former partners utilized more *we-talk* (r = .17, p < .01), fewer past tense words (r = -.23, p < .001), and more present tense words (r = .15, p < .05). In our final analysis, we found that targets' use of *we*-talk mediated the association between naïve judge ratings of target attachment and targets' self-ratings of attachment (b = .02, 95% CI [.005, .06]).

Because the use of *we-talk* implies a perception of the self as part of a plural unit (Agnew, 2000), individuals with stronger attachment to former partners likely experience more difficulty separating their self-concept from that of their partner, which is indicated by their higher use of *we-talk*. Additionally, the mediation of target *we*-talk suggests that *we*-talk may be one form of behavioral cue by which naïve judges perceive targets' strength of attachment from their relationship narratives. Building on the Brunswik theoretical framework, the current investigation is among the first to examine person perception process in a romantic context. It revealed a strikingly high accuracy in naïve judges' perceptions of others' attachment to former partners and connected several linguistic cues to self-concept disturbance after relationship dissolution. This suggests that in discussions of a former relationship, the use of first-person plural pronouns represents a behavioral residue of dissolution in the adjustment process. This work adds to the literature on person perception in suggesting that naïve judges demonstrate high levels of accuracy in the perception of targets' attachment to their former partners, and further suggests that targets' first-person plural pronoun use in written text may be one behavioral marker through which naïve judges infer information regarding targets. For the full article, please see Borelli, Sbarra, and Mehl (2019).

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Commentary

Perspective on Egon Brunswik: Q-Method

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[Editors' note: The Wikipedia entry on Q methodology notes, "Normal factor analysis, called "R method," involves finding correlations between variables (say, height and age) across a sample of subjects. Q, on the other hand, looks for correlations between subjects across a sample of variables" https://en.wikipedia.org/wiki/Q_methodology.]

I just happened onto an interesting chapter which isn't especially new, but might be of interest to the readers of the Brunswik Society Newsletter who have not yet seen it. The chapter focuses on the place of Egon Brunswik in the history of psychology, and is by David E. Leary (1987) who, at the time of the writing, was in the Department of Psychology, University of New Hampshire. Egon Brunswick (1903-1955) was a Viennese psychologist who spent the final 20 years of his life at the University of California at Berkeley.

The tie-in to the Q-Method list is that he and William Stephenson were acquainted when the latter spent a term at Berkeley sometime in the early to mid-1950s: Brunswik makes a reference to Stephenson's work in his acclaimed *Systematic and Representative Design of Psychological Experiments* (1947) and Stephenson incorporated the concept of representativeness and ecological universes in *The Study of Behavior* (1953). It might be recalled that on the fly-leaf of the dust jacket of *The Study of Behavior*, it states that "Spearman himself hailed the author of *The Study of Behavior* as the foremost creative statistician in the psychology of our time": It was Egon Brunswik who relayed this comment of Spearman's to Stephenson.

The two men's lives were parallel in several respects. They were born less than a year apart: Brunswik studied engineering (Stephenson physics), but finally took his PhD in psychology in 1927 (Stephenson 1929); and both relied on correlational statistics for their measurements. Leary could have been speaking of Stephenson when he spoke instead of Brunswik's background:

> ... so many psychologists seemed not to understand his methodological, theoretical, and probabilistic convictions. They did not reject Brunswik's psychology for emotional or even clearly defined intellectual reasons. They simply let it slip by, in ignorance of its meaning and import (p. 133).
>
> In making the move to the United States, Brunswik lost an audience that shared much of his intellectual background, the aid of a number of talented and committed research assistants, and a professional context in which perception [in Stephenson's case subjectivity] was seen as an important and attractive research problem (p. 134).

> Matters were not helped by the fact that Brunswik was such a widely read scholar who continually referred to new developments in other sciences and disciplines that might have some significance for psychology. Many students heard for the first time about cybernetics, communication theory, ... and other developments in Brunswik's courses. His enthusiastic discussions of how these developments might be of service to psychologists were not always matched by the students' ability to follow what he was talking about (p. 135).
>
> ... many have turned to Brunswik's work for brief periods of time and have taken away this or that piece of his message, either ignorant or uncaring about the larger, systematic context from which that piece was removed (p. 136).

