
The Brunswik Society

Newsletter

Vol. 33, Nov. 2018

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ISSN 2296-9926

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Imprint

The Brunswik Society Newsletter, ISSN 2296-9926
is published yearly
Editorial staff:
Kaufmann, E., Athanasou, J. A., & Hamm, R. M.

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Foreword

Many thanks to all authors for their contributions!

We are very pleased to present our newest Brunswik Society Newsletter, the first after the Brunswik Society meeting in November 2017. The meeting honored Hammond's work and showed the importance and the actuality of his and Brunswikian research in general. For the perfectly organized meeting, we would like to thank *Mandeep Dharmi* and *Jeryl Mumpower*. To share the meeting spirit, you will find special contributions by *Kathleen Mosier* and also by *Jeryl Mumpower* in the current newsletter.

Beside the meeting (see program in our 2017 newsletter), additional contributions cover quite heterogeneous topics, ranging from classical lens model applications (*Brauer* or *Csaszar*) to the application of Hammond's cognitive continuum theory (*Molinaro*). The contribution by *Kretzschmar* considers a seldom mentioned, but important aspect of Brunswik's research – the symmetry principle. Moreover, in the current newsletter Brunswik's research is applied to special domains, for example to medical science (*Dwyer* or *Nater*), to sport (*van Maarseveen*) or across domains (*Koriat*).

Just as in previous years, we highlight contributions describing either PhD-thesis research (*Guath*) or research PhD students have authored (*Breil*, *Molinaro*, *Sundh*), showing the interest of young researchers in this field. Contrarily, also many experienced researchers like the previous editor of the Newsletter still contribute (*Sjödahl*).

Finally, we make the reader interested in history aware of the footnote in Heft's contribution which should not be missed.

We, the editorial team, hope that the current newsletter will inspire future research as well promote the exchange between Brunswikian researchers to further develop Brunswik's ideas.

Sincerely,

Esther Kaufmann, Robert M. Hamm and James A. Athanasou

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 of the Brunswik Society Newsletter by becoming involved in the next Brunswik Society Newsletter, let us know by email (esther.kaufmann@gmx.ch). Thank you in advance for your support.

Contributions

A Lens Model Analysis of Textual Information for Testing the Validity and Utilization of Linguistic Cues for Adult Playfulness

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Adult playfulness is an understudied individual differences variable. At its core, it describes the ability to (re)frame situations in a way such that people experience them as entertaining, and/or intellectually stimulating, and/or personally interesting (Proyer, 2017). We use a structural model of playfulness that consists of four facets (see OLIW-scales; Proyer, 2017):

- **Other-directed** (i.e., using playfulness in social situations; e.g., solving tension by friendly teasing),
- **Lighthearted** (i.e., seeing life as a comedy rather than a battlefield, liking to improvise instead of planning ahead),
- **Intellectual** (i.e., playing with ideas, preferring complexity over simplicity), and
- **Whimsical playfulness** (i.e., liking odd and unusual things and people, being considered extravagant by others).

There is robust evidence that playfulness contributes to various domains of the social life; amongst others, playfulness is a desired trait in romantic partners for long-term relationships (e.g., Chick, 2001; Chick, Yarnal, & Purrington, 2012; Proyer & Wagner, 2015) and facilitates relationship satisfaction (e.g., Aune & Wong, 2002; Proyer, 2014). An open question is how accurately people can perceive playfulness in others. Initial findings show that playfulness (or variants such as the *need to play*) can be judged accurately among peers and family members (e.g., Ostendorf, Angleitner, & Ruch, 1986; Proyer, 2017; Proyer, Brauer, Wolf, & Chick, 2018). However, the accuracy of the perception of playfulness in zero-acquaintance settings has not yet been studied: How good are strangers in perceiving playfulness in a target, particularly when only limited information is available to the observers? In line with the notion that (a) personality is reflected in language use (Pennebaker & King, 1999) and (b) unacquainted observers use linguistic cues to infer personality traits correctly above chance (e.g., Borkenau, Mosch, Tandler, & Wolf, 2016), we recruited $N = 144$ participants ($M = 28.6$; $SD = 11.6$ years; 79% females) who completed a 28-item measure of adult playfulness (OLIW-scales; Proyer, 2017) and described themselves in short texts (only limitation: using a maximum of five sentences). These participants are referred to as *targets*. Five unacquainted participants (*observers*) read the self-

descriptions and rated the playfulness of the target solely based on the information provided in the texts.

Our analyses have shown that the self- and observer ratings converge well for global playfulness ($r = .35$) and the single OLIW facets ($r = .21$ to $.37$). There was high agreement across observers (ICC = $.69$ – $.80$). Thus, people can accurately judge playfulness based on limited textual information. In a next step, we utilized the lens model (Brunswik, 1956) to examine the validity and utilization of linguistic cues. Usage of the *Linguistic Inquiry and Word Count* software (LIWC; Pennebaker & King, 1999), which scans the descriptions for the relative frequency of 80 pre-determined word categories (e.g., grammar use, expressions of positive/negative emotions, swear words), helped uncovering these cues in the language. Hence, we operationalized the LIWC-word categories as cues and tested the cue-validity by correlating the self-ratings of playfulness with the word frequencies of each of the 80 categories; the cue-utilization was computed as correlation between observers' playfulness ratings and the language use. The findings showed that each facet of playfulness was associated with a specific cue-validity; for example, those high in Other-directed playfulness used first-person plural words ("we") more frequently and higher Intellectual playfulness was associated with indicators of complexity (e.g., using more words per sentence). Contrary to expectations, playfulness was unrelated to the expression of positive emotions. However, observers strongly utilized the existence of positive emotions to infer high playfulness (inaccurately with respect to the analysis of the data from the targets). To clarify the overlap between the validity and utilization of the linguistic cues, we have computed a *sensitivity index* for each facet by correlating the cue-validity and -utilization coefficients. Overall, there was imperfect but yet robust overlap between the existence and observers' utilization of cues for all facets ($r = .41$ to $.62$) except for Intellectual playfulness ($r = .19$).

Our study has shown that people can infer playfulness in strangers above chance, when basing their judgments on short written self-descriptions. The usage of the lens model has helped us to understand which linguistic cues within textual information are related to expressions of playfulness — and which cues are utilized by observers to infer playfulness. The LIWC approach comes with certain limitations: Foremost, no analysis of the content is provided. Hence, the low validity-utilization overlap for Intellectual playfulness indicates that information beyond the tested cues exists, contributing to accurate judgments of the facets.

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What is Measured within an Assessment Center: A Detailed Investigation of Underlying Cues

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Assessment Centers (ACs) are a widely used tool for decision makers to select potential employees or students. Typically, applicants face a variety of different tasks (i.e., exercises) that are designed to elicit differences on predefined (mostly social) skills such as empathy, assertiveness, teamwork, or resilience. While there is evidence of predictive validity of ACs (e.g., Sackett, Shewach, & Keiser, 2017), the question of what is and can be measured within ACs has left researchers with confusion and disagreement (e.g., Jackson, Michaelides, Dewberry, & Kim, 2016; Kuncel & Sackett, 2014). Specifically, it has been debated whether distinct social skills can be reliably assessed across situations (i.e., dimensional approach) or whether AC results just reflect general performance differences within specific tasks, independent of desired social skills (i.e., exercise approach).

For our research, we moved beyond this debate and took a closer look into actual interpersonal behavior shown in ACs. Following a Brunswikian tradition of representative design (Brunswik, 1956), we aimed at sampling a variety of specific cues (physical, behavioral, verbal, paraverbal) elicited by candidates within and across different tasks. With this in mind, we aimed at:

- 1) Identifying observable cues that vary between candidates within AC tasks,
- 2) analyzing the overarching structure of observable cues,
- 3) comparing the structure of observable cues with the structure of desired social skills, and
- 4) investigating the influence and optimal combination of observable cues in predicting AC performance ratings.

Thus, in a first part of this research we mainly considered the right side of Brunswik's classic lens model (Brunswik, 1952, 1956), pertaining to how perceivers

(i.e., AC judges) make sense of a social environment (i.e., AC applicants) by focusing on observable cues (i.e., applicants concrete appearances and behaviors).

