

# **THE BRUNSWIK SOCIETY NEWSLETTER**

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## ABOUT

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The Brunswik Society is an international association of researchers who are interested in understanding and improving human judgment and decision making. Founded in 1985 by Kenneth Hammond, members of the Society share an appreciation for the work of psychologist Egon Brunswik.

## STAY CONNECTED

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Visit the Brunswik Society website at <https://brunswiksociety.org/>.

To receive information about the Society's annual meeting and newsletter, email [info@brunswiksociety.org](mailto:info@brunswiksociety.org).

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### Imprint

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# FOREWORD

We are very pleased to present the 2024 Brunswick Society Newsletter! We would like to thank all the readers and especially the authors and co-authors for their valuable contributions.

Started in 1986, the Brunswick Society Newsletter has been published for more than 38 years. This years' contributions show the current state of ongoing Brunswick-Hammond related efforts. The contributions span a wide range of areas within the field of Psychology such as: human-robot interaction (Pohl et al.), personality (Buss et al.; Härtel et al.; Witkower), medical and clinical studies (Blackhurst et al.; Huttin) as well as the traditional area, for Brunswick- and Hammond-inspired research, of judgment and decision-making, with studies on risk assessments (Borkenhagen et al.), judgments of athletes (Peringa et al.), and preferences (Forsgren et al.). The studies exemplify use of representative design and the lens-model, as well as an exercise in combining a lens-model style logic with mediation analysis (Buss et al.).

The newsletter also includes intriguing conceptual and methodological discussions, such as discussions on internal wisdom of the crowd effects, on the partitioning of distal variables into multiple cues from a Brunswikian and Fermian perspective (Hoffrage et al.) and on representative design as a feasible alternative to recent proposals of integrative design (Holleman et al.).

We are glad to see submissions from researchers with all levels of experience, from PhD-students to emeritus professors, and wise words from someone who has long treaded the Brunswikian path to those who are just embarking on it (Doherty). In addition, Stewart provides a throwback to a pivotal meeting for judgment and decision-making scientists in 1978 and reminds us that the book *Human judgment and decision making: Theories, methods, and procedures* by Hammond et al. (1980) is always worth a re-read. We are also sad that a long-time Brunswick Society member Robin Hogarth (1924–2024) passed away this year. Natalia Karelaia, a previous PhD student of Hogarth's, wrote a remarkable memorial, showing his impact on judgment and decision-making with a Brunswikian lens. Together both attended the Brunswick Society meeting in 2007 presenting their meta-analysis on lens model studies (Karelaia & Hogarth, 2008), which are perfectly embedded within other Brunswikian reviews (Dhmi, Hertwig, & Hoffrage, 2004; Kaufmann & Athanasou, 2009; Kaufmann, Reips, & Wittmann, 2013).

Lastly, an update to the Brunswiki project is also part of the newsletter, make sure to check it out (Dhmi et al.)!

We invite authors to start planning their contributions for the 2025 Brunswick Society Newsletter and welcome a wide variety of topics such as recent Brunswick-Hammond-related trends, research projects, comments on the contributions in the current Brunswick Society Newsletter, etc.

As always, the newsletter contains the agenda for the upcoming 2024 Brunswick meeting, which marks the 30th year anniversary of the meeting. We are looking forward to the meeting and hope to see many of you there!

Thank you all for your ideas, comments, and for further developing the field. As you see, also our editorial team consists of scholars with different experience levels, from PhD students successfully completing their PhD thesis in 2024 like August to more experienced ones. If you're interested in joining us in this informative and easy work, send an email to Esther ([esther.kaufmann@gmx.ch](mailto:esther.kaufmann@gmx.ch)).

Sincerely,

James Adaryukov, August Collsiöö, Robert M. Hamm, Esther Kaufmann, and Kylie A. (Molinaro) Smykalski



# IN MEMORIAM

## Robin M. Hogarth

The Brunswick Society honors the memory of Robin M. Hogarth, who passed away on April 21, 2024, in Barcelona, Spain, where he lived with his wife, Carmen Pi-Sunyer. He was 81. Robin was an Emeritus Research Professor at Barcelona School of Economics, Universitat Pompeu Fabra. His passing is a significant loss for our scientific community. Over his productive academic career, Robin's thinking and research made profound contributions to the field of judgment and decision making. His work built upon and extended many foundational ideas of Egon Brunswick. Among other topics, Robin explored how individuals make decisions under uncertainty, how they learn in different types of environments, and how they should adapt their strategies to various types of feedback. Throughout his many articles and books, Robin offered a comprehensive analysis of the processes of judgment and decision making and how these are affected by environmental conditions.



Robin received his PhD from the University of Chicago. He was a professor at INSEAD in France and the London Business School before returning to Chicago in 1979, where he served on the faculty for over 20 years, acting as Deputy Dean (1993–98) and Director of the Center for Decision Research (1983–93). In 1998, he moved to Barcelona and joined Universitat Pompeu Fabra as an ICREA Research Fellow. Over the years, he advised many PhD students who were inspired by his ideas and scientific curiosity.

Robin's significant contributions to the research on judgment and decision making were recognized with numerous awards and honors, including the inaugural Lifetime Achievement Award from the European Association for Decision Making. He wrote numerous papers and authored 10 books on the subject, including *Judgment and Choice* (1987), *Educating Intuition* (2001), *Dance with Chance* (co-authored with Anil Gaba and Spyros Makridakis, 2009), and *The Myth of*

*Experience* (co-authored with Emre Soyer, 2020).

References to Brunswick's work appear across many of Robin's papers and books. While at the University of Chicago, Robin worked with his late colleague and friend Hillel J. Einhorn to develop seminal ideas on the "illusion of validity" in human judgment (Einhorn & Hogarth, 1978),

emphasizing the critical role of task environments. Drawing on Brunswik's probabilistic functionalism (Brunswik, 1952, 1955), they analyzed how the structure of judgmental tasks leads people to overestimate the reliability of their judgments and develop unwarranted confidence in their decisions. Their model demonstrated how incomplete feedback and the probabilistic nature of environments contribute to this illusion. In another notable paper, Robin extended Brunswik's model from understanding how individuals use environmental cues to form judgments to examining how groups aggregate individual judgments, identifying the implications of group decision strategies for the accuracy of group judgment (Einhorn et al., 1977).

After joining Universitat Pompeu Fabra, Robin extended Brunswik's ideas on representative design to economics, challenging the practice of testing economic theories in "abstract" environments. He argued that "if economists wish to apply abstract theories to concrete situations, then the latter need to be sampled in the testing process" (Hogarth, 2005). Robin also continued to investigate the context sensitivity of various decision and judgmental strategies. In a research program on decision heuristics, in which I had the privilege to participate, we examined how heuristics can be effective tools when aligned with environmental structures (e.g., Hogarth & Karelaia, 2007). A key takeaway from this work is that people do not need extensive computational skills to make good decisions, as simple models often suffice. However, people do need task-specific knowledge to know when to apply the appropriate models. Robin strongly believed that this knowledge was central to domain-specific expertise in decision making. Our analysis of the data spanning over five decades of research using Brunswik's "lens model" further emphasized the importance of task environment characteristics—such as the number of available cues, their redundancy, and the types of feedback—in shaping the accuracy of human judgment (Karelaia & Hogarth, 2008).

In his book *Educating Intuition* (2001), Robin introduced the concept of "wicked" learning environments—settings where feedback is delayed, incomplete, misleading, or absent—and explored how these conditions undermine effective judgment. In line with Brunswik's emphasis on reliable cues and representative feedback, he contrasted wicked environments with "kind" ones, where clear and consistent feedback facilitates learning. Robin's collaborations with his PhD students further demonstrated how the inability to recognize the wickedness of learning environments can lead to entrenched errors, overconfidence, and flawed decision-making (e.g., Hogarth & Soyer, 2011; Hogarth et al., 2015). In his last book, *The Myth of Experience* (co-authored with Emre Soyer, 2020), he compellingly presented these ideas to a broader audience.

Many students, colleagues, and scholars will be forever grateful to Robin for sparking curiosity in decision making research as well as science in general, for his generosity and kind support, and for the humble wisdom we were fortunate to learn from. He cared deeply about his students and colleagues and was an academic role model for many. Robin had a sharp yet gentle sense of humor, often referring to himself as "a relic of the British Empire". Beyond all of this, Robin simply embodied what it truly means to be a humanist.



Robin is and will be dearly missed, and his memory will live on forever.

— Natalia Karelaia, INSEAD, France

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# SOCIETY NEWS

## 30th International (Virtual) Meeting of the Brunswik Society

**Free event – for Zoom link register your name, affiliation, and email address with Gijs Holleman (g.a.holleman@tilburguniversity.edu)**

**Friday, December 13<sup>th</sup> 2024, 11:45–14:15 EST (16:45–19:15 GMT) via Zoom**

**Opening Remarks** – Thomas R. Stewart (University at Albany, USA)

**Title:** Representative Design – A Realistic Alternative to (Systematic) Integrative Design

**Presenters/Authors:** Gijs A. Holleman (Tilburg University, the Netherlands), Mandeep K. Dhali (Middlesex University, London), Ignace T. Hooge & Roy S. Hessels (Utrecht University, the Netherlands)

**Abstract:** In a recent article in *Behavioral and Brain Sciences*, Almaatouq et al. (2024) posit that there has never been “a workable alternative” to the ‘one-at-a-time’ paradigm of experimental design in the social and behavioral sciences. As a solution, they propose *integrative design*, in which researchers need to map out and make explicit the “design space of possible experiments”. We disagree with Almaatouq et al. that no realistic alternative exists to the “one-at-a-time” paradigm. In our commentary (Holleman et al., 2024), we argue why Brunswik’s program of representative design is a more realistic alternative than integrative design to address the problem of generalizability and commensurability in the social and behavioral sciences, because integrative design cannot guarantee the external validity and generalizability of results.