They differed in at least one important respect. Apparently depressed, at age 52, at not being understood or appreciated, Brunswik unceremoniously ended his life. Stephenson was perhaps spared this anguish by virtue of having been enmeshed in the European theater during the War, hence perhaps more focused on his work and on "catching up" in the post-War period. (There is a gap in his vita from 1939 to 1949, when nothing was published.) He also went through a bout of depression shortly after retirement (1972), but then rallied to go through an extraordinary period of creativity during which he consolidated the two major threads of his life, physics and psychology, producing the series of papers on Newton's Fifth Rule and the confluence of Q and quantum theory. Science will reap benefits to itself if it can ever figure out what it is that enables some of its distinguished elders in particular to persevere in their productivity.

Egon Brunswik, like Stephenson, was influenced by European functionalism, Gestalt theory, positivism (Moritz Schlick), and by the Anglo-American statistical tradition. His mentor was Karl Bühler, about whom Leary notes that:

> ... he showed that the relationship between particular aspects of the object-world (sensations) and the experiential awareness of the subject (perception) is *fundamentally ambiguous*. Any given sensory stimulus, he showed, will be perceived differently when placed against a different contextual background. Furthermore, Bühler found that the same principle could be applied in the study of language: no word has a single fixed meaning; rather, all words receive their meaning from the sentence and paragraph in which they are embedded. Any given word can mean several or more things, depending on the context in which it is uttered. Thus, the hearer of language must interpret – must infer the probable meaning of a word – based on the word's relation to its linguistic setting (p. 118).

Stephenson made the same point on repeated occasions, and it is now commonplace that Q sorts (and their factors) have to be interpreted after they have been produced so as to determine the meanings that emerged during the sorting.

Bühler went on to show that not only can words represent different objects, but different objects can be represented by different words, so that there is "no invariant one-to-one relationship between representations ... and the things they represent" (Leary, p. 118). (This explains why the same Q factors can emerge from different Q samples – and, therefore, why standardized Q samples are unnecessary – and why different factors can emerge from the same Q sample.) Brunswik picked up on this essential ambiguity between perceiver and thing-perceived, and made the *subject-object relationship* the center of his theory of perception. His position was clarified by Fritz Heider's idea that subject and object were separated by a "medium"

through which perception is achieved, and by Hans Reichenbach's probabilistic theory of human knowledge (as opposed to the Vienna Circle's nomothetic theory). In the mid '30s, Brunswik came under the influence of Edward C. Tolman of Berkeley (on sabbatical in Vienna in 1934), hence of the American stress on objective methodologies. "As a result," Leary writes, "the subjective pole in the functional relationship between the subject and object receded from Brunswik's psychology for more than a decade" (p. 120).

The parallels between Brunswik and Stephenson are once again prominent. Stephenson, too, was impressed with the ambiguity between subject and object: if you focus on the object (e.g., a test item with fixed meaning, as in R methodology), the subject becomes hazy; if you focus on the person (Q methodology), the meaning of the item becomes hazy. Likewise, due to his exposure to quantum theory, he did accept probabilism and uncertainty as irreducible. That subjects and objects are separated by a medium that must be considered is a central principle in J. R. Kantor's formulation of a psychological event – PE = C (k, sf, rf, hi, st, md), where md is the medium – which Stephenson had already embraced before coming to the U.S. But whereas Brunswik's "psychology without an organism" (with its divorce from the subjective pole) was a natural consequence of the influences operating on his development, Stephenson was protected from this through his exposure to James Ward's warning (in *Psychological Principles*, 1920) about a "psychology without a subject," so Stephenson already had a commitment to keep the subject firmly in the picture. Moreover, as Brunswik was forced to develop measurement procedures for his system (based, like Stephenson's, on correlation theory), so was Stephenson forced to develop them for his system. There is little question that Stephenson was more successful in this regard, and central to his success was the fact that the subject was retained – the so-called "centrality of self" principle. Brunswik eventually had to restore the subject in terms of Tolman's "purposive behavior," with each behavioral potential being relied upon in terms of its probable effect on goal achievement.