For this, we used data of an actual speed AC for the selection of medical students at the University of Münster, Germany. 203 applicants were judged by teams of two judges (overall 60 judges) at ten different exercises. Here, we focused on three 5-minute stations that included short interpersonal role-plays with professional actors (i.e., taking care of a stranger after an accident, persuading a patient to follow specific advice, delivering bad news). The whole AC was videotaped and trained experts rated over 60 behavioral cues for each station. The videos for the respective stations were watched nine times and rated by two to four raters.

For behavioral cues we focused on micro/meso behaviors that were selected based on existing literature (e.g., Borkenau & Liebler, 1995; Gifford, Ng, & Wilkinson, 1985; Grünberg, Mattern, Geukes, Küfner, & Back, 2018) as well as on a bottom-up analysis of observable and varying cues within the videos. Cues were either rated or counted and allocated to key behavioral domains derived from the interpersonal circumplex (Wiggins, 1979) and additional areas (Borkenau, Mauer, Riemann, Spinath, & Angleitner, 2004; Leising & Bleidorn, 2011):

- Dominant behavior (e.g., upright posture, confident flow of words)
- Friendly behavior (e.g., statements of support, active listening)
- Expressive behavior (e.g., lively facial expressions, showing optimism)
- Arrogant behavior (e.g., challenging gestures, interruptions)
- Nervous behavior (e.g., nervous change of position, reinsurance)
- Intelligent/competent behavior (e.g., fluent way of speaking, comparison of arguments)

Furthermore, raters coded task relevant cues that revolved around specific behaviors described in the anchor specification for the judges regarding the respective social skills. This included checklist items (e.g., applicant introduces herself), rating items (e.g., applicant keeps eye contact), and countable items (e.g., applicant verbalizes feelings of patient). Overall, an average of 23 task specific behavioral cues per station were identified and aggregated to one more objective performance score per social skill. Additional groups of lay persons ($n = 20$) also rated physical appearance, professional appearance, as well as first impressions of liking, competence, charisma, and specific social skills.

Preliminary analyses (based on one station) showed that:

- Behavioral differences can be reduced to the broader constructs of *Agency* (i.e., *getting ahead*), *Communion* (i.e., *getting along*), *Nervousness* and *Intellectual Competence*, which all influence subsequent performance judgments.
- Basic behavioral differences can explain subsequent judgments almost as good as task relevant behaviors.
- Task relevant behaviors pertaining to a specific social skill were also related to the judgments other social skills assessed within the same exercise.
- First impressions (rated after 15 seconds) were related to subsequent ratings of judges, but this was fully mediated by task relevant behaviors.

- Appearance related characteristics (when controlling for task relevant behavior) did not influence subsequent ratings.

All these results offer first hints on why judges often cannot discriminate between multiple social skills within one station and how one can design stations to evoke individual differences in desired behaviors/skills. In future research, we want to investigate whether these results hold for the other stations and (using a machine learning approach) identify specific behavioral combinations that most strongly influence subsequent judgments. Furthermore, we aim at investigating specific outcome criteria (e.g., performance of candidates during and after medical school), thus including the left side of the lens model.

In summary, as a first approach to micro-analytically investigate behavioral differences within an actual AC, this study showcases the power of detailed Brunswikian lens model analyses for understanding what ACs can and cannot measure.

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Using Brunswick's Lens Model to Study Strategic Foresight

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This is a brief description of the paper by Felipe Csaszar and Daniella Laureiro-Martinez (2018, "Individual and organizational antecedents of strategic foresight: A representational approach" in *Strategy Science* 3(3) 513–532). This paper studies what determines the ability to make predictions about strategic outcomes, which we term *strategic foresight*. Such ability is central to most theories of competitive advantage, yet little research has studied empirically what drives strategic foresight.

This paper identifies individual- and organization-level antecedents of strategic foresight by analyzing an exercise taken by 358 MBA students. Our method builds on Brunswick's lens model to measure how individuals represent the problem they see and to analyze what characteristics of their representations affect individuals' ability to make predictions about strategic outcomes. Here's how the method works. First, participants watch two videos, each describing a startup's business plan and main product. These startups are trying to raise money on crowdfunding sites. The two startups are chosen for their sharp contrast: although both met their fundraising goals, one went on to technological and commercial success and the other failed. The participants, who have no previous knowledge about the startups, have to predict which will be more successful and explain why by writing an open-ended list of pros and cons for each startup. We then code the pros and cons reported by the participants and classify them into 10 categories, such as marketing, operations, and funding.

This setting is representative of many strategy settings that lack an underlying correct model and in which managers must attend to a stream of unstructured, complex, and uncertain information that must serve as the basis for making a decision. Examples include a manager deciding whether to hire an interviewed applicant, a venture capitalist judging whether a particular startup merits further consideration, or a CEO deciding whether to implement a plan suggested by a subordinate. In all these settings, foresight is reflected in choosing the best available alternative.

Among the individual antecedents, we show that two characteristics of mental representations (namely, their breadth and agreement with consensus) are positively related to strategic foresight. Comparing individual to group performance reveals that groups exhibit greater strategic foresight than do individuals. Finally, from comparing the performance of real-life groups with "statistical" groups (for which decisions are

computed by averaging the predictions of individuals before they become group members), we find that the superiority of group performance is due mostly to aggregating predictions, not representations.

Reference:

Csaszar, F., & Laureiro-Martinez, D. (2018). Individual and organizational antecedents of strategic foresight: A representational approach. *Strategy Science*, 3(3) 513–532.

Analysing the Judgements of Chronic Low Back Pain Case Severity and Future Risk of Disability by General Practitioners in Ireland

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Chronic pain (CP) refers to an unpleasant sensory and emotional experience that relates to actual or potential tissue damage (or described by a person in terms of such damage) that persists for more than three months (i.e., over and above the time to recover from surgery or an injury). It is a major healthcare burden with wide-ranging effects on the individual, their family, society and the workplace - affecting 36% of people living in Ireland, with approximately half of these cases (16-20% of the overall Irish population) having chronic lower back pain (Hoy et al., 2012; Raftery et al., 2011). However, the management of CP, and particularly chronic lower back pain (CLBP), is often difficult. For example, though people living with CLBP frequently present to their general practitioner (GP) for advice and management, appropriate pain management and treatment is often difficult, as approximately 90% of cases of lower back pain are non-specific in terms of underlying pathology (Pillastrini et al., 2012; i.e., there is no identifiable basis for the pain). In addition, there are extensive differences between treatments recommended by GPs and patient treatment preferences (Airaksinen et al., 2006; Coole et al., 2010; Koes et al., 2006), with existing research indicating that both patient and contextual factors influence medical judgements regarding chronic pain (Chibnall et al., 1997).

For example, while 'case severity' is the seriousness of the patient's *current* situation, 'future risk of disability' is based on a more complex interaction of *biopsychosocial* factors (i.e., biological, psychological and social variables (Nicholas et al., 2011), including effects of social interactions, work status, self-esteem, motivation, mobility and sleep problems). Patients living with significant

levels of pain-related disability may be more difficult to treat and often require extensive intervention to improve overall functioning; and thus, assessing the risk of future disability in the early stages of the pain experience (e.g., first three months) is important for the minimization and prevention of disability and prolonged suffering (Nicholas et al., 2011; Rasmussen-Barr et al., 2012).

In recent research by our team at the Centre for Pain Research in NUI Galway, we examined the clinical judgements of 28 GPs in Ireland regarding 34 fictional patients' case severity and future risk of disability through judgement analysis. Judgement analysis (JA) is an idiographic regression modelling technique that has been utilised in healthcare research for the purpose of allocating weighting to judgement criteria, or cues, observed by professionals in their clinical decision-making (e.g., Beckstead, 2017; Wigton, 1996). The primary aim of the study was to model two critical information utilisation tasks performed by GPs with regard to CLBP – combining information cues (i.e. problems with mobility, sleep, motivation, self-esteem, and pain right now) to form a judgement about a hypothetical patient's current case severity and a judgement about the same patient's risk of future disability.

It was hypothesised that the judgement weighting would differ across the two judgements and that judgements regarding future risk of disability would be less consistent among GPs than judgements about case severity, both of which were supported by results from the regression-based JA and subsequent follow-up statistical analysis. Specifically, in comparison of the two judgement types (Beckstead, 2017; Hamm & Yang, 2017), there were significant differences in the relative weight attributable to four of the five information cues included in the JA. Both 'mobility' and 'pain right now' were weighted significantly higher in judgements of case severity than for risk of future disability. The opposite pattern occurred in ratings of motivation and self-esteem, which were weighted significantly higher for future risk of disability than case severity. These findings suggest that participating GPs placed more emphasis on biomedical indicators when judging case severity; and more emphasis on psychological cues when judging risk of future disability.