**Title:** Representative Stimuli Reveal Transitive Preferences

**Presenters/Authors:** Mattias Forsgren, Gustav Karreskog Rehbinder, & Peter Juslin (Uppsala University, Sweden)

**Abstract:** The APA Dictionary of Psychology states that intransitive relationships “appear to be illogical and inconsistent but are often found in matters of personal preference”. The studies underpinning this view have typically used monetary gambles as options. Such novel, artificial stimuli may be useful for theory testing but are not representative of the objects people choose between in their everyday lives. To make general statements, we should instead evaluate transitivity using stimuli that *are* representative (“representative design”). Across two large-sample experiments, we find that while a small number of participants have intransitive preferences for monetary gambles, we never find evidence of intransitivity for any participant across ten categories of everyday objects. The received view that preferences are “often” intransitive appears to have been a methodological artefact.

**Title:** Including Patients' Perspectives in Medical Case Vignettes: A Brunswikian Approach

**Presenter/Authors:** Marvin Kopka & Markus A. Feufel (Technische Universität Berlin, Germany)

**Abstract:** Case vignettes—written summaries of medical episodes—are used to evaluate digital health tools and how patients interact with them. However, traditional vignettes often fail to reflect real-world complexity, hampering generalizability. We present a framework based on Brunswik's representative design to create use-case specific vignettes from real-world patient descriptions. Comparing both types of vignettes for the decision to seek medical care, we find that laypeople become more risk-averse when using representative rather than traditional vignettes (seeking care in 91% vs. 85% of cases), and that digital health tools improve performance (between 7% and 20% more correct solutions). This suggests that representative design should be applied to prevent misjudgments of human-technology interactions with digital health.

**Title:** A Drift Diffusion Lens to Model Vicarious Functioning

**Presenters/Authors:** Florian Scholten, Lukas Schumacher, & Paul Kelber (Tübingen University, Germany)

**Abstract:** Brunswik's vicarious functioning (VC) principle is informed by two key elements: (a) vicarious mediation, which refers to the flexible representation of the distal criterion by multiple, intermittently present cues, and (b) uncertainty about which cues to prioritize according to their ecological validity. We propose that reaction times represent a fine-grained measure of both features and present a drift-diffusion lens. Our lens integrates a dynamic transition model into a basic drift-diffusion model, allowing parameters to reflect the dynamic process of VC over time. Reanalysis of reaction time data from two experiments on the multiple-cue probability learning paradigm (Scholten & Bröder, 2024) shows that our drift-diffusion lens can account for the inductive probabilistic inference process of the naive statistician.

**Title:** The Wisdom of the Inner Crowd and the Wisdom of Cues

**Presenter/Authors:** Tamara Gomilsek, Ulrich Hoffrage, & Julian N. Marewski (University of Lausanne, Switzerland)

**Abstract:** In a recent study (Gomilsek, Hoffrage, & Marewski, 2024), we introduced a novel class of strategies to elicit the wisdom-of-the-inner-crowd. These strategies are rooted in physics, where Enrico Fermi used the back-of-the-envelope guesstimation technique. Fermian strategies prescribe decomposing an estimation problem into subtasks, solving the subtasks separately, and ultimately integrating those solutions into a final estimate. In our experiment, a similarity-based Fermian-strategy boosted the wisdom-of-the-inner-crowd even more than Herzog and Hertwig's (2009) consider-the-opposite strategy. Both Brunswik and Fermi took an analytical approach, which consisted of creating a net of cues and then integrating them. One of the differences is that Brunswik's lens model is usually used as a descriptive model, whereas Fermi's way of arriving at estimates can be conveyed as a prescriptive strategy.

**Paper in Memory of Robin Hogarth:** Less is More in Temporally-Dependent Managerial Environments

**Presenter:** Tomás Lejarraga (University of the Balearic Islands, Spain)

**Abstract:** While relying on small samples of experience is often considered a source of bias, managers frequently use them for making judgments and predictions. We explore how reliance on small samples of recent experience varies with the temporal structure of the information environment. Through simulations, experiments, and time-series analyses of managerial information cues, we show that people effectively use more recent samples in environments with high temporal dependence, leading to better predictions. We also find that managerial environments typically exhibit high temporal dependence. Thus, using small samples of recent experience can be ecologically rational for predictions in managerial contexts, supporting a ‘less-is-more’ effect.

**Closing Remarks** – Robert M. Hamm (University of Oklahoma Health Sciences, USA)

### **Virtual Social/Networking Hour!**

**Friday, December 13<sup>th</sup> 2024, 14:30 EST (19:30 GMT)**

**Free event – invites will be sent to meeting delegates**

**The organization team looks forward to seeing you:**

**Mandeep Dhani, Gjjs Holleman, & Esther Kaufmann**

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## The Brunswiki Project: Collaborative Effort to Put Brunswik on Wikipedia

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### Tom Stewart

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In the 2022 newsletter, Mandeep Dhami published a paper called “The BrunsWiki Challenge: Your Society Needs You!!!” In this edition of the newsletter, we would like to provide you with a brief update of this project.

We are pleased that several members of the Society kindly ‘volunteered’ to help write first drafts of entries – several of whom have come out of retirement simply to do so. We are very grateful to them. There are now three live articles:

- Egon Brunswik (previous entry updated by Tom Stewart):  
[https://en.wikipedia.org/wiki/Egon\\_Brunswik](https://en.wikipedia.org/wiki/Egon_Brunswik) (There is also a German article:  
[https://de.wikipedia.org/wiki/Egon\\_Brunswik](https://de.wikipedia.org/wiki/Egon_Brunswik))
- Brunswik’s Lens Model (first draft written by Esther Kaufmann):  
[https://en.wikipedia.org/wiki/Brunswik%27s\\_lens\\_model](https://en.wikipedia.org/wiki/Brunswik%27s_lens_model)
- Vicarious mediation and vicarious functioning (first draft written by Len Adelman):  
[https://en.wikipedia.org/wiki/Vicarious\\_mediation\\_and\\_vicarious\\_functioning](https://en.wikipedia.org/wiki/Vicarious_mediation_and_vicarious_functioning)

As with all Wikipedia entries, these articles are works-in-progress. Your comments and suggestions would be appreciated. Wikipedia articles can be directly edited by anyone with a (free) Wikipedia account. If you prefer, please send your comments to Tom Stewart and he will implement them.

Additionally, we have found that there are other relevant articles already on Wikipedia that could be updated to better tie into Brunswikian theory and research, and we would appreciate your efforts in doing so:

- Policy capturing: [https://en.wikipedia.org/wiki/Policy\\_capturing](https://en.wikipedia.org/wiki/Policy_capturing) (Very limited, should be supplanted by our Judgment Analysis article)
- Ecological validity (perception):  
[https://en.wikipedia.org/wiki/Ecological\\_validity\\_\(perception\)](https://en.wikipedia.org/wiki/Ecological_validity_(perception))
- Sensory cue: [https://en.wikipedia.org/wiki/Sensory\\_cue](https://en.wikipedia.org/wiki/Sensory_cue)
- Nomothetic and idiographic: [https://en.wikipedia.org/wiki/Nomothetic\\_and\\_idiographic](https://en.wikipedia.org/wiki/Nomothetic_and_idiographic)

Future articles planned (volunteers named) include:

- Kenneth R. Hammond (Tom Stewart)
- Berndt Brehmer
- Probabilistic functionalism
- Representative design (Mandeep Dhami)
- Judgment analysis (Tom Stewart)
- Lens model equation (Rob Hamm)
- Social judgment theory
- Multiple cue probability learning (Jim Holzworth)
- Interpersonal learning (Jeryl Mumpower)
- Interpersonal conflict
- Cognitive feedback
- Cognitive continuum theory (Mandeep Dhami)

You can help in several ways:

1. Read an article and improve it. Either get a free Wikipedia account and edit directly or send comments to Tom Stewart ([t.stewart@albany.edu](mailto:t.stewart@albany.edu)).
2. Suggest new links and references for published articles.
3. Monitor articles to make sure that changes are accurate.
4. Volunteer to write an article. E-mail Mandeep Dhami ([m.dhami@mdx.ac.uk](mailto:m.dhami@mdx.ac.uk)).

We hope that this project will mean that future generations of scholars will be able to learn about the contributions of Egon Brunswik and Kenneth R. Hammond, which together cover a range of theoretical, methodological, and applied issues.



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# HISTORICAL NOTE

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## Twelfth Annual Conference on Human Judgment

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**Tom Stewart**

University at Albany, United States

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Beginning in 1967, before the Society for Judgment and Decision Making and the Brunswick Society existed, Ken Hammond hosted the predecessor to those meetings, an annual invitational judgment conference in Boulder. The 1978 meeting was notable for the number of leaders in the field who attended.