Brunswik's "probabilistic functionalism," as his theory was called, necessitated a methodology that represented a sharp break with the past – a replacement of systematic with representative design in experimentation. Systematic design is best exemplified by R. A. Fisher's procedures (in *The Design of Experiments*, 1935), which Brunswik considered too formal (i.e., "systematic") and restrictive when compared to the wider variability of conditions in the natural environment. By way of contrast...

> The call for unrestricted vicarious functioning in studying gross behavioral adjustment ... injects a new element into the discussion of these issues. It is the requirement of normalcy, naturalness, "closeness to life," or, with a more methodological slant, that of "situational representativeness." According to the much stressed requirement of "representative sampling" in differential psychology, individuals must be randomly drawn from a well-defined population; in the same manner, the study of functional organism-environment relationships would seem to require that not only mediation but especially also focal events and other situational circumstances should be made to represent, by sampling or related devices, the general or specific conditions under which the organism studied has to function. This leads to what the writer has suggested to call the "representative design of experiments" (Brunswik, 1952, pp. 29-30).

The principle of representative design is elaborated in Brunswik's *Systhematic and Representative Design of Psychological Experiments* (1947), which Leary calls "one of the most remarkable works in twentieth-century psychology" (p. 128). (It appears in slightly revised form as the first part of *Perception and the Representative Design of Psychological Experiments*, 1956.) What representative design calls for is sampling on the stimulus side in the same way as conventionally carried out on the responder side. We are accustomed to selecting random samples of respondents, hence to being able to generalize to those populations from which responses have been taken, i.e., to all other members of the population not included in the experiment. What Brunswik was calling attention to was the need for sampling on the stimulus (or object) side of the situation so as to enable the scientist to generalize to those populations of situations to which the results might be said to apply. Without representativeness on both sides – objects as well as subjects – true generalization is precluded.

In his subsequent elaborations, Brunswik advanced the view that the object side is not only typically overlooked as a domain requiring sampling, it is probably the more important – i.e., there is apt to be more variability among situations than among people, hence knowledge about behavior needs to place more emphasis on sampling occasions than on sampling persons, which of course provides substantiation for Q studies which typically employ relatively small person samples relative to item samplings.

Stephenson incorporated Brunswik's major idea of stimulus representativeness into Q method (see *The Study of Behavior*, Index, "Brunswik" and "Representative sampling"). He was aware, perhaps through Brunswik, of the restrictive character of Fisherian designs in the structuring of Q samples, and sought to correct for this restrictiveness by maximizing heterogeneity in item selection from the balanced design. For example:

> One of our early studies made use of a sample of 60 colored photographs of vases. This did not consist of *any* photographs of vases; all were colored and were similarly reproduced. Several were taken from each of the great eras of vase-making, from Ancient China, Greece, Egypt, and Europe. [This would be a "systematic" Fisherian design of the completely-randomized variety were procedures to go no further.] No two were obviously alike. What was achieved was a certain homogeneity with respect to *vases* -- anyone, looking at the 60, would tend to regard them as of one class, alike in a very substantial fashion; but also, a definite heterogeneity was achieved, such that would lead one to say that, even so, all the vases are different ones. The statistician is likely to think of populations as necessitating such conditions of homogeneity in kind and of heterogeneity and noncontingency among the items of a kind (Stephenson, 1953, p. 65).

The principle, in short, is to assure the incorporation of main features through the use of Fisher's procedures, but then to try to avoid the restrictive features of the design by making within-cell item selections with an eye to maximizing heterogeneity:

> Thus, care about homogeneity of class and heterogeneity of assessment within it is directed toward operational matters, and therefore toward the necessity in statistical distributions for the items to be independent and not contingent in any obvious manner upon one another (p. 65).

Stephenson saw an advantage in forging links to Brunswik. What, if anything, did Brunswik see in Stephenson's works?