Results also revealed that the regression models of the future risk of disability judgements captured significantly less variance than the equivalent models of current case severity – indicating that GPs' were less able to base a judgement of future disability on the five information cues of self-esteem, motivation, sleep, pain right now, and mobility than they were when judging current case severity. Coupled with results of a cluster analysis, which identified one cluster of judges regarding case severity compared with two clusters for future risk of disability judgements, these findings indicated that the participating GPs' judgements of future risk of disability were less consistent than their judgements of case severity.

The findings of the current study add to our understanding of how GPs interpret cases of CLBP by drawing attention to the context of the judgement task, with significant differences in weightings of the same cues across different judgement tasks suggesting that through using the same information differently, they were attempting to tailor the information to the demands of particular judgements. Furthermore, the lesser degree of consistency across judgments regarding future risk of disability may suggest a more challenging judgement context than case severity – a finding relevant to extant

research regarding implementation of a biopsychosocial perspective and awareness of associated cues (e.g., motivation and self-esteem) in treatment of CLBP.

Overall, our findings imply that it is becoming increasingly important to identify the judgement 'style' of GPs' judgement-making (e.g. case severity and/or future risk of disability), since this may well influence their approach to management of clinical cases. Building upon these findings, we conclude that future investigation of GPs' clinical judgement-making regarding CLBP patients should utilise JA, not only as a means of weighting cues, but also as a possible means of assessing the *accuracy* of clinical judgements (e.g., through the Brunswik lens model), given its potential use as a method of providing structured feedback on clinical decisions, as well as for teaching judgement-making in clinical settings. Consistent with this suggestion, we are currently examining the effects of an educational intervention, teaching the fundamentals of the biopsychosocial approach, on the weighting, speed and accuracy of clinical judgements by medical students and GP trainees regarding CLBP patients' future risk of disability. However, further research is requisite to achieve a broader perspective on the judgment policy of GPs and medical students with respect to CLBP-related case severity and future risk of disability.

This research was completed at the National University of Ireland, Galway through collaboration with Hannah Durand, Andrea Gibbons, Bronagh Reynolds, Edel Doherty, Sinead Conneely, Brian Slattery and Andrew Murphy, as well as invaluable advice from Rob Hamm from the Department of Family & Preventive Medicine, University of Oklahoma Health Sciences Center.

For the full article, please see:

Dwyer, C. P., MacNeela, P., Durand, H., Reynolds, B., ..., McGuire, B. E. (2018). Judgment analysis of case severity and risk of future disability of chronic low back pain patients by general practitioners. *PLOS ONE*, 13(3): e0194387.

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Feedback Learning and Multiple Goal Pursuit in an Electricity Consumption Task

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The overall aim with the thesis (Guath, 2018) was to investigate how learning to pursue two conflicting goals (cost and utility) in an electricity consumption task is affected by different forms of feedback, goal phrasing, and task environment. The electricity consumption task tried to mimic the situation that confronts a person who is given feedback by an in-home-display (IHD). The research question was motivated by applied research investigating the efficiency of outcome feedback on electricity consumption via in-home displays points at modest reductions (2-4%, Klopfert & Wallenborn, 2011). This is not surprising from a cognitive psychological perspective, with a wealth of research showing that learning with outcome feedback is problematic (e.g., Brehmer, 1980; Kluger & DeNisi, 1996).

A new experimental paradigm, the simulated household, that captures the cognitive task that confronts people when trying to regulate their electricity consumption, was developed. The experimental task is a development of multiple-cue-probability learning task (MCPL, e.g., Balzer, Doherty, & O'Connor, 1989). The current task contained no less than 18 cues, representing the different electricity applications in a small household, and they were combined into two criteria: total cost and total utility. The cost was a linear function whereas the utility was a non-linear function, and they were conflicting in the sense that increased utility typically resulted in an increased cost. The task for the participant was to regulate the cost and the utility in the house during a period of 28-120 days (depending on the study). The participants could either approach the task by optimising or saving (see Figure 1), the former involved cutting the costs at the expense of the utility, while the latter implied improvement on both variables.

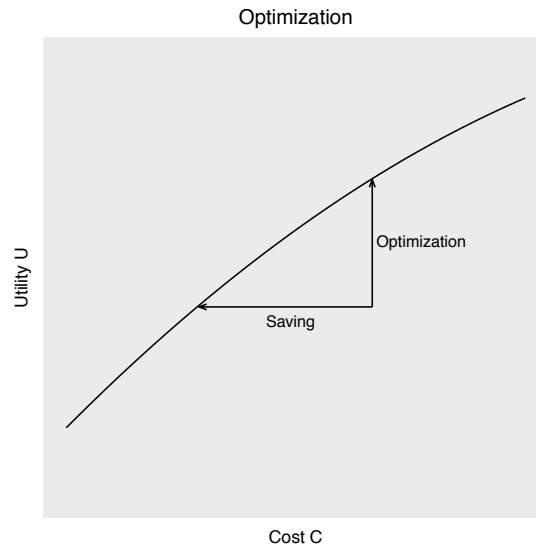


Figure 1. Schematic illustration of the decision problem that confronts the experimental participants, which is to maximize the utility obtained by the fictive household inhabitant given the cost expended on electricity consumption. The intersection between the lines illustrates a possible state when the cost budget is met and the two principal directions for improved electricity efficiency, saving and optimization.

In three studies, different aspects of the problem of regulating one's consumption was investigated. *Study I* (Juslin, Elwin, Guath, Millroth, & Nilsson, 2016) investigated how different feedback in terms of frequency, detail, and presence of random noise or not affect performance. It also investigated if participants pursued the goals sequentially or simultaneously and if they were able to derive a model of the task. Results showed that frequent feedback was beneficial only in a deterministic system and, surprisingly, random noise improved performance by highlighting the most costly appliances. Modelling results indicated that participants pursued goals sequentially and did not have a mental model of the task.

Study II (Guath, Millroth, Julsin, & Elwin, 2015) investigated if a short feedforward training could replace or complement outcome feedback. Results indicated that the performance with one of the feedforward training schemes led to comparable performance to outcome feedback only. The best performance was obtained when this feedforward scheme was combined with outcome feedback.

Study III (Guath, Juslin, & Rackwitz, 2018) investigated if the sequential goal pursuit observed in Study I was related to interpretation of the task or cognitive limitations by specifying goals for cost and/ or utility. Further, it investigated the reason for the cost prioritisation. Results indicated that the sequential goal pursuit derives from cognitive constraints.

Together, the results suggest that although people are able to regulate the electricity consumption in a complex environment, they i) pursue the goals sequentially and ii) instant outcome feedback may harm performance by distracting people from the most important and costly appliances to the appliances that allow large variability in use.

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Behavior Settings and the Causal Texture of the Environment?

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In their 1935 Psychological Review paper, Tolman and Brunswik urge psychologists to extend their analyses of psychological phenomena beyond consideration of organismic processes alone to include their relations to the “causal texture” of the environment. The causal texture is attributable to that fact that “different [environmental] events are regularly dependent upon each other” (p. 43); and later Brunswik (1957) adds that “the texture of the environment . . . extends in depth away from the common [organism-environment] boundary “(p. 300).

If we reflect on the past half century of psychological research, we find that few in psychology have heeded Tolman and Brunswik’s call to attend to the causal texture of the environment. The one notable exception is James Gibson (1979) whose ecological approach to perception stands out as a detailed analysis of the environment from a psychological perspective. However, while Brunswik and Gibson agreed that psychological inquiry should begin with a focus on organism-environment relations and that a careful consideration of the environment was essential in doing so, their conceptual approaches were starkly different (see, Gibson, 1957; Kirlik, 2001). Various contributors to Hammond and Stewart’s (2001) important volume on Brunswik acknowledge Gibson’s efforts in this regard.

¹ As an historical footnote, my mentor in graduate school who very much shaped my thinking was one of Brunswik’s last graduate students, Joachim Wohlwill.