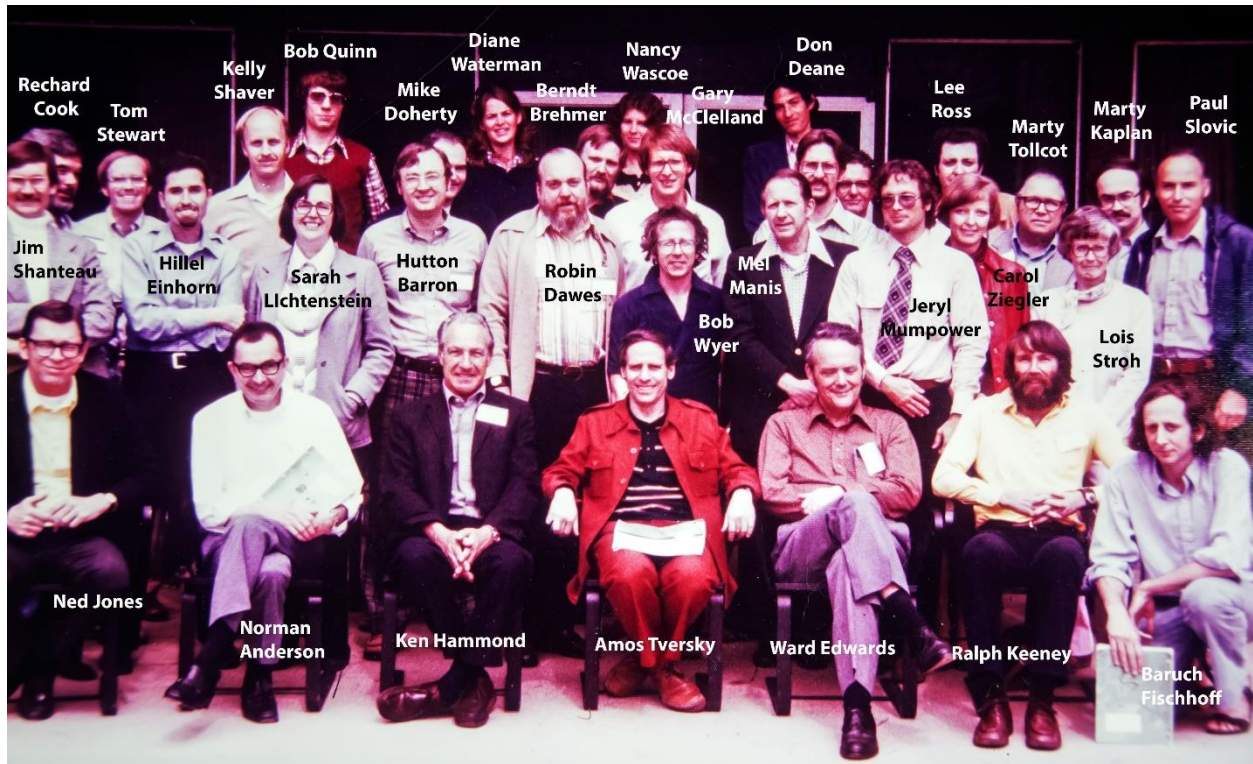
Here is how the meeting was described in the preface to Hammond, McClelland, and Mumpower (1980):

*We undertook this book in the hope that it would help integrate the numerous approaches to judgment and decision making that have evolved over the past few decades. More immediately, the book was to provide a point of departure for a conference that we hoped would mark the start of such integration, the Twelfth Annual Conference on Human Judgment held April 28-30, 1978, in Boulder CO. Twenty-five prominent researchers and theoreticians in the field of judgment and decision making were invited. All but one accepted the invitation, and only one other was unable to attend, a remarkable indication of the interest in integration. A draft of the present book was distributed to all participants prior to the conference; with some revisions, the same report appears here. (p. xiii)*

The draft that was sent to participants is available on the Internet Archive (Hammond, McClelland, and Mumpower, 1978). In the book, the field of judgment and decision making was described by six major theories:

- Decision theory, represented at the meeting by Ralph Keeney
- Behavioral decision theory, represented at the meeting by Ward Edwards
- Psychological decision theory represented at the meeting by Amos Tversky
- Social judgment theory, represented at the meeting by Ken Hammond
- Information integration theory, represented at the meeting by Norman Anderson
- Attribution theory, represented at the meeting by Ned Jones

The group photo from the meeting is not on the current Brunswick Society website. For those who have not seen it, here is an updated version:



Thanks to Jeryl Mumpower and Gary McClelland for comments and help in identifying some of the people in the photo.

### References

- Hammond, K. R., McClelland, G. H., Mumpower, J. (1978). The Colorado Report on the Integration of Approaches to Judgment and Decision Making. University of Colorado, Institute of Behavioral Science, Center for Research on Judgment and Policy, Report No. 213, Boulder, CO. Full text at [https://archive.org/details/DTIC\\_ADA061750/page/n1/mode/2up](https://archive.org/details/DTIC_ADA061750/page/n1/mode/2up)
- Hammond, K. R., McClelland, G. H., Mumpower, J. (1980). *Human judgment and decision making: Theories, methods, and procedures*. United States: Praeger. Full text at <https://archive.org/details/humanjudgmentdec0000hamm/mode/2up>

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# CONTRIBUTIONS

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## The Brunswick Lens Model: Advancing Theoretical Understanding of Deception in Autism

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**Tiegan Blackhurst, Calum Hartley, & Lara Warmelink**

Psychology Department, Lancaster University, United Kingdom

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One's ability to deceive and detect deception is a unique social skill which allows individuals to navigate social contexts, avoid conflict, and maintain social relationships (Vrij, 2008). As lying is social in nature, it is widely believed that autistic individuals who experience difficulties with social understanding may struggle to engage in, and detect, deception (Williams et al., 2018; Yirmiya et al., 1996). As some autistic individuals may be at an increased risk of victimization and manipulation, it is crucial to investigate the nature and causes of autistic adults' difficulties with deception in order to inform interventions that can reduce risk. However, existing literature focuses primarily on autistic children's use of deception and offers limited theoretical exploration of underlying psychological mechanisms. To address this, we authored a theoretical review (Blackhurst et al., 2024) which introduced a system-level theoretical framework to the study of deception in autistic adulthood: the Brunswick Lens Model of Deception (Brunswick, 1952; Hartwig & Bond, 2011).

Hartwig and Bond (2011) were the first to apply the Brunswick Lens Model to deception (see Figure 1). The communicator (to the left of Figure 1) chooses whether to tell the truth or lie. Following this, the individual will then subconsciously display behavioural cues. The validity co-efficients extending from the communicator to each cue suggest the strength and direction of the relationship between each cue and the communicator's veracity (whether they are lying). In order to detect deception, a judge (to the right of Figure 1) will focus on each cue, inferring deception and honesty from different cues. The lines stretching from the cues to the judge each have a utilization co-efficient representing the strength and direction of the relationship between that cue and whether it leads the judge to infer deceit. It is crucial to mention that a judge may rely on behavioural cues which have a validity co-efficient of 0 as not all behaviours are indicative of deceit (e.g., averted eye-gaze is a stereotypical deception cue but has been recognised as an objectively unreliable indicator of deceit; DePaulo et al., 2003).

*Example:* A deceptive communicator may make more eye-contact with a judge to appear credible (increased eye-contact representing the cue to deceit). Then, the judge may notice this behaviour and consider whether this suggests that the communicator is lying or telling the truth. As deliberate

attempts to maintain eye-contact with another person may appear suspicious, the judge may decide that this behaviour is indicative of deceit and believe the communicator is lying.

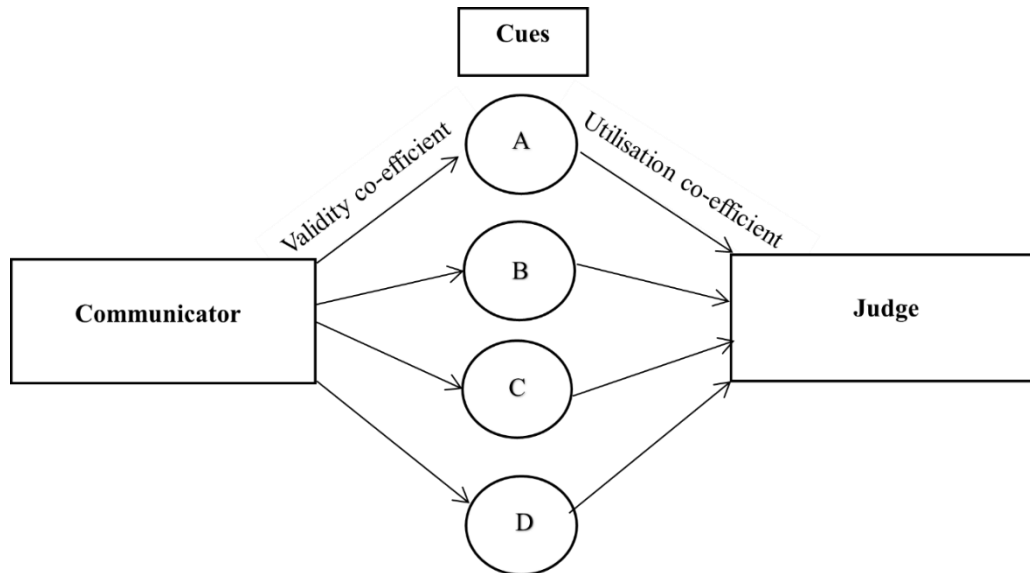


Figure 1. Hartwig and Bond's (2011) application of the Brunswik Lens Model to Deception (figure from Blackhurst et al., 2024).

Using the Brunswik Lens Model of Deception, we offered evidence-based theoretical predictions and testable hypotheses concerning how autistic adults' behaviour may differ during the different processes involved in deception including *Choosing to Lie* (1), *Producing Deception Cues* (2), *Perceiving Deception Cues* (3), and *Making the Veracity Decision* (4). Wherever possible, we made alternative hypotheses to showcase how the strengths and weaknesses that autistic adults experience may both influence the deceptive process. Below are select examples of our predictions:

1. *Choosing to Lie*: Autistic adults may choose to lie less frequently than neurotypical adults due to differences in their perspective taking abilities (Yirmiya et al., 1996) and/or adverse emotional reactions associated with lying (Blackhurst et al., 2024).
2. *Cues to Deception*: Autistic adults report avoiding eye-contact to guard against sensory overload and to prevent sharing confidential information (Trevisan, 2017). Therefore, autistic adults may display higher levels of gaze aversion when lying (beyond their natural levels of autism-related gaze-aversion).
3. *Judge Perceives Behavioural Cues*: Some autistic adult's experience heightened auditory sensitivity (including pitch discrimination) which could increase their ability to detect paraverbal cues to deceit (Heaton et al., 2008).
4. *Making the Veracity Decision*: Some autistic adults may experience a reduced capability to detect deception due to cognitive load difficulties (Williams et al., 2018).