In a brief correspondence which I had many years ago with Kenneth Hammond, Brunswik's foremost proponent, Hammond remarked something to the effect that Brunswik regarded himself as a theorist but considered Stephenson to be more a technician, and this viewpoint shows through in Brunswik's major treatise, both the 1947 version and in the 1956 revision. Noting that his use of correlation dealt with functional problems and that, in a certain way, "it may be said that ... individuals and test situations have shifted places," still Brunswik (1947) wanted to make clear that "this type of exchange has to be sharply distinguished from the 'inverted' correlation technique recently introduced by Stephenson" (p. 34), at which point he cited Stephenson's 1935 paper on "Correlating Persons Instead of Tests" and his 1936 paper in *Psychometrika*. Brunswik recognized that by exchanging rows and columns of a data matrix that persons became variables, but the rows were implicitly conceived to be the same objective tests of the kind intrinsic to R methodology: Thus, as he said (p. 34), "inverted correlation is a much less radical departure from the customary ways of psychological statistics than the application of correlation and sampling aspects to functional stimulus-response problems" of the kind suggested by Brunswik's conceptual framework. At this point, therefore, Brunswik was victim of the conventional view that R and Q represent reciprocal features of one and the same data matrix, and this becomes clearer as one reads on:

> There is no difference in the type of *material* used by Stephenson and the other factor analysts. The only difference is that correlations are calculated between columns, rather than between rows, of a common "persons X their features" matrix. If our own case were extended, as it should be..., to integrate more than two (say, M...) features of a sample of situations at any one time, the matrix would be one of "situations X their features" (i.e., using, as we have already done, N for the size of an ecological sample, an N X M matrix) rather than one of "persons X their features" (i.e., an n X m matrix) (p. 34).

Hence "tests," for Brunswik, carried the connotation of person characteristics, as in R-method scale assessments. That Q might involve a distinctly different and non-reciprocal matrix from that involved in R was not something that occurred to him. Once again, we see the pernicious influence of misconceptions and "accidents on purpose" that have hounded Q methodology, and that have been engraved in social science methods texts as misleading guideposts for subsequent generations.

Brunswik further amplified his above comments:

> ... In the end, one may thus arrive at a factoring of perception in terms of situational dimensions. This would be a counterpart to the already well-developed customary type of factoring in terms of personal abilities as recently also extended to perception by Thurstone.... But it would be diametrically opposite to the latter with respect to type of content since there would be not merely an exchange of rows for columns, as by Stephenson, but a substitution of an altogether different set of variables for those which enter into the matrices dealing with differential psychology, be it that these matrices are used for the customary kinds of factor analysis or for the Stephenson technique (p. 34).

Stephenson's procedure was therefore categorized by Brunswik (in his comprehensive Table 2, p. 30) as a branch of *differential psychology*, so as to distinguish it from his own functional and ecological psychology.

It bears mentioning that differential psychology was associated with William Stern (*Die Differentielle Psychologie*, Leipzig, Johann Ambrosius Barth, 1911) and provides the methodological base for studying individual differences in quantities of characteristics – e.g., when high vs. low scores on an IQ test indicate differences in amount of intelligence. Differential psychology is therefore foundational to R methodology, and Stephenson (1953), perhaps in reaction to Brunswik, endeavored to make this clear in a footnote in *The Study of Behavior*:

> In system (1) [R methodology] the concern is with samples of *persons* to which tests have been applied: the analysis begins with the *individual differences* so observed. The system thus subserves differential psychology fundamentally, and all the factor work of Spearman, Thurstone, Hotelling, Holzinger, Burt, Cattell, and others falls within this rubric. In system (2) [Q methodology], samples of *statements* are constructed, which are used, basically, for statistical descriptions for a single person: the concern is with *intra-individual* "significance" of these statements. In (1) the *tests* are correlated and factored; in (2) the *descriptions* are so dealt with. Systems (3) and (4) are merely alternative ways of looking at data for systems (1) and (2), respectively, and they are thus not independent of (1) or (2), respectively. System (3) comes within the purview of *profile analysis* ...; it also leads to Cattell's P-technique (p. 14-15).

As we now know, Brunswik, although he had obviously read Stephenson's 1936 paper – which he cited, and which contains the distinctions among systems 1 through 4 to which Stephenson refers – mistakenly took profile analysis (system 3) rather than Q methodology (system 2) to be the focus of Stephenson's urgings, and therefore missed the main point and then tucked this methodological innovation away under the rubric of differential psychology. This perhaps explains why Brunswik viewed Stephenson's work as of technical interest only.

But this was in 1947. Stephenson's and Brunswik's careers apparently converged for a term at Berkeley, and *The Study of Behavior* appeared about that time and just before the 1956 revision of Brunswik's treatise was posthumously published. Are there discernible differences in the two versions?