That said, there remains a striking omission in this volume. Absent, except for a passing comment (Ash, 2001, p. 463), is any consideration of the landmark work on the environment from an ecological perspective by Roger Barker (1903 – 1990). This omission is especially surprising because Barker, unlike Gibson, explicitly draws on Brunswik's conceptual framework in developing his approach. And it is not the case that Barker was omitted because he would be considered a minor figure in psychology, having received the APA Award for Distinguished Scientific Contributions in 1963. Indeed, an essay by Barker was included in Hammond's (1966) earlier edited book on Brunswik. Recognition of the theoretical significance of his work has been overlooked in much of psychology because of the naturalistic methodology he employed and because his primary discoveries demand that psychologists consider a level of analysis that is not customary to psychological thinking. Barker's (1968) research brings to light eco-psychological structures that extend "in depth" and in scale in ways seemingly unanticipated by Brunswik.

Barker's distinctive research program began with a Brunswikian insight. In spite of the fact that by the 1940s Barker had accrued considerable experience studying children in the laboratory, he came to the realization that he had little knowledge about children's everyday lives in their communities. This limitation is characteristic not only of the study of child development, but in experimental psychology generally. In the absence of information about how often and under what conditions actions and events occur under daily circumstances, the everyday significance of any laboratory finding or the representative character of any laboratory arrangement cannot be assessed. Barker came to see this problem play out with regard to his own previous experimental collaborations. Barker, Dembo, and Lewin (1941) famously established experimental support for the frustration-regression hypothesis among children studied in their laboratory; but years later after Barker accumulated detailed records of children's activities in everyday settings, he found that the conditions they had previously induced in the laboratory rarely occurred in the everyday lives of children they had studied. Lacking the kinds of records common in other sciences that provide information about the frequency, distribution, and circumstances of occurrence of its primary phenomena under typical circumstances, psychology is generally at a loss to evaluate the relative representativeness of its laboratory-based findings and designs. Barker and his colleagues set out to amass such information through detailed naturalistic observation of children's activities in a small town.

Space only permits brief mention of one notable discovery that emerged from this work. Barker attempted to determine if causal regularities could be found in the patterns of behavior that were observed. To his initial surprise, antecedent actions from social others (e.g., directives) were comparatively poor predictors of children's observed actions. He realized that in order to account for what a child might be doing at any particular time that he needed to adopt a higher-level unit of analysis than is common by psychologists. Children's actions were best accounted for by knowing 'where' they were in the community at a particular time, rather than knowing about their intrapersonal qualities or the immediate actions by others directed toward them. Importantly, 'where' is best understood in an eco-psychological vein with respect to objective dynamic structures that emerge out of and are sustained by collective actions of individuals with the support of materials features ('milieu') in some location over some duration of time. Barker called these specifiable higher-order units of joint action and milieu behavior settings. Commonplace examples of behavior settings

include classroom sessions, operations of stores, group games on playgrounds and elsewhere, family dinners, music and dance practices/performances, public libraries, worship services, to name just a few. While there is variability in actions among individual children in any behavior setting, these actions are constrained (i.e., the degrees of freedom limited) by virtue of their participation in those settings. In other words, a specific occurrence of a behavior setting is an emergent functional dynamic structure that comes into existence owing to a pattern of actions among individuals operating within certain normative constraints. The dynamic integrity of the behavior setting is only preserved if its participants act within particular constraints. Indeed, to be a participant in any setting means that one must operate within those constraints that make that very setting possible.

This discovery of behavior settings is in fact congruent with one of the features of adopting an ecological perspective, and one, as far as I can tell, that escaped Brunswik's attention. The environment from an ecological perspective has a nested hierarchy of dynamic, quasi-stable systems. A science that only seeks an underlying fundamental level of explanation misses the nested levels of dynamic systems structure in nature entirely. A system-oriented approach, which presumably Brunswik had sympathies with (Cooksey, 2001), recognizes that higher-order dynamic structures can emerge from the interdependent relationships that operate among their constituent entities. Barker showed that the "causal couplings" Tolman and Brunswik identified as operating within the level of analysis of organism-environment relations also exist between levels of analysis, as relations operating at one level of analysis can give rise to and are inversely constrained by higher-order dynamic structures to be found only at an extra-individual level of analysis.

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**Can People Tell Whether Their Beliefs and
Judgments are Correct or Wrong?**

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Brunswik (1955) has voiced a plea for a representative design that respects the conditions to which our mind has adapted through evolution and learning. Advocates of the ecological approach (Gigerenzer, Hoffrage, & Kleinbölting, 1991; Hoffrage & Hertwig, 2006; Juslin, 1994) have argued that some of the cognitive illusions that had been documented in the literature, such as the overconfidence bias, are not real but stem from researchers' failure to sample items representatively from the organism–environment relation in the naturally occurring ecology. Indeed, several experiments indicated that when items are selected randomly from their reference class, the overconfidence bias is either strongly reduced or entirely eliminated (Gigerenzer et al., 1991; Juslin, 1994).

However, it has not been always realized that because of people's adaptation to reality, representative samples of items are bound to be biased, yielding object-level accuracy (OLA) that is considerably better than chance. Thus, when two-alternative, forced-choice (2AFC) items are sampled representatively, OLA – the percentage of correct answers – is much better than chance for many domains. Such was also the case for the studies that have been found to yield good calibration.

The study reported by Koriat (2018) concerned resolution rather than calibration. Results across many domains indicate that people are skilled at discriminating between correct and wrong answers, endorsing the former with higher confidence than the latter. In fact, in many attempts to model choice and decision behavior, researchers have relied heavily on confidence judgments, taking their diagnostic validity for granted. Koriat (2018) examined the question whether the high meta-level accuracy that has been observed in many studies is due to OLA being generally better than chance. Using 2AFC items from several domains, confidence was significantly higher for correct than for wrong choices across consensually-correct (CC) items for which $OLA > 50\%$. In contrast, for consensually-wrong (CW) items, for which $OLA < 50\%$, confidence was consistently higher for wrong choices than for correct choices. This crossover interaction was obtained across 16 experiments using a variety of tasks, which included word matching, general knowledge, perceptual comparisons, judgments of geographical relations, recognition memory, and the prediction of people's social beliefs, social attitudes, and personal preferences. A similar pattern was obtained using a systematic design in which items were sampled systematically to cover the full range of OLA (0-100%). Thus, for CW items, the same person was more confident in his/her wrong choices than in his/her correct choices,

and for a given item, those who chose the wrong answer tended to be more confident than those who chose the correct answer. The results were interpreted in terms of the Self-Consistency Model of subjective confidence (Koriat, 2012). According to this model, when presented with a 2AFC item, people sample a number of cues from memory. Their choice is based on the balance of evidence in favor of the two options, and their confidence is based on the consistency with which that choice was supported across the sampled cues. Because people tend to sample their cues largely from the same population of cues, inter-person consensus is a proxy to within-person consistency. Thus, self-consistency is diagnostic of accuracy for the representative, CC items, whereas for CW items it is counterdiagnostic of accuracy.

A similar pattern of results was reported for Feeling-of-Knowing (FOK) judgments. Koriat (1993) argued that when the retrieval of a memory target fails, FOK is based on the amount of partial information accessed about the elusive memory target regardless of the correctness of that information. Indeed, both correct partial information and wrong partial information were found to contribute equally to the FOK. However, FOK judgments were, nevertheless, accurate in predicting the future recognition of the memory target because most of the partial information retrieved was correct. Thus, FOK judgments are accurate because memory itself is accurate by and large. Indeed, the FOK-recognition relationship was found to be positive only across typical (“representative”) memory questions that tend to elicit primarily correct partial information, whereas for questions that tend to elicit a preponderance of incorrect partial information, the FOK-recognition relationship was negative (Koriat, 1995).

Altogether the results provide strong support for Simon’s notion of bounded rationality (1956; 1982) and for the theoretical framework of Gigerenzer and his associates on fast and frugal heuristics (see Gigerenzer, Hertwig, & Pachur, 2011). Simon argued that people do not strive for general algorithms that provide optimal solutions under all conditions, but make do with satisficing heuristics that yield reasonable solutions that fit the architecture of a particular environment. Confidence judgments and FOK judgments would seem to rely on frugal, “bounded” heuristics that have been specifically tailored to the ecological structure of the natural environment for which OLA tends to be better than chance by and large. Although these heuristics are liable to yield illusions of knowing for a few unrepresentative items (Koriat, 1998), they have the advantage of being fast and frugal, and of producing metacognitive judgments that are accurate for most items in the natural environment. Perhaps the best evidence for the overall usefulness of these heuristics is the failure of researchers to recognize that our ability to tell between correct and wrong judgments is confined to the probability structure of the world we live in.