The theoretical review explained how future research could adopt the Brunswick Lens Model to directly target how cognitive mechanisms – and the relationships between them – may differ between autistic and neurotypical adults. Our call for future researchers to organise their work in relation to the Brunswick Lens Model would enable the systematic testing of theory-driven predictions regarding how autism may influence deceptive communication in adulthood, which could help inform interventions to help mitigate risk and protect the future interests of autistic adults.

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## **Investigating Expert and Lay Judgments of Pathogen Transmission Risk in Urban and Architectural Environments**

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The threat of infection posed by the COVID-19 virus forced the general public to use the visible cues within urban and architectural environments as a ‘lens’ through which pathogen transmission risk could be inferred. This study aimed to apply Brunswick’s Lens Model to quantify the relationships between (1) the visible cues of urban and architectural environments and lay assessments of pathogen transmission risk, (2) the same relationship for experts, specifically Infection Control Practitioners (ICPs), and (3) the correlation between lay and expert risk ratings.

To investigate these relationships, we gathered risk assessments from both laypeople and experts regarding various urban and architectural settings, including parks, shopping centers, and residential buildings, using Likert scales. The visible cues of these environments, such as crowd density, ventilation, and natural light, had been previously quantified by architects. We conducted correlational analyses to determine which cues were significantly associated with risk ratings from both lay participants and ICP experts. Additionally, we analyzed the correlation coefficients between the two groups to assess whether they associated similar cues with pathogen transmission risk.

Our findings revealed substantial agreement between laypeople and experts in their risk ratings across different environments. Both groups agreed on the significance of cues such as crowdedness, potential for crowds, and cleanliness in assessing risk. However, there were notable differences in their associations. Experts’ risk ratings showed significant associations with corridor size and marginal associations with the number of touchable surfaces, seating, and access to fresh air, reflecting a more nuanced understanding of pathogen transmission risks linked to these design elements.

These findings have important implications for public health and urban planning. By elucidating how different groups perceive risk, the study can enhance communication strategies and highlight design features that may be overlooked by the general public. Incorporating the insights of ICP experts early in the design process can contribute to creating environments that more effectively mitigate pathogen spread. This understanding is crucial for developing informed public health policies and educational efforts, ensuring that both expert and public perspectives are integrated into the design of safer and more resilient spaces.



In summary, the research provides valuable insights into the alignment and discrepancies between expert and lay judgments of pathogen transmission risks, offering guidance for improving risk management strategies and designing safer environments.

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## Why are Extraverts More Popular at First Sight? Visualizing the Mediating Role of Dominant Behaviors, in Face-to-Face and Virtual Interactions, as a Lens

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Whereas most people wish to be popular, that is, to be liked by others (Back & Kenny, 2010), extraverted individuals are particularly successful in gaining popularity. To better understand which specific behaviors explain this relationship between extraversion and popularity, we applied the lens model (Brunswick, 1956) practice of comparing relative weights in two judgment models to face-to-face and virtual group interactions. We also utilized the product of the cue validity and the cue utilization as a measure of the impact of a cue.

The positive link between extraversion, which generally refers to being outgoing and talkative in social situations, and popularity has been found in numerous studies with various social settings (e.g., Back, Schmukle, et al., 2011; Ilmarinen, 2018; Szczygiel & Mikolajczak, 2018; van der Linden et al., 2010). However, few studies have addressed the underlying mechanisms connecting extraversion to popularity in social interactions. According to theoretical approaches such as the PERSOC framework (Back, Baumert, et al., 2011) and the Social Relations Lens Model (Back, Schmukle, et al., 2011) individuals scoring high on extraversion are likely to be more popular because they display observable behaviors, such as body language and verbal content, which their interaction partners interpret and use to form popularity judgments. Initial empirical evidence suggests that dominant behaviors, such as self-assured movements, strength of voice (Back, Schmukle, et al., 2011), and oral fluency (Ilmarinen, 2018) may mediate the link between extraversion and popularity. Our study extended this research by systematically examining the role of extraversion and its facets as well as a greater number of dominant behavioral cues in two distinct social contexts.

To achieve this goal, we conducted two studies ( $N_{\text{overall}} = 415$ ) in which we analyzed video-recorded data from face-to-face and virtual group interactions among unacquainted individuals. In Study 1, participants attended an on-site lab session where they engaged in a cooperative task in groups of 3–6 people. In Study 2, participants took part in a negotiation task via Zoom with 3–5 people. In both studies, each person provided a self-report of extraversion and rated their group members on popularity after the interaction. Trained observers analyzed the recorded interactions to assess participants' dominant behaviors using a set of 12 cues (Grünberg et al., 2018) across three behavioral channels – facial expressions and body language (nonverbal cues), vocal tone and speech patterns (paraverbal cues), and verbal content (verbal cues) – as well as general cues that encompass multiple channels. To identify specific behaviors that explain the relationship between extraversion and popularity, we employed a combined approach of a lens model (Brunswick, 1956; Nestler & Back, 2013) and a mediation analysis. For a more nuanced understanding, we examined

the extraversion facets assertiveness, sociability, and activity in addition to the overall score of extraversion. For more study details, please refer to our published paper (Buss et al., 2024).

Our results, partly shown in Figure 1, revealed three key findings:

1. People with higher extraversion behaved more dominantly in social interactions and gained more popularity in response.
2. The relevance of specific behavioral cues varied depending on the social context. In face-to-face cooperative interactions, nonverbal behaviors such as having an upright posture were found to be especially relevant for the link between extraversion and popularity whereas in the virtual negotiation task paraverbal cues such as speaking fluently were more important.
3. Looking at the narrower facet level of extraversion, assertiveness, the tendency to be decisive, persuasive, and take responsibility, and sociability, the tendency to be outgoing and talkative (Soto & John, 2017), were particularly important in explaining dominant behaviors and popularity.

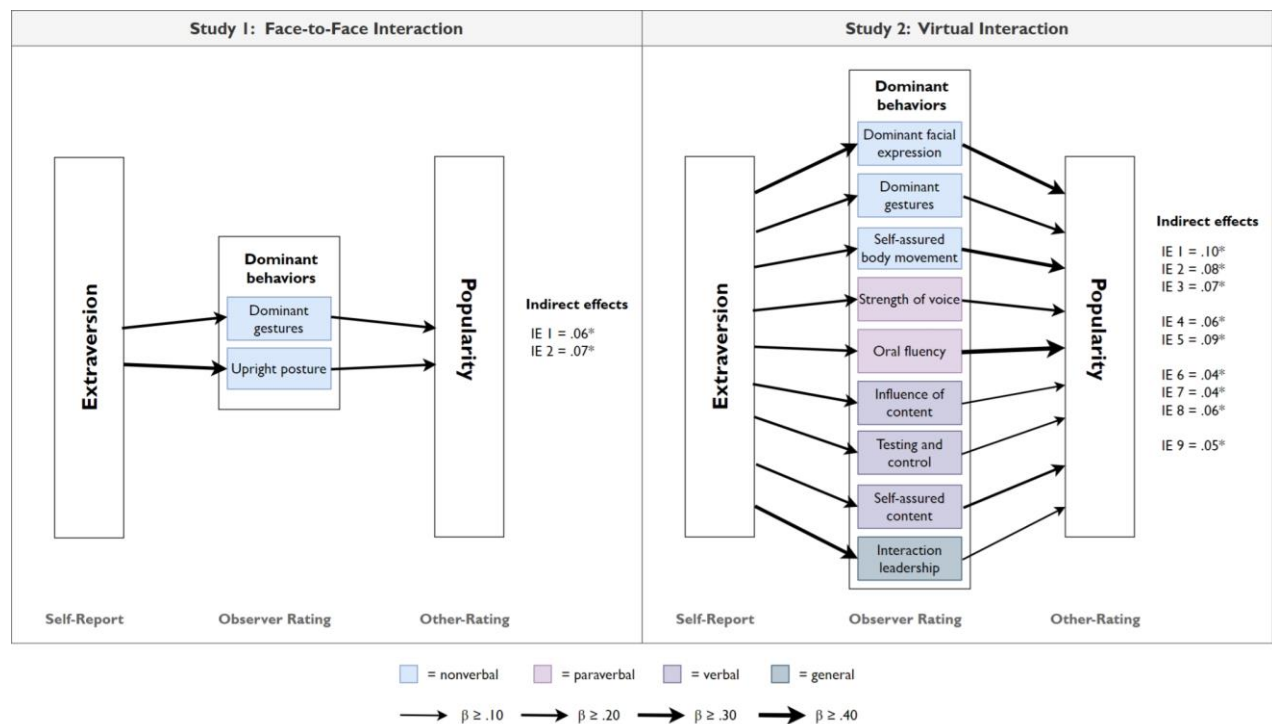


Figure 1. Schematic illustration of the lens model underpinning our results for face-to-face ( $n_1 = 124$ ) and virtual interactions ( $n_2 = 291$ ). The numbering of the indirect effects denotes the corresponding mediation paths from top to bottom. \* indicates significant percentile bootstrapped CIs. [Adapted from Buss et al., 2024.]