Well, Brunswik does cite *The Study of Behavior*, but there's not so much as a letter that's been changed in that part of the 1956 publication that contains the substance of the 1947 monograph. The change is in Part Two, "Perception: The Ecological Generality of Its Distal Aim," which is new material, and in that section Brunswik makes a reference to Stephenson (1953) and Carl Rogers ("Case of Mrs. Oak," 1952), who he notes "have randomly sampled traits or types of responses, although perhaps from somewhat arbitrarily constituted trait-universes which perpetuate the bias of their original constitution" (p. 139). Brunswik then came as close as he was to come to an accommodation with Stephenson, seeing the difference now as notational ("a terminological policy") rather than scientific or statistical:

> Merely as a terminological policy, we should like to suggest that the phrase "representative design" be confined to cases in which representativeness is sought for elements of the external, ecological situation. Repeated applications of a test (intraindividual differences), the sampling of attitudes, statements, adjective traits, or behaviors from a "repertory" universe, all these must be classified with subject sampling rather than with object sampling (p. 139).

Note the term *intra*-individual differences: Stephenson had introduced this term, in order to distinguish Q from R (which dealt with the *inter*-individual differences of differential psychology), and so Brunswik seems to be trying to take this distinction into account. Still, the logic of profile analysis and of Cattell's P technique remains in evidence: the scores in Stephenson's methodology (as Brunswik sees matters) are the result of "repeated applications of a test," so that the intra-individual variations are relative to the person's fluctuating performances on a test that measures his or her trait(s) at difference points in time or under difference conditions – hence Brunswik's assertion that samples of tests, traits, attitudes, etc. from a "repertory universe" are to be classified with subjects (since they measure person characteristics) rather than the object universe with which his system was concerned.

Of course, we now recognize this problem as primarily one of concourse and of conditions of instruction: The Q sample needn't be filled with personal traits (e.g., I am happy, tired, hungry, etc.), but may contain locations (e.g., at home, work, at the movies, etc.) or situations (e.g., when arguing, guiding discussion at church, meeting my wife for tea, Friday nights at Dorothy and Tom's, etc.). And conditions of instruction can also capture representative situations from the person's experience (e.g., Brown, 1975). Brunswik apparently didn't grasp these possibilities, but they fit hand in glove with the probabilistic methodology which he sought and which Q methodology incorporates:

> Representative design, then, is but a special case of representativeness at large as we know it to be a universal research requirement. It is geared to the way in which situations occur in life. Each situation is a "variate package," that is, a more or less incidental combination of specific values along a large, and indeed unknown, number of dimensions. Ecologies ... are in many ways like persons, which also are variate packages.... (p. 139).

Q also is geared to "the way in which situations occur in life," and at its best remains close to the specificities of concrete situations, even going so far (to the chagrin of some) to abjure general and standardized Q sorts designed to be applicable in diverse settings. Q also takes situations to be "variate packages" that can be represented by Q samples and unpacked in terms of conditions of instruction, leading to a discovery, via factor analysis, of what before was "an unknown number of dimensions." And people, too, are variate packages, as is routinely shown with any person one might choose to select and place under the microscope of multiple conditions of performance. We therefore have no difficulty in joining Brunswik in his conclusion:

> It is by virtue of these relative consistencies that variate packages as a whole, and not their isolated dimensions, should be taken to define a universe. If we accept this position, there are only two major types of universes, the responder populational and the ecological.... (p. 139-140).

The former justifies the P set, the latter the Q sample.

It is of course tragic, if Leary is correct, that Brunswik ended his life early in part because he felt misunderstood and unappreciated, for he seemed on the brink not only of seeing what Stephenson's ideas meant technically, but also of appreciating their worth from a theoretical, conceptual, and methodological vantagepoint (broadly conceived). The key, we might suspect, turns on the importance of subjectivity, and the secrets which Q helps unlock. We might venture to say, in light of recent discussions on this [Q methodology] list, that had Brunswik taken this step at Berkeley, the "California

way"[1] might have taken a quite different turn, and life itself might not have appeared quite so bleak.

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[1] Work by Jack Block at Berkeley about which there was much debate on the Q-Method electronic discussion list in the mid-1990s and thereafter.

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