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The Relation of Personality and Intelligence— What Can the Brunswik Symmetry Principle Tell Us?

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Personality and intelligence are defined as hierarchical constructs, ranging from broad *g*-factors to specific constructs. However, studies examining the relationship between personality and intelligence have often not considered the hierarchical structure of both constructs. Thus, widely reported small or zero correlations between personality and intelligence could be an effect of asymmetrical comparisons according to the Brunswik symmetry principle (Wittmann, 1988).

The aim of the present project (Kretzschmar et al., 2018) was to investigate whether different combinations of hierarchical levels lead to different personality-intelligence correlations as expected by the Brunswik symmetry principle. The focus of the first study ($N = 682$) was an elaborated measurement of personality (NEO-PI-R), which was applied with a relatively short intelligence test (Intelligence Structure Test 2000 R, Amthauer et al., 2001). In the second study ($N = 413$), a comprehensive measurement of intelligence (Berlin Intelligence Structure test) was used with a shorter personality questionnaire (NEO-FFI). In line with the Brunswik symmetry principle, our findings emphasize that personality-intelligence correlations varied greatly across the hierarchical levels of constructs considered in the analysis. On average, openness to experiences showed the largest relation with intelligence. With regard to intelligence, the highest correlations with personality traits were found for the most specific cognitive abilities (e.g., verbal reasoning). Furthermore, correlations of some specific combinations of personality and intelligence constructs were substantially larger (up to $r = .52$) than reported in the literature, which did not differentiate the hierarchical structure on a fine-grained level.

We recommend for future studies to investigate personality-intelligence relations at more fine-grained levels based on elaborated measurements of both personality and intelligence. This makes it possible to explicitly consider the hierarchical structure of the constructs and the Brunswick symmetry principle, which can unmask substantial personality-intelligence relations.

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

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Phishing emails, malicious messages designed to appear legitimate in an attempt to get individuals to conduct compromising actions, pose a continuously growing threat to cybersecurity. Existing user training and automatic filtering techniques are not grounded in cognitive theory and thus have limited effectiveness. As such, there is a real need to understand how users identify phishing emails. Because the lens model provides a means of analyzing both the environment and the human users, we hypothesized that it would be a more effective way of understanding the phishing problem than conventional approaches. Further, recent literature suggested that cognitive automaticity plays a critical role in phishing victimization (Vishwanath et al., 2018). The overlap between the lens model and the cognitive continuum theory (CCT; a human judgment theory that places cognitive modes along a continuum from intuitive to analytical cognition) also suggests that the effect of automaticity (intuitive cognition in CCT terms) on phishing detection could be studied at a higher fidelity than was previously possible (Hammond et al., 1987). The lead author's dissertation focused on applying the lens model and the CCT to phishing. This aimed to satisfy three objectives: validating the lens model approach for the analysis of phishing email judgments, exploring the differences in lens model approaches within this domain, and applying and extending the lens model's analysis capabilities with the CCT to better

understand the phishing problem. Results from the first objective were published in Molinaro and Bolton (2018), manuscripts regarding the others are in preparation.

Because judgment analysis (JA) had not been previously applied to the phishing domain, it was necessary to assess whether the statistical assumptions of JA with multiple linear regression were upheld. We hypothesized that phishing cues are linearly combinable because each adds additional evidence that an email is phishing, meaning a lens model analysis was appropriate for evaluating phishing judgments. To test this, ten participants, who judged whether or not emails were phishing, were analyzed using the double system lens model. Results showed that the lens model is an effective means of analyzing phishing judgments. This was indicated by a high environmental predictability value, which showed that the judgment environment was well represented by a linear model. Thus, the non-linearity of the environment was not a performance limiting factor for the judge. High cognitive control values indicated that humans do use linear judgment strategies, meaning a linear regression model adequately captured the human’s judgment policy.

Both the criterion and judgment in the data used throughout this work were dichotomous. Thus, it was necessary to investigate the statistical and practical differences between the four most appropriate lens model approaches for handling dichotomous variables (linear, logistic, confidence-adjusted, and hybrid, see Table 1).

Table 1. *Overview on four lens model handling dichotomous variables.*

	Judgment		Criterion	
	Type	Model	Type	Model
Linear	Dichotomous	Linear	Dichotomous	Linear
Logistic	Dichotomous	Logistic	Dichotomous	Logistic
Confidence-adjusted	Continuous	Linear	Dichotomous	Linear
Hybrid	Continuous	Linear	Dichotomous	Logistic

Partially modeled by Hamm and Yang (2017), comparisons included lens model statistics, cue weight rankings, and prediction accuracy using cross-validation. A second, larger dataset with 74 judges was analyzed. Results indicated differences between the lens model statistics computed for the four methods based on the type of regression used to evaluate the environment. Specifically, the approaches that fit a logistic model to the criterion provided the best decomposition of the phishing judgment domain. Because there were no significant differences between statistics from the logistic method and the hybrid method, and the hybrid method had other practical disadvantages, it was concluded that the logistic method was the most appropriate for evaluating phishing judgments. Logistic regression also exhibited the most accurate predictions for both the criterion and for individual’s judgements.

The lens model and the CCT were then used to understand the cognitive aspects of the task and the participants’ judgments. This used the logistic lens model method results from objective 2. For this, a task continuum index (TCI) score from one to ten was calculated using the number of cues, the average inter-cue correlation, the

standard deviation of cue weights, the degree of non-linearity in the organizing principle, and the degree of certainty in the task system. This resulted in a TCI score of 7.574, indicating a more analysis-inducing task. A cognitive continuum index (CCI) score from one to ten was calculated for each participant using cognitive control, the degree of non-linearity in the judge's organizing principle, the response rate, overestimation (the difference between perceived accuracy and actual accuracy), and overprecision (the difference between average judgment confidence and judgment accuracy). Low overestimation and overprecision values indicated more analytical cognition (Wang et al., 2016). A high CCI score corresponded to more analytical cognition. Achievement and CCI score had a positive, strong, statistically significant correlation. Achievement and the absolute value of the difference between the CCI and TCI scores had a strong, negative, statistically significant correlation. Not only do these results support the previous phishing research because judges using more analytical cognition performed better, but they also uncover the effects of task characteristics on cognition in the phishing domain. Using cluster analysis, participants were grouped based on judgment policy (cue weights), which resulted in three clusters. Cluster comparisons indicated that clusters 1 and 3 were not significantly different based on CCI score, achievement, C-product sum (the amount of achievement explained by unmodeled components), and G-product (the amount of achievement explained by modeled components), but CCI score, achievement, and G-product were all significantly lower in cluster 2. The C-product sum was significantly higher in cluster 2. There were no significant differences in explained achievement (the proportion of achievement that the judgment and criterion models explain) between clusters. These results indicate that, while there were three different judgment policies, two did not have any differences in achievement, highlighting the role of vicarious functioning. Although the amount of achievement explained by the modeled and unmodeled components differs between clusters, the lack of a significant difference in explained achievement means the models consistently explained achievement regardless of cluster. When comparing the specific odds ratios for each cue between clusters, the main difference between the highest and lowest achieving clusters was in the utilization of the suspicious link and URL hyperlinking cue. This result, combined with the significant differences in CCI score, seem to suggest that for those cues to be appropriately utilized more analytical cognition is required from the judge.

This work builds upon the lens model, CCT, and phishing literature by combining established and novel measures and analysis techniques to provide a more comprehensive understanding of the phishing domain. Results indicated that the lens model, especially the logistic method, is effective for evaluating phishing judgments. CCT analyses evaluated the cognitive implications of the task and judgments. Results supported the posited relationship between automaticity and victimization and highlighted differences between judgment policy groups. This gives analysts the ability to understand how to apply JA to the phishing domain. This will be vital for providing a theoretically grounded basis for mitigation and training approaches.