By combining a lens model with a mediation analysis, our study showed that the link between extraversion and popularity could partly be explained by extraverted people displaying more

dominant behaviors, which interaction partners observe and use to form their popularity judgments. Moreover, our findings revealed important differences across social settings and extraversion facets. Despite these valuable insights, there are a few limitations regarding the correlational design, the influence of situational demands in the interaction tasks and perceptual biases of human raters that need to be considered. To allow for causal inference, future research could use experimental designs with confederates to investigate popularity in response to varying degrees of certain dominant behaviors. Future studies should also explore how our results generalize to different social settings and extend the data basis by extracting behavioral cues automatically using trained algorithms (Phan & Rauthmann, 2021).

Summarizing, this study provides a deeper understanding of how extraversion relates to popularity through specific dominant behaviors observed in face-to-face and virtual interactions. We hope that these findings inspire future research to further investigate the nuances of social dynamics and explore alternative methods for assessing behavioral cues in diverse social contexts.

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## The Brunswikian Path and the Chasm Between Knowing and Understanding

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I was recently asked what I might say to a young person who was embarking on a career following a Brunswikian path. I reframed the question to make it easier to think about and asked myself “What would I say to myself if I were just beginning such a career?” Many things come easily to mind, but I’ll focus on just one and elaborate on that single one. That one would be to tell my young self that

*There is a chasm between knowing and understanding.*

To me, *knowing* a scientific issue means being able to do well on a multiple-choice test or being able to talk about it well enough to sound smart. *Understanding* a scientific issue is what you need to make even a small contribution to human knowledge.

Brunswik’s psychological system is relevant to a broad sweep of the behavior of organisms, including the study of judgment and decision making (JDM). A derivative of Brunswik’s system that is directly relevant to JDM is Social Judgment Theory (SJT) was developed by Ken Hammond and elaborated by him and others. The domain of JDM is vast, and you must focus yet even more sharply and decide to what to commit yourself to understanding. SJT is an important area of theory and research within JDM, and was my main focus for years. Ideally, you should know many approaches to JDM, but you cannot understand all of them all in one lifetime. If you are interested in focusing on and pursuing a Brunswikian path, specifically SJT, you must choose to *understand* it, to make it part of you.

You should ultimately make a serious effort to read and get a broader knowledge of Brunswik’s writing, which is profound. But if you value your sanity, do not start down the path by reading Brunswik! Do not read Brunswik until you have prepared your mind by reading some secondary sources. I suggest *The Psychology of Egon Brunswik*, edited by Ken Hammond and published in 1966. But if you become committed to SJT, I suggest that you immerse yourself in the experimental literature of SJT and in the lens model. *Understand* the lens model and *understand* it early on. Make the model a part of yourself as it is ubiquitous in SJT. It has analytical power and an intellectual beauty of which I was repeatedly reminded as I read research papers and taught it in my JDM course. Moreover, I believe that the lens model is much more than just a valuable tool for theory and research in SJT. It is also a useful way to conceptualize the very nature and practice of science and scientific thinking.



I will explore just a little further what I mean by *understanding* your chosen field. Suppose you've done what you believe is a beautiful experiment. You have the precious  $p < .05$  or even  $p < .01$ ! There is then a temptation to stop thinking and play the publication game as I think too many do play it. I fear that I have done so in the past. That game says *Write it up, submit it and go on to the next experiment*. But you should also understand your data as well as humanly possible. Think about it from those multiple perspectives you have learned along the way. Make graphs and study them. Look at scatterplots. Ask what researchers using different models might make of your data, or if the data would be relevant to their models.

But of course, do not let the process be a servant of procrastination or of a fear of rejection. Remember, as one philosopher of science put it, science is public knowledge. And remember

*There is a chasm between knowing and understanding.*

Postscript. I posed this same question to a treasured colleague of many years' standing. His answer was not different in principle from mine, but he also said

"I think one of the best decisions I made about my career was to take the summers off, go out west, and climb mountains. I am still reaping the benefits of that."

I have read a fair number of biographies of great scientists, many of whom wrote of their love of nature, skiing, music or some activity other than science. Please do not interpret what I have written above as saying that you should be a one-trick pony!

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## Representative Stimuli Reveal Transitive Fechnerian Preferences

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If I prefer option A to option B, and option B to option C, does that imply that I prefer option A to option C too? Put differently, does my mind represent a consistent ranking of those options (e.g.,  $A \succ B \succ C$ ) or are there self-contradictory “cycles” in my preferences? If the former is true, then my preferences are “transitive”. If there are self-contradictory cycles, then they are “intransitive”. Whether human preferences are transitive or intransitive has been a perennial question (e.g., Davis, 1958). We may care about it for practical reasons – transitivity is an axiom of expected utility theory (von Neumann & Morgenstern, 1944) and, more generally, abandoning it rules out much of the maths we may want to use when modelling human preferences. All functions, for example, produce transitive output. There is also the more psychological question of human competence at stake: it is difficult to rationalise the self-contradictory nature of intransitive preferences and they famously leave one open to being abused as a “money pump” (Davidson et al., 1955). The notion that human preferences are intransitive appears to be widespread (e.g., Brandstätter et al., 2006; Starmer, 2000). Indeed, it has become generally accepted to the point that the APA dictionary entry for “intransitivity” (American Psychological Association, 2023) states that “Such [intransitive] relationships appear to be illogical and inconsistent but are often found in matters of personal preference or other subjective judgments.”

The typical stimuli in psychological investigations of (in)transitive preferences (e.g., Birnbaum, 2023) have been monetary gambles of the form  $P \times \$X, \text{ else } \$Y$ . Such options are artificial in that they scarcely, if at all, exist outside of the laboratory – the setting we (typically) want to make claims about. Although recent work has emphasised statistical limitations in previous studies (Regenwetter et al., 2011), the unrepresentativeness of the stimuli remains neglected. We have addressed this question in the spirit of representative design (Brunswik, 1956) through two experiments with stimuli representative of the participants’ everyday environment.

In Experiment 1, we recruited 300 participants each from the USA and UK. (We included the USA participants to achieve variation in how familiar the options were, but this will not be important for the part of the results we present here). In Experiment 2, we recruited 400 UK participants.

Participants made two-alternative forced choices (2AFCs) between options from different categories. From a “master set” for each category, five items were randomly sampled for each participant. All pairwise combinations of these five were then presented three times as 2AFCs, in random order. On each trial, participants chose one option and indicated their preference strength on a half-range scale (Weber & Brewer, 2003). Here we will focus on the choice data. All

participants in Experiment 1 chose from the same three categories while each participant in Experiment 2 faced four out of eight possible categories, assigned with blocked randomisation.

The stimulus categories for Experiment 1 were:

- (i) Monetary gambles to play.
- (ii) UK political parties to vote for.
- (iii) Confectioneries to have.

The categories for Experiment 2 were:

- (iv) Movies to watch.
- (v) Magazines to subscribe to.
- (vi) Cars to own.
- (vii) Holiday destinations to go to.
- (viii) Charitable organisations to make a £100 donation to.
- (ix) Dinners to have.
- (x) Establishments to get a meal from.
- (xi) Fruits to have as a snack.

The master set for (i) consisted of the five monetary gambles from Experiment 1 in Tversky (1969). (ii) consisted of all political parties sitting in the UK House of Commons at the time of data collection. (iii) and (v) – (xi) consisted of all items from Yougov consumer polls that more than 50% of the polled had heard of. If Yougov’s representative sample of the UK population had not heard of an item, we argued, then it is quite uncommon and thus not representative of everyday life. We also excluded a smaller number of these items due to the accompanying image being missing or ambiguous. (iv) consisted of all movies on the IMDB Top 100 list.

We fit a number of prominent models (Cavagnaro & Davis-Stober, 2014) that have in common that they postulate that preferences are transitive but expressed imperfectly, with noise, but differ in what shape that noise takes. We return to one of these models below, but our most striking result is this: for the monetary gambles, there is a small number of participants for whom there is substantial evidence (Bayes factor  $> 10^{0.5}$ ) of intransitive preferences and a larger minority for whom the evidence is inconclusive. However, for the categories of representative options (“representative categories”) there is never substantial evidence of intransitive preferences and a small number of inconclusive participants (see Table 1). At least in these data, intransitive preferences for representatively sampled options appear virtually non-existent.

*Table 1.* Number of participants for whom there is substantial evidence in favour of any transitive model, the intransitive model, or neither, by condition.

	Any transitive model	Intransitive model	Neither
<b>Experiment 1</b>			
<i>UK/USA participants</i>			
Monetary gambles	235/248	11/5	54/47
Political parties	288/289	0/0	12/11
Confectioneries	293/291	0/0	7/9
<b>Experiment 2</b>			
Movies	199	0	6
Magazines	198	0	5
Cars	195	0	7
Holiday destinations	188	0	5
Charitable donations	201	0	6
Dinners	193	0	2
Establishments	192	0	5
Fruits	195	0	3

We now turn to focus on the transitive model that best seems to explain these data. There is a long tradition in psychology of assuming that stimulus magnitudes are discriminated with Fechnerian (Fechner, 1860) imprecision. The greater the distance of two stimuli on some cognitive continuum – in our case, preference strength – the greater the probability of choosing option A over option B when A is truly preferred. As the difference in preference strength decreases, discrimination becomes more stochastic and the choice probability approaches 50% – choice as if by coin flipping. Across representative categories, the Fechnerian model is the best fit for 86% – 91% of participants. For the monetary gambles, the Fechnerian model still performs well but is the best fit for a substantially smaller number of participants: about 71% (UK) and 73% (USA).