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Remembering Ken Hammond – Reflections on the Top 10 Personal Influences

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I met Ken Hammond at a JDM meeting when I sat next to him for lunch. At that time, I was a human factors research scientist at NASA Ames Research Center. I was excited to be introduced to the Cognitive Continuum guy! His research was not only highly interesting, but also, as we discovered, very related to my own. His work and his mentorship proved to be invaluable to me as I set my research agenda, and the ‘Top 10’ list here reflects the ways in which Ken Hammond influenced my own research and career path. It is my personal reflection, but also reveals the breadth and importance of Ken’s work.

10. Cognitive Continuum

During our JDM lunchtime discussion, Ken and I discussed the work I was doing at NASA. At some point during the meeting, my friend Linda Skitka and I coined the term ‘automation bias’ to describe what I had seen professional pilots do in a simulator study of an electronic checklist. The checklist was designed to be a back-up for the pilots’ own manual systems check – but we found that most pilots used it instead of doing their own check, and did not look at the cockpit indicators to see whether they confirmed what the checklist was saying. It was so much quicker and easier just to rely on the checklist! These responses to the electronic checklist as well as to other automated systems fit well with the Cognitive Continuum framework. Instead of using automation as an analysis tool or as a backup to their own analysis, pilots were using it as a shortcut – a heuristic – thus putting their interactions at the intuitive rather than the analysis end of the Cognitive Continuum, a practice that opened the door for complacency and automation-related errors. Our subsequent work examined the specifics of this phenomenon.

9. Features of the task elicit specific types of cognition

The Hammond, Hamm, Grassia and Pearson (1987) article describing how features of the task elicit different types of cognition – for example, numbers elicit analysis; pictures and graphs elicit intuition – gave me important insights into the responses of pilots and others to automated systems: In essence, designers had created automated systems and displays with ‘Intuitive’ features that elicited intuitive cognition when the

systems actually required analysis. This has been an underlying factor in many aviation accidents and incidents.

8. Brunswik Society

Ken introduced me to the Brunswik Society and encouraged me to present the aviation work at Brunswik Society meetings. This provided access to a network of like-minded researchers with whom I've consulted or whose work I've examined. I would not have found you otherwise!

7. Brunswikian Theory – Representative Design, Lens Model – and applications

Needless to say, the theories and models from Brunswik – as well as the applications of the theories and models – definitely informed my work. I was part of a small group that pursued applications of lens model in human factors work. Representative design was an appropriate guiding concept for human factors design – implemented via studies in the lab, simulator, analog environment, and actual environment using students, lay adults, and professionals. We sought converging evidence...

6. Coherence & Correspondence

In terms of theory, the most significant influence Ken had on me was the introduction to the frameworks of coherence and correspondence, and these became cornerstones of my work. With these frameworks, I was able to describe the evolution of the aircraft cockpit, and discuss transformation of a formerly correspondence-driven environment into a complex hybrid ecological system, combining probabilistic cues with electronic data and information. I was able to make the case that the electronic side of the environment demands more formal cognitive processes than does the continuous ecology of the naturalistic world. So judgment and decision making in a hybrid ecology require coherence as the means to correspondence.

These concepts became very important in the aviation research I was doing. Recognition of analytical coherence as a strategic goal in hybrid ecologies carries implications for research models, as well as for the design of systems and decision aids.

5. Ken loved aviation

You may know that Ken was an aviation buff – he had friends that were pilots and he loved to fly. This was something we had in common, and we had many discussions about pilots, aviation, technology – and decision making. Our ongoing debate was about whether the safest road was always to follow the automation – his opinion, backed by examples of pilots who experienced spatial disorientation and followed the seat of their pants rather than their instruments (a potentially disastrous course of action) was that pilots should learn to trust in and follow automation. My view, backed by my research in automation bias, was much more skeptical.

4. Ken made me a hero to my students

I remember once Ken visited my lab during a visit to the Bay Area. He met with my students and we took him to lunch. We had just read one of his papers on coherence and correspondence for discussion in the lab – it was relevant to the project we were doing. The students were so impressed that I knew Ken, that he would come to the lab and talk to them, and that he asked them questions about the research and about their own plans and goals. So I was a hero thanks to Ken (at least for a while!).

3. Ken believed in my work

Ken believed that the applied psychology work I was doing was important – although he encouraged me to be more theoretical in my thinking... He read my grant proposals and gave me insightful feedback, and it was something for me to know that Ken Hammond valued what I was doing and found it to be interesting – particularly the coherence/correspondence work.

2. Ken encouraged me to go Beyond Rationality and toward Wisdom

Ken's book *Beyond Rationality: The Search for Wisdom in a Troubled Time*, was particularly important to me, and is also critically important and relevant for us now. I don't think Ken would be happy to see what is happening in the world today.

1. Ken was a wonderful friend and mentor

Top on my list and bottom line of my reflections, Ken Hammond was a wonderful friend and mentor to me. I miss him, and I am forever indebted to him. Thank you for inviting me to say so!

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News from the Past Year

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My big news is that I retired from Texas A&M University, effective June 1, 2018. Mandeep Dhama and I organized a meeting of the 25th International Meeting of the Brunswik Society to commemorate Ken Hammond's 100th birthday. It was held in Vancouver, British Columbia in November 2017. I thought the meeting was terrific; if interested you can see the program, which was published in last year's 2017 edition of the Brunswik Society News.

The meeting was a good spur to Mandeep and me to finish our paper on Ken Hammond's contributions to judgment and decision making research. No individual was more important in perpetuating Ken's legacy than was Ken. The paper was published in *Judgment and Decision Making* earlier this year; the reference is

Dhama, M. K., & Mumpower, J. L. (2018). Kenneth R. Hammond's Contributions to the Study of Judgment and Decision making. *Judgment and Decision Making*, 13(1), 1–22.

Also at the Brunswick meeting, Roland Scholz made a presentation in which he applied Brunswikian ideas in two seemingly rather disparate domains – visual perception and sustainable transitions. I commented on the paper at the meeting and published my comment, which (along with a number of additional comments) accompanied Roland's article in *Environment Systems and Decisions*.

Mumpower, J. L. (2018). Comment on Scholz's Managing Complexity: From Visual Perception to Sustainable Transitions—Contributions of Brunswik's Theory of Probabilistic Functionalism. *Environment Systems and Decisions*, 38, 65–68. doi:10.1007/s10669-017-9658-1

I published several other papers, although most of these were not distinctively Brunswikian in their orientation:

- Rutherford, A., Bello-Gomez, R., Mumpower, J. L., & Griffin, M. (In press). Understanding vacancy time: A theoretical framework informed by cross-sector comparison. *Perspectives on Public Management and Governance*.
- Liu, X., Mumpower, J. L., Portney, K. E., & Vedlitz, A. (In press). Perceived Risk of Terrorism and Policy Preferences for Government Counterterrorism Spending: Evidence from a U.S. National Panel Survey. *Risk, Hazards, & Crisis in Public Policy*.
- Mumpower, J. L., & Luk, S. Y. (2017). Siting High-Level Radioactive Waste Disposal Facilities: Lessons from a Half Century of Many Failures and Few Successes. *International Journal of Policy Studies*, 8(2), 1–28.
- Lindell, M. K., Mumpower, J. L., Huang, S. K., Wu, H. C. (2017). Samuelson, C. D., & Wei, H. L. Perceptions of Protective Actions for a Water Contamination Emergency. *Journal of Risk Research*, 20(7), 887–908.

A few other papers, including one on Viscusi and Zeckhauser's recollection bias in risk perception, are in various stages of the review process. Jim Holzworth, Tom Stewart, and I continue working on what will probably be the final paper from a series of studies that we conducted regarding the ability of judges to make selection and detection decisions under varying conditions of base rate, uncertainty, and payoff.

Music Listening and Stress in Daily Life – A Matter of Timing

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We and others have shown that music listening may reduce stress. Previous evidence on this stress-reducing effect was gathered in quasi-experimental studies (Thoma & Nater, 2011). However, findings from these studies are quite heterogeneous, as they differ in terms of experimental design, music selection, and participants, making comparisons across studies difficult. Furthermore, in such quasi-experimental studies, participants are most often investigated only once, in one artificial setting (e.g., before/after surgery, before/after a standardized stress test). Thus, research into the effects of music listening in various situations of daily life is warranted. Ambulatory assessment (Kubiak & Stone, 2012) – as a complementary tool to laboratory research – enables psychological phenomena to be studied in an ecologically valid way (Sloboda, O’Neill, & Ivaldi, 2001). The roots of this approach can be traced back to Brunswik’s representative design approach (Brunswik, 1955).

Using an ambulatory assessment approach, as described in Linnemann, Strahler and Nater (2017), we have previously shown that music listening reduced both subjective stress and cortisol, but only music that was listened to for the reason „relaxation“ yielded lower subjective stress and cortisol (Linnemann et al, 2015). We also showed that subjective stress and cortisol was lowest when subjects listened to music in the presence of others (Linnemann, Strahler, & Nater, 2016). In our previous studies, we only asked whether participants had listened to music since the last measurement point, but no information was collected on when exactly and how long they were listening to music. We therefore tested whether there was an association between self-reported stress levels and music listening when music listening was objectively tracked. We also explored the temporal dynamics underlying the association between music listening and stress in terms of duration (that is, the duration of music listening that is necessary to be associated with beneficial effects) and latency (that is, how long it takes for music to exert beneficial effects).

We examined a sample of 60 participants (37 women), aged 18 to 34 years ($M = 22.4$ years, $SD = 3.5$). Informed consent was obtained from all individual participants included in the study. Participants received instructions on how to use the electronic diary device. Since participants were instructed to listen to music only using the study device via the application ‘Simple Last.fm Scrobbler’ (The SLS Team, 2016), the music files to which they intended to listen during the ensuing week were uploaded onto the electronic diary device. Then, the use of the application was explained. The ‘Simple Last.fm Scrobbler’ application automatically logged the exact time point of music

listening for any song that was listened to for at least half the duration of the track. The collected data on music listening for each participant were saved on the Last.fm servers (Last.fm Limited, London, UK). Starting from the next day, for a total of six or seven consecutive days, participants received six signals over a time window of 12 hours, beginning at 10:00 am. Upon each signal, participants were asked to complete items concerning stress, mood, and music listening behavior, among others.

Employing multilevel logistic regression using the self-reported data on music listening we found a significant negative association between music listening and stress. Participants indicated lower levels of stress when they reported current or past music listening ($M = 1.09$, $SE_M = 0.06$) in comparison to no music listening ($M = 1.19$, $SE_M = 0.06$). However, objectively assessed music listening via the 'Simple Last.fm Scrobbler' application was not significantly associated with stress. Participants indicated similar stress levels when there was current or past music listening ($M = 1.13$, $SE_M = 0.07$) in comparison to no music listening ($M = 1.10$, $SE_M = 0.06$). Thus, although the subjective data replicated previous evidence that music listening is associated with stress reduction, this association was not replicated using the objective measure of music listening.

We also tested how long participants needed to listen to music in order to significantly detect an association with stress. This analysis revealed that music listening begins to be associated with reduced stress levels after around 20 minutes. Next, we tested the latency of associations between stress and music listening. As a subjective measure of the latency of this association, we compared whether self-reported music listening at the current moment had a stronger association with reduced stress levels than having reported listening at a time point between the current and the previous signal. We found that the objectively assessed time lag demonstrated a significant negative relationship with subjective stress levels, insofar as self-reported stress levels decreased with an increasing time lag between the most recently played track and the current signal. These results demonstrate that beneficial associations between music listening and stress seem to occur in a time-delayed manner and not during the act of music listening per se.

Our findings suggest that only subjectively assessed data on music listening capture effects of mere music listening on stress. When temporal dynamics of this effect are of interest, subjectively reported data on music listening should be complemented by objective data on the exact time of music listening.

Note: additional details on this study can be found in Linnemann et al. (2018).

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What Is Representativeness?

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The overall aim with Brunswik's representative concept suggests some principles when choosing stimuli conditions or cues representing a broader context ("mother population") to which we want to generalize our results (Brunswik, 1955). In Fig. 1 we suggest a hierarchical approach, where representativeness refers to relations between different stages along an abstract-concrete dimension, starting with an overruling goal. Based on Flanagan's critical incident method, we have, in our nursing research, described situation differences to be taken into consideration when constructing task descriptions for decision-research or educational purposes. Many of our situations demonstrate that nurses work under severe stress conditions. However, time as a situation variable is seldom observed in decision studies. Hammond (1996) writes: "many judgments and decisions, even very important ones, are made in brief periods of time ...perhaps in few minutes of time....Often there is virtually no time for thought...the restriction of research to those situations that permits very little time points to obvious limitation to current generalizations about the cognitive competence of human beings. Time limitation should be kept in mind" (p. 192).

Human capacity to detect causal relations is in many ways restricted, due to lack of attention to seemingly trivial initial events. Much human behavior is elicited by such cues, e.g., social skills and emotional reactions. This phenomenon, i.e., that seemingly unimportant, overlooked cues (events) may trigger exponential development of consequences has been called the butterfly effect, a name proposed by Edward Lorenz in a lecture about Predictability (29 December, 1979). A modern version of how modest, initial influences may result in large scale effects in everyday life is presented by Thaler and Sunstein (2009).

Questions about generality and causality in decision research are closely related to the concept of representativeness. According to Kahneman (2011) this concept seems mainly to be an intra-psychic attention phenomenon, likely leading to dependent variables in terms of choices or preferences. In Brunswikian research representativeness has a quite different connotation focusing on dependent variables in terms of environmental dimensions or aspects (Hammond, 1996). Hammond is well aware of this conceptual difference. In the Brunswik Annual Newsletter of 2012 Hammond writes: "For Brunswik representativeness is an objective, measurable

relation between the cues attached to the objects in the real world (or the parent population) and the cues presented by those objects—yet it took psychologists roughly 50 years to accept the central idea that if they wanted to generalize their result ...they would have to meet the standard statistical requirements of representativeness.... Regrettably, few psychologists have grasped this yet” (pp. 22–23).

The following circumstances might throw some light on this dilemma.

- 1) Environmental domains to be represented in Brunswikian research are today not stable. Under such circumstances research results run the risk of losing their content validity.
- 2) To define an environmental parent population from which to construct content-valid tasks (samples) for example vignettes, often requires interdisciplinary cooperation. Sometimes specialists are on speaking terms with each other, sometimes not.
- 3) In Scholz and Steiner (2015) we find a description of the complexity of interdisciplinary research projects, briefly presented in our context as follows:
 - 1) Need for experiential knowledge
 - 2) Integrating intuitive and analytical approaches
 - 3) Societies' different historical and cultural backgrounds
 - 4) Differences with regard to values and preferences
 - 5) A holistic approach aiming at sustainable actions and results

An aspect or value-based approach

The parent population to which we want to generalize our sampling results in our nursing study can be described on different levels of abstraction. On a low abstraction level we might find that demands on skills and knowledge change relatively fast. If we move higher up on the concrete-abstract ladder (see Fig. 1) we might find that certain levels, i.e., aspect- or goal-levels, are more permanent, despite uncertainty on more concrete levels. Accepting this approach, we start with defining our parent population in terms of overarching general goals or values. This need for general goal descriptions in research contexts is briefly described by Flanagan (1954). His first credo states: No planning and no evaluation of specific behavior is possible without a general statement of objectives. To illustrate such general goals, we present the following goal description from the Swedish Health Care Law, 1982: “Healthcare should be given with respect for all humans' equal value and for the individual's self-esteem.” Certainly Swedish health care laws have been revised since 1982, but the social norms and values have remained. This emphasis on everybody's equal value and security is described by Saltman and Bergman (2005) as based a very old tradition going back as early as AD 1000 when the tribal chieftains met as the Viking Parliament (Thing) in Uppsala. Following Flanagan's advice above, we place the two general goals “everybody's equal value” and “security” on the top of our abstract-concrete ladder (Fig. 1).

THE ABSTRACT-CONCRETE LADDER

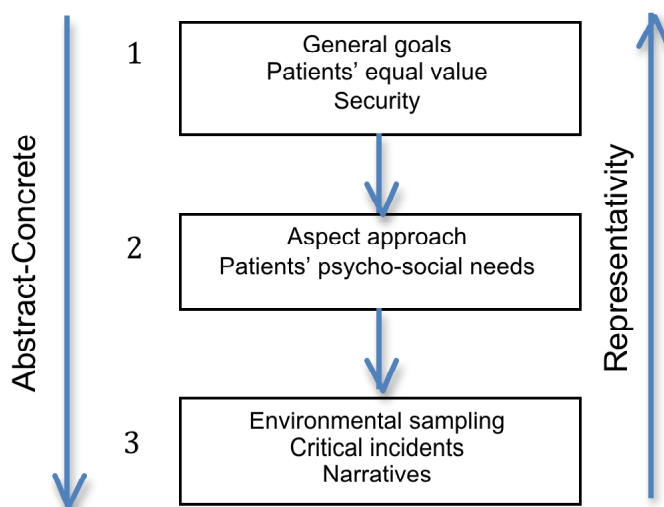


Figure 1. The abstract-concrete ladder.