Descriptives tell a similar story: for each participant, we sort the options according to that participant’s maximum-likelihood transitive preference ordering. We then rename the highest-ranking option to “A”, second highest to “B”, etcetera, so that their best-fitting preference ordering

reads  $A > B > C > D > E$ . We then calculate the average, group level choice probabilities. For every representative category, they consistently follow the Fechnerian prediction that  $P(A > B) < P(A > C) < P(A > D) < P(A > E)$ . For the monetary gambles, we do not consistently obtain that Fechnerian pattern.

In sum, conclusions regarding both (a) whether preferences are transitive and (b) what cognitive theory best explains them critically depend on whether we expose participants to monetary gambles or representative options. We immediately concede that this does not mean that experimentalists should always eschew monetary gambles. Using them should, however, be a conscious, strategic decision well-motivated by the research question: routine application of monetary gambles as a “drosophila” (Lopes, 1983) will apparently lead to substantially different results than representative stimuli.

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## From Bullet Points to Personality Insights: What's Hiding in Your Resumé?

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Recruiters often prioritize personality when making hiring decisions (Dunn et al., 1995), with resumé screening being the most widely used method in the selection process (Zibarras & Woods, 2010). As such, resumé are frequently used as a means to infer an applicant's stable personality traits (Cole et al., 2009). However, research on the specific cues within resumé that indicate personality traits remains limited (Burns et al., 2014; Cole et al., 2003). This underscores the need for more in-depth studies to determine how effectively resumé signal an applicant's personality.

Here we will provide a brief summary of the article by Tobias M. Härtel, Simon M. Breil, Eric Grunenberg, and Mitja D. Back, "Relationships Between Resumé Cues and Applicants' Personality," published in *Applied Psychology* (available at <https://doi.org/10.1111/apps.12522>). In this article, we present an empirical study on how applicants' personality traits are expressed in their resumé information.

According to Brunswik's lens model (1956), accurately inferring personality from resumé requires the presence of valid cues—specific information in resumé that genuinely reflects the applicant's personality traits. Building on this framework, the goal of this study was to explore the extent to which resumé can be used to accurately infer personality by identifying and understanding the valid cues that signal an applicant's personality traits, as represented on the left side of the lens.

To explore how resumé reflect personality traits, we collected a sample of 141 business students at the start of their careers, who submitted resumé for a fictional entry-level business position. In addition to assessing self-reports of the commonly studied Big Five personality traits, we included grandiose narcissism—a trait known to predict important occupational outcomes beyond the Big Five (Judge et al., 2006).

Our approach to cue coding was guided by the principle of *good information* (Back & Nestler, 2016), which emphasizes capturing a comprehensive representation of the resumé's cue environment. This holistic strategy allowed us to assess the full potential of resumé to signal personality traits. We analyzed 70 resumé cues across various dimensions, with coding performed by 11 trained coders. This extensive set of cues enabled us to address gaps in prior research, exploring areas previously unexamined and employing a more nuanced, high-resolution approach.

We examined resumé cues related to format and layout (e.g., appealing look), education (e.g., average marks), professional experience (e.g., number of internships/jobs), language skills (e.g.,

number of listed languages), software proficiency (e.g., number of graphic design software skills), scholarships (e.g., number of financial scholarships), and extracurricular activities/hobbies (e.g., sport related extracurricular activities/hobbies). Following Burns et al.’s (2014) call, we selected cues for each trait based on personality theory and existing empirical research, ensuring that our interpretation of valid cues is grounded in established knowledge. This approach enhances practical applicability in selection contexts, where transparency and fairness are essential.

The top five most strongly correlated resumé cues derived for each respective trait are shown in Figure 1.

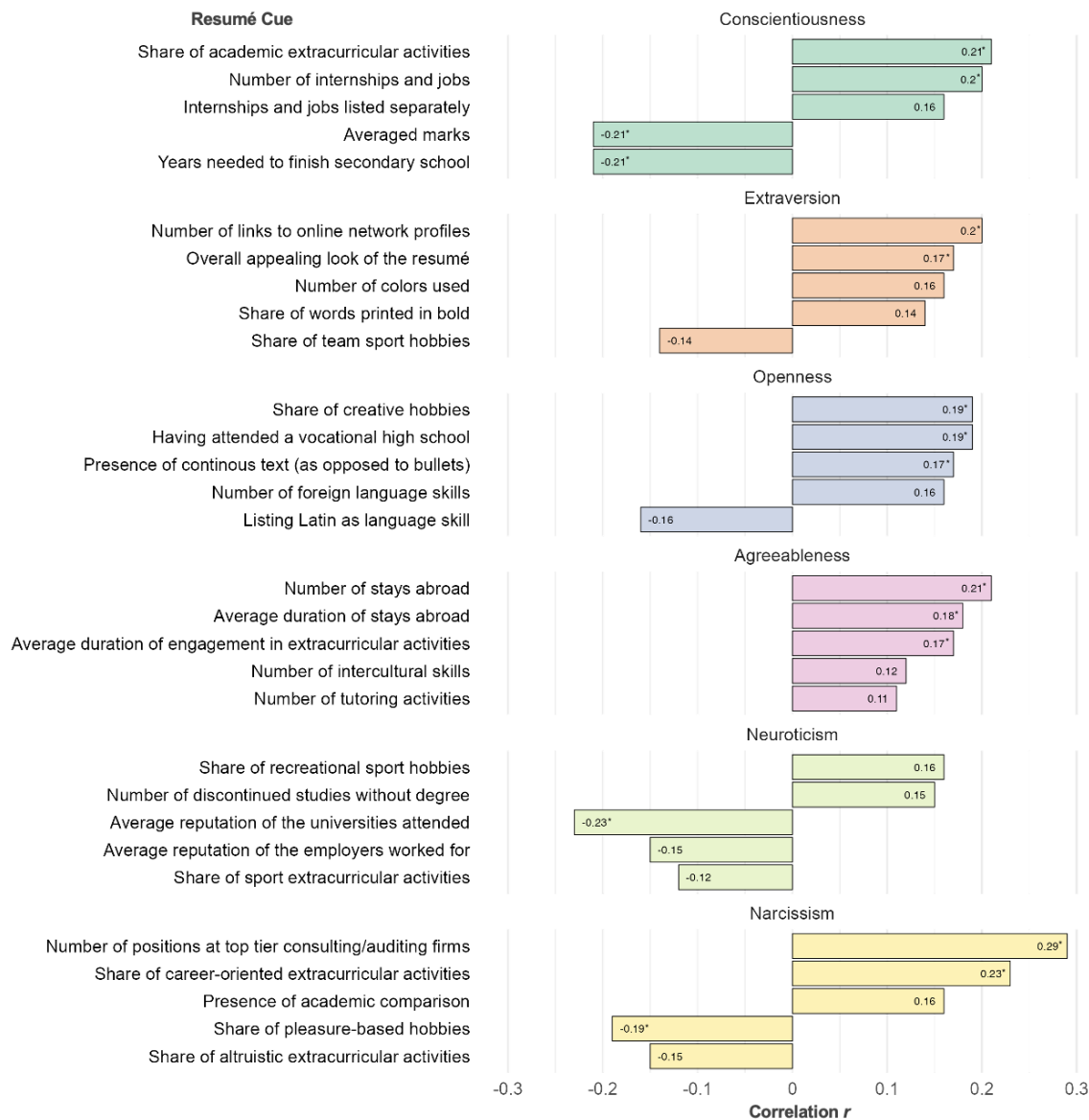


Figure 1. Overview of resumé cues most strongly correlated with the respective traits they were expected to signal. Significant correlations ( $p < .05$ ) are indicated with an asterisk “\*”.

Out of the 70 resumé cues examined, we found 16 to be significantly correlated with the traits they were expected to signal. Valid resumé cues were identified for all the personality traits studied. Hierarchical linear regression analysis further revealed that resumé cues explained significant variance in personality traits beyond basic demographics (gender and age) for most traits. Specifically, openness ( $\Delta R^2 = .23$ ), conscientiousness ( $\Delta R^2 = .18$ ), and narcissism ( $\Delta R^2 = .17$ ) were most reflected in the resumé information. However, the observation that only a subset of theoretically relevant resumé cues showed rather small associations with personality traits indicates that there is a mediocre upper limit to the accuracy of personality inferences based solely on resumé.

Resumé-based personality assessments are widely used in corporate recruitment. Our study's findings can help improve recruiters' accuracy by highlighting valid resumé cues, as shown in Figure 1. However, it's important to recognize that resumé have limited capacity for accurately inferring personality traits. Therefore, while resumé can be useful for initial, non-invasive pre-screening, especially when managing large numbers of applicants, they should not be solely relied upon for comprehensive personality assessment. For more accurate evaluations of individual characteristics, traditional personality tests remain the most effective approach.

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**Egon Brunswik, Enrico Fermi, and the Net of Variables**

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How can people make better estimates, for instance, of an animal's weight? In 1906, the British polymath Francis Galton visited a fair where butchers, farmers and other visitors were asked to estimate the weight of a slaughtered ox as part of a guessing game (Galton, 1907). He found that although the individual estimates were widely scattered, the median of these independent estimates was remarkably close to the true value—a phenomenon that has since been referred to as the wisdom-of-crowds (Surowiecki, 2005). When many estimates are collected and then combined, the individual errors tend to cancel each other out. As an aside, aggregating individual estimates improves accuracy, especially when the errors are independent and uncorrelated (Thurstonian error; Juslin et al., 1997), but is less useful when the errors are not independent, e.g., because a select group of judges with a common bias was surveyed (Brunswikian error).