On the next step down the ladder we find “patients’ psycho-social needs.” In brief these are: 1) emotional security, 2) being member of a group, 3) being able to communicate, 4) feeling independent, 5) receiving appreciation, 6) personal integrity, 7) self-esteem, 8) new experiences, 9) achievements, 10) play and recreation, and 11) personal realization. (For a more extensive need description see Sjö Dahl, 1992, pp. 59–61). On the last, concrete level we have our “narratives”, told by 172 nurses. Our three levels are connected in that level two is representative for level one and level three is representative for level two.

Considerations regarding our patients’ psychological needs, in concrete ward-situations, have their boundary limits. As cognitive decision researchers have accepted the term “bounded rationality” we suggest an analogous term “bounded emotionality” or “need consideration” when studying interpersonal relations in patient-nurse ward situations.

Task-complexity

The complexity of nursing as a profession is impressive; the nurse has several aspects to consider, and the time available for carrying out even complicated tasks may be very restricted (see Hammond, 1996). Knowledge systems can be of different kinds. Polanyi (1958, 1967) makes the following distinction between two knowledge dimensions: 1) Knowledge about the object or phenomena that is in focus — focal knowledge; 2) Knowledge that is used as a tool to handle or improve what is in focus — tacit knowledge (Sveiby, 1996). Nurses can be expected, in their daily work, to switch between these two knowledge systems, often under time stress. Although not distinctly separate, the following different categories of task complexity are presented in our case material: 1) Content complexity, 2) Purpose complexity, 3) Acting complexity, 4) Choice complexity, 5) Priority complexity, 6) Treatment complexity, and 7) Safety complexity.

Our narrative material illustrates this complexity of nurses' work situations involving rapid, successive demands on focal and tacit information. The switches of attention between different cue senders and between focal and tacit information put great demands on self-control and may, under stress, in the long run lead to ego depletion, i.e., loss of work motivation (Kahneman, 2011, p. 42).

The critical incidents, narratives, collected in our nursing research, are usually extensive due to the complexity of reported incidents. Every incident narrative was complemented with some open-ended questions such as: 1) How did you become aware of the critical situation? 2) Did you take any action in this situation? 3) Did you act in some way later on? 4) Why did you choose to act as you did? 5) What were the consequences, the result of the measures you took? 6) Did anyone, other than the patient, take part in this incident?

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Judgments Compound Risk Judgment in Tasks with both Idiosyncratic and Systematic Risk: The “Robust Beauty” of Additive Probability Integration

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In research on human probability judgment it is often assumed that events are statistically independent, even though statistical independence is arguably rare in most real-world settings. One example of a setting where statistical dependence is usual is financial assets from a common market, which are often conceptualized as being affected by both idiosyncratic risk and systematic risk (Bodie, Kane, & Marcus, 2013; Sharpe, 1964). Idiosyncratic risk denotes risk specific to one asset, while systematic risk (“market risk” or “non-diversifiable risk”) denotes risk common to all assets in the common market. In this study, we explored how people integrate risks of assets in a simulated financial market into a joint probability judgment that all assets in a small portfolio decrease in value, both when assets are independent and when there is a systematic risk present affecting all assets. Simulations indicated that when a systematic risk was included, additive or exemplar-based strategies were more effective than multiplication of individual risk values. Considering that previous research indicated that people tend to intuitively approach joint probability tasks using additive heuristics (Juslin, Lindskog, & Mayerhofer, 2015), we expected the participants to find it easiest to master tasks with high systematic risk but shift to multiplication or exemplar memory when risks were independent. Results from three experiments confirmed that participants tended to approach the joint probability judgment task using additive heuristics and that they tended to adapt more quickly to the task with systematic risk, even though the inclusion of systematic risk was unknown to the participants beforehand, and its existence could only be extrapolated from feedback training. Contrary to hypothesis, we found no indication of exemplar memory.

We believe that these results imply that people are more inclined to approach similar joint probability judgments using additive strategies not because of limited cognitive capacity, but rather as an adaption to environments where dependencies of a similar type are usual. Note that this does not necessarily mean that people are explicitly aware of the potential dependencies or their effect on the joint probability; indeed, we find it more likely that, because additive processes are generally robust and effective cognitive strategies for cue-integration (e.g., Hammond, 1996; Hammond & Stewart, 2001; Juslin, Nilsson, & Winman, 2009; Karelaia & Hogarth, 2008) they are a reasonable algorithm of choice for situations where the structure of the environment is not explicitly known. Only when given adequate reason to presume that the events in question are indeed independent, such as by the feedback training used in our study, are participants likely to switch to explicit multiplication.

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Motor and Gaze Behaviors of Youth Basketball Players Taking Contested and Uncontested Jump Shots

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In sports, opportunities for action emerge and disappear as individuals interact with their environment, due to the dynamic and fast-paced nature of these settings. Performers need to learn to continuously adapt their behavior to the changing task constraints, and consequently including the appropriate task constraints in the design of sports practice and research on perceptual-motor skills is a major issue. Representative design is a concept initially proposed by Brunswik (1956) and states that tasks should be created in such a way that the task constraints represent the natural performance setting as accurately as possible. In invasion sports, immediate opponents offer relevant constraints on action possibilities. A defender (almost) by definition has considerable perturbing effects upon the actions of an attacker. Therefore, in research and training, tasks requiring the performer to execute a skill against an opponent may provide a more representative design of the actual performance setting (Brunswik, 1956; Gorman & Maloney, 2016; Pinder et al., 2011).

To explore motor and gaze behaviour in the presence and absence of a defender, and expand upon previous work in this area (e.g., Rojas et al., 2000; Gorman & Maloney, 2016; Klostermann et al., 2017), we (Van Maarseveen and Oudejans, 2018) analysed skilled youth basketball players as they performed contested and uncontested jump shots. The players performed 24 shots in both

conditions (i.e., contested and uncontested) from about 5 m from the basket. The results showed that as expected, an approaching defender trying to contest the shot led to significant changes in movement execution and gaze behavior including shorter shot execution time, longer jump time, longer ball flight time, later final fixation onset, and longer fixation on the defender. These changes in movement execution seem to reflect the participants' attempts to adapt their movements to the approaching defender in order to reduce the likelihood of the defender blocking their shot (Gorman & Maloney, 2016; Klostermann et al., 2017; Rojas et al., 2000). As these changes in motor behaviour were not accompanied by an overall decline in shooting accuracy, we extended the existing literature by showing that some players were successful in these adaptations while others were not, and that this seemed to be related to their visual behavior. Players whose final fixations on the basket were affected in duration and timing showed a decrease in shooting accuracy, while players whose final fixations were unaffected did not show a decrease in performance. This suggests that the players with a decrease in performance when facing a direct defender missed out on the relevant visual information to control their shot successfully.

For sports practice this means that it is essential to also train the basketball shot with a defender applying more or less defensive pressure as that may simulate the circumstances under which players shoot in games. Of course, the presence of defensive pressure is only one of the (many) relevant constraints that need to be considered for representative training designs. Other factors are for example actions prior to shooting, time pressure and mental pressure. By enhancing the representativeness of sports practice tasks, the skills acquired in practice will more likely generalise to competition (Pinder et al., 2011).

In perception and action research, the task constraints should also be designed in such a way that the constraints represent the behavioral setting to which the results are intended to be generalized (Dicks et al., 2009; Pinder et al., 2011). In situ task constraints are well suited for this, as the appropriate sampling of environmental conditions outweighs the eventual decrease in methodological rigour and control.

* This contribution for the Brunswik Society Newsletter contains a summary of and excerpts from the following article:

Van Maarseveen, M. J. J., & Oudejans, R. R. D. (2018). Motor and gaze behaviors of youth basketball players taking contested and uncontested jump shots. *Frontiers in Psychology*, 9, Article 706, 1–9. doi: 10.3389/fpsyg.2018.00706

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