Building on Galton's findings, researchers have recently investigated whether similar benefits can be obtained when a person makes repeated estimates of the same object, either after sufficient time has elapsed to reset their thinking and approach each estimate anew (Vul & Pashler, 2008), or when they are instructed to make a new estimate under the assumption that the first estimate was off (a procedure Herzog & Hertwig, 2009, refer to as dialectical bootstrapping). It turned out that aggregating estimates from the same person also improved accuracy—a phenomenon that became known as wisdom-of-the-inner-crowd (Herzog & Hertwig, 2009).

How do these two phenomena relate to Egon Brunswik's conceptual framework? His lens model is an analytical framework in which a distal variable can be inferred based on a set of proximal cues (Brunswik, 1955). Such inferences are possible because the variables in this net are related to each other (typically expressed as correlations), and therefore, knowledge of the proximal cues improves the prediction of the distal variable (typically achieved by multiple regression). Now, the estimates of the distal variables are usually correlated with the distal variable (in Brunswik's framework, this is called achievement). It is precisely this correlation that makes it possible to use these estimates as (proximal) cues! Galton did exactly this: he used the visitors' estimates as cues and integrated them into a final estimate (albeit not with regression, as typically done in a Brunswikian framework). From a Brunswikian perspective, the wisdom-of-crowds could, therefore, be seen as the wisdom-of-cues (with each individual's estimate serving as a cue). A similar argument could be made for the wisdom-of-the-inner-crowd: Repeated estimations of the same individual can also serve as cues that can be integrated and help to improve performance.

In a recent experiment (Gomilsek et al., 2024), we wanted to replicate Herzog and Hertwig's (2009) findings on the wisdom-of-the-inner-crowd phenomenon. In addition, we compared their dialectical bootstrapping condition (which essentially implemented a consider-the-opposite strategy) with a "similarity" condition in which we instructed participants to think of similar objects, provide estimates for them, and report the average of these estimates as an estimate of the target object. We found that this similarity-based strategy performed better than the consider-the-opposite strategy. Moreover, we believe that such a similarity-based strategy is closer to Brunswik's framework than the consider-the-opposite strategy. Why? Each of the estimates of similar objects should be highly correlated with the to-be-estimated variable of the target object and can be used as a proximal cue. Together, they form a useful net of variables.

At this point, we can include the Italian physicist (and Nobel laureate) Enrico Fermi in our story. Not only did Fermi (1901–1954) live at almost the same time as Brunswik (1903–1955), but they also both used an analytical framework. Analyzing something essentially means breaking it down into parts (Hoffrage & Marewski, 2015). For example, to analyze a molecule is to describe it in terms of its structure, specifically the atoms that compose it. Similarly, judgment analysis (Hammond et al., 1975; Cooksey, 1996) models the performance of a (distal) variable through a net of variables that act as probabilistic cues and that together allow an inference about the distal variable.

How can the term "net of variables" be associated with Fermi? Fermi recommended decomposing an estimation problem into subproblems, solving these subproblems independently, and then integrating the solutions of the subproblems into a final estimate. Since we are dealing with numerical estimates, each subproblem solution is a variable, and since the subproblems are connected, these variables form a net.

Estimation problems for which it is difficult to find or calculate a precise solution and which can be solved with the help of Fermi's advice are called "Fermi problems". Examples are: "How many piano tuners work in Chicago?" or "How many windows are in London?". How could the number of piano tuners be estimated using a Fermi strategy? For example, one could estimate the population of Chicago, from there, the number of households, the number of households with pianos, the number of pianos that need to be tuned per year, the number of pianos that one piano tuner can tune per year, and from there one could calculate the number of piano tuners needed to meet that demand.

What are the commonalities and differences between Brunswik's and Fermi's approaches? Both scholars had an analytical approach that involved creating a net of variables and then integrating them. One of the differences is that Brunswik's lens model is usually used as a descriptive model. Researchers run regressions on their computers to explain and predict people's judgments. In contrast, Fermi's way of arriving at estimates can be communicated as a prescriptive strategy. John Q. Public may then execute it on the back of a napkin. As the piano tuners example shows, it would not make sense to combine some of the variables that make up the components with a regression equation, even though many are likely to be correlated with each other (across different cities) and

with the variable being estimated (the number of piano tuners). It should also be noted that Fermian strategies share an interesting property with the wisdom-of-crowds and the wisdom-of-the-inner-crowd: Estimation errors can cancel each other out, at least partially. If one component (i.e., one variable) is underestimated while another is overestimated, these two erroneous estimates together can still lead to a better result than a holistic estimate of the distal variable without decomposing the problem into components.

Fermi was a physicist, and his strategy of first decomposing and then combining is widely known both in physics and in education. We believe that his approach could also be of great interest to psychologists, especially in the area of judgment and decision making. We are currently planning a follow-up experiment in which we will compare the performance of participants who are instructed to use different estimation strategies, including Fermian strategies. Note the plural: as we discussed in Gomilsek et al. (2024), the integration of estimates on subproblems can be (1) multiplicative (as in the piano tuner example), (2) additive (e.g., estimating the weight of an ox by adding the estimates of the head, torso, and legs), or (3) averaging (as a similarity-based strategy would suggest). And so, the same applies to this topic as everywhere else: further research is required...

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## Representative Design – A Realistic Alternative to (Systematic) Integrative Design

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In a recent article in *Behavioral and Brain Sciences*, Almaatouq et al. (2024) posit that there has never been “a workable alternative” to the ‘one-at-a-time’ paradigm of experimental design. To this, they attribute the lack of theoretical coherence and generalizability of findings in the social and behavioral sciences. As a solution, Almaatouq et al. (2024) propose *integrative design*, in which researchers need to map out and make explicit the “design space of possible experiments” associated with a given research question, embracing many potentially relevant theories. Researchers can then iteratively generate and test theories with experiments sampled from this “design space”, allowing integration of findings across experiments and theories.

In our commentary (Holleman et al., 2024), we point out that over seventy years ago Egon Brunswik introduced *representative design* as a workable alternative to the problem of commensurability and generality. For researchers familiar with Brunswik’s and Hammond’s critiques of systematic experimental designs, and the importance of representative sampling of stimuli and tasks (Dhimi et al., 2004; Dhimi & Mumpower, 2018; Holleman et al., 2020), concerns about generalizability and theoretical coherence in psychology are well understood. However, one shortcoming of Almaatouq et al.’s (2024) proposal of integrative design is that it does not seem to question the representativeness of experimental conditions studied, so just like in systematic design, the generalizability of results in integrative design remain unknown. We argue that Almaatouq et al.’s integrative design cannot guarantee the external validity and generalizability of results which is sorely needed, while representative design tackles the problem head on. We argue why representative design is a more realistic alternative than integrative design to address the problem of generalizability.

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## Modularity and Cost Cognitive Cues

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Hammond's social judgment theory (Hammond, 1996; Doherty & Kurz, 2010) and Brunswick lens model (Brunswik, 1952; Cooksey, 1996) were the conceptual basis to initiate a research line in cost sharing research for health financing policies. It aimed to incorporate the type of information used by stakeholders to influence behavior (Huttin, 2014; 2023). Experimental designs from conjoint models were used in a reversed way to analyze the impact of patient and physicians' economics in addition to product economics on decision shifts at individual and group level.

At the Brunswick conference in Toronto (2005), Professor Huttin discussed with Professor Hammond the lack of coherence of regulated medical markets in European health systems (Huttin, 2013); it was necessary to re-open the debate between coherence and correspondence approaches to truth; so the research project using "reversed conjoint design" to implement the conceptual framework of the Lens model on groups of primary care physicians was useful to identify reliable cost cognitive cues, which could help to better understand decision shifts due to patient or physician economics. The next research milestone was on consistency of the module of cues with reversed conjoint studies (Huttin, 2019) and fits more the correspondence approach.

The extension of the Cognitive Continuum Theory (CCT, Hammond, 1987, 1988, 1996) discussed by Doherty, Holzworth and Stewart (2023) questioned the opposition between coherence and correspondence metatheories; they propose that truth criteria of both theories could be conceptualized as a continuum, to help with better use of research designs. This cost sharing research contributes to their proposed revision (see premise six of Doherty et al., 2023) on coherence and correspondence "as psychological continua that affect research design and interpretation". This experimental research for cost sensitivity simulators in health care illustrates then quite well the complementarity between the two and the need for researchers and policymakers to identify which one is best suited and under which circumstances. As the change of paradigm in medicine and biology also leads to more process research, it becomes critical to be able to combine the criteria to use both coherence and correspondence theories for evolving tasks. Moreover, for research on cost sharing mechanisms, a better knowledge on effects of incoherencies on compliance with treatment or patient adherence due to financial restraints can also help policy makers to increase accuracy of decision making with more cues on patients in real world settings (more cues in a correspondence approach). However, the integration of non-clinical criteria cannot be easily implemented, since it is against usual medical ethics rules. Therefore, only more complex decision rules embedded in organizations or systems can incorporate the cues.

It leads then to exploring designs of technologies (Baldwin & Clark, 2002), to adapt appropriate architectures to include modules of cognitive cost cues, since a multi-cue system on cost information conflicts with decision processes at points of care. Medical informatics of health care organizations is complex. But researchers can contribute to building evidence on how the system works and the implementation in a health system could include modules of cost cognitive cues in software of information systems, under strict security rules (e.g. HIPPA, USA). The architecture proposed at previous Brunswick meetings resulted from a discussion with IBM to find a safe repository of life science, socio-economic data and links to disease econometric modeling, with program options for inclusion at different steps of modeling and for different types of populations and regions (Figure 1). It requires flexible information and communication technologies.

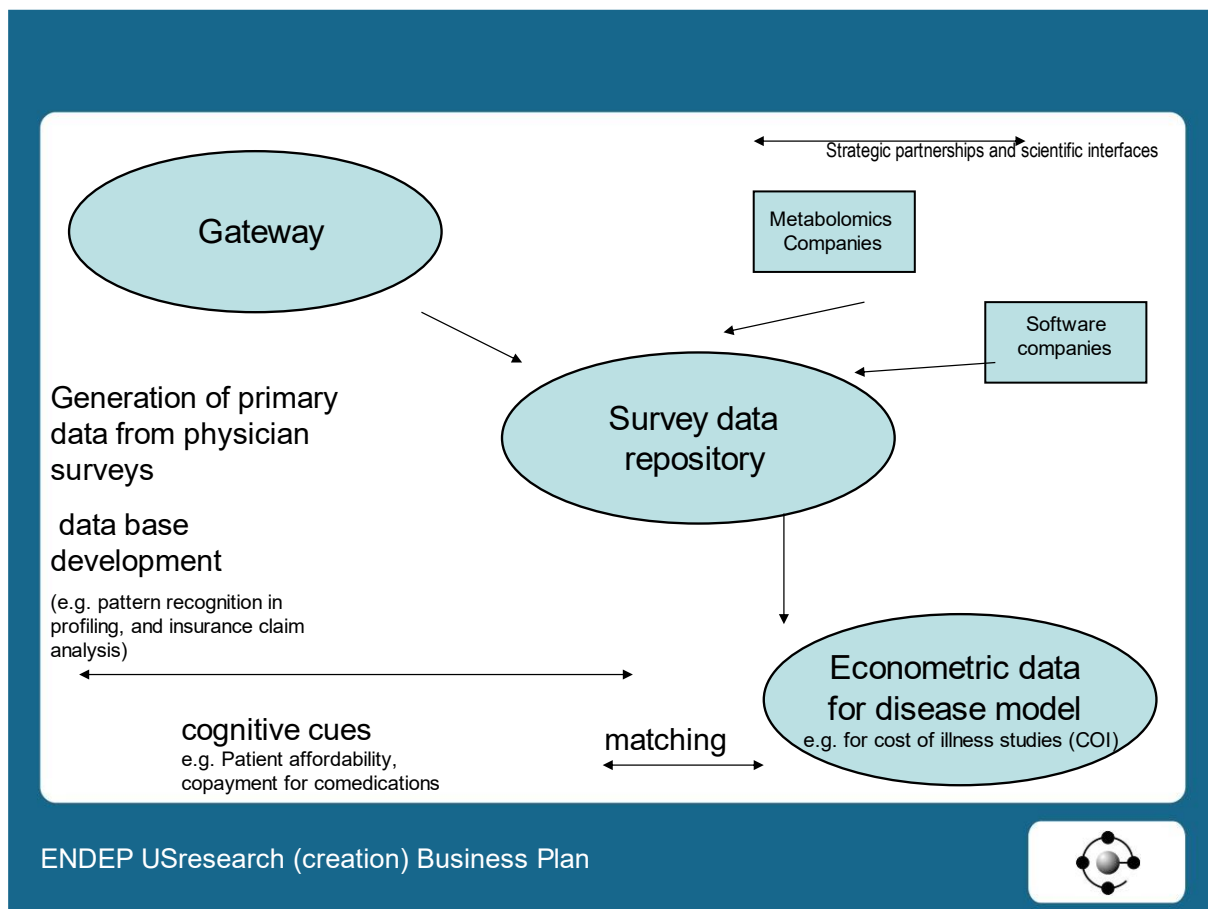


Figure 1. A cognitive architecture for cost cognitive cues, source: Prof Huttin CC-ENDEPUSresearch, communication at Brunswick meeting, 2005, *reprinted with permission of Prof Huttin, Journal of BioLaw, 2006.*

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## Introducing the Lens Model to Athlete Assessment: A Tutorial

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There has been increasing interest in improving the judgment and decision-making processes of sports scouts, particularly in the context of talent identification (e.g., Den Hartigh et al., 2018). This attention is well-founded, as errors in judgment can be costly, whereas sound decisions can greatly benefit individual players, teams, and organizations. However, we observed a lack of a uniform framework for investigating these processes in sports. Drawing on the successful application of the Lens Model (Brunswik, 1952) in other judgment domains, we wrote a tutorial to demonstrate how the Lens Model can be used to understand how scouts combine information and to identify potential ways to improve judgmental accuracy.

The first section of the tutorial explores the successful application of the Lens Model outside the realm of sports, including fields such as education and job performance predictions. We emphasize that, in many cases, the model of the judge outperforms the judge in terms of accuracy (Karelaia & Hogarth, 2008). We connect this finding to Kahneman and colleagues' (2021) work on "noise," which highlights the negative impact of random inconsistencies in human judgment and we underscore the advantages of actuarial approaches. The tutorial then explains the Lens Model and its parameters, drawing extensively on the works of Hammond et al. (1964), Kuncel et al. (2013), and Yu (2018).

To illustrate the potential application of the Lens Model in athlete assessment, we present an empirical example evaluating soccer scouts' judgments. Eighteen scouts participated in a simplified paper-and-pencil task, each rating 50 players on a 1-10 scale based on four skill ratings: tackling, interceptions, sprinting speed, and game insight. These skill ratings were sourced from the FIFA video game 2022 database (shared by Leone, 2022), with transfer market value used as the criterion. We applied multiple regression, correlation coefficients, and dominance analyses to estimate the full Lens Model. The results averaged across all scouts are shown in Figure 1. Consistent with previous research, the model of the scouts ( $r_m = .68$ ) proved significantly more accurate than the scouts themselves ( $r_a = .62$ ), with unmodeled knowledge ( $C$ ) close to zero (Karelaia & Hogarth, 2008). We noted that the environmental predictability ( $R_e$ ) was inflated to .77, likely due to overfitting in a small sample and the removal of outliers before selecting the 50 players from the FIFA database. Additionally, the high cognitive control value ( $R_s$ ) of .93 may be attributed to the standardized nature of the task. The standardized relative importance percentages, summing to 100% and estimated with dominance analysis (Azen & Budescu, 2003), are displayed alongside each skill rating. On the left, these percentages reflect the optimal relative importance for predicting market value in the sample of 50 players. On the right, they represent the relative importance that the scouts (implicitly) assigned to each skill rating in their judgments.

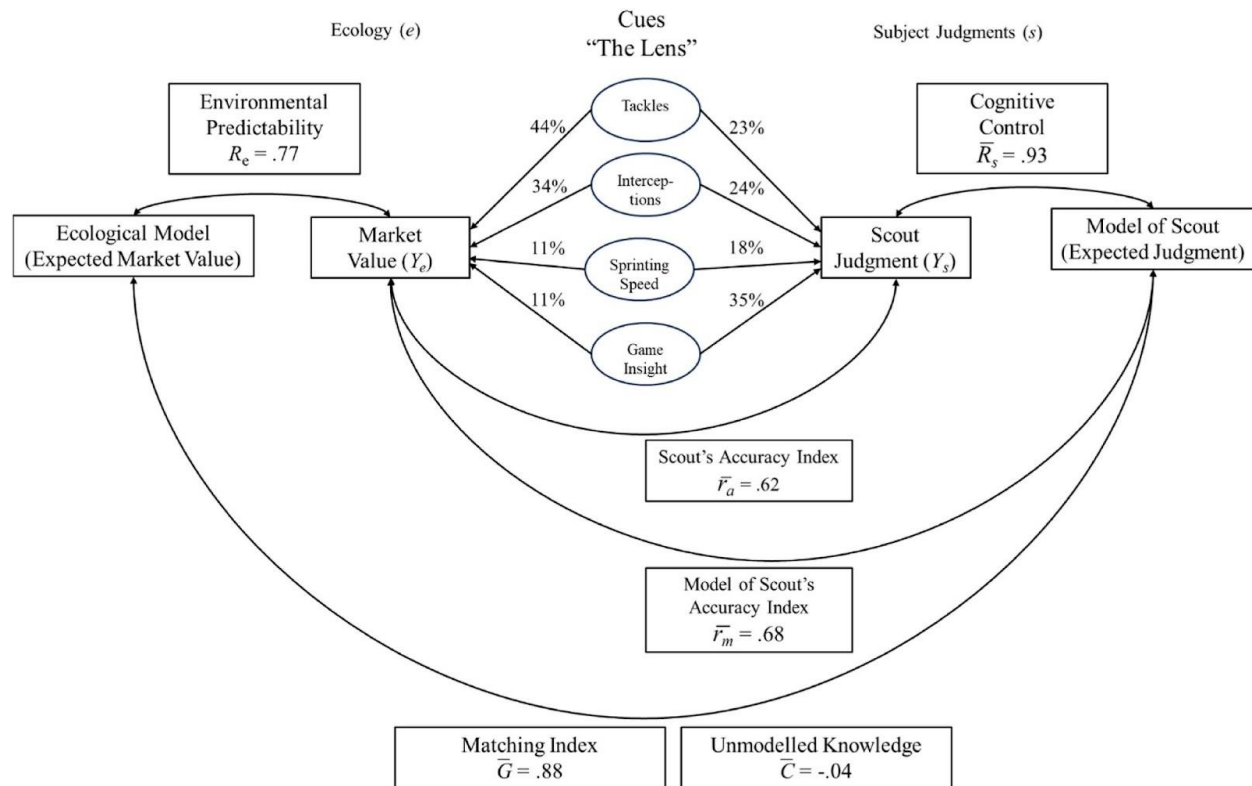


Figure 1. Lens Model Aggregated Results

We conclude the tutorial by outlining potential research directions and addressing some challenges in applying the Lens Model to sports, such as the operationalization and collection of criterion scores. Additionally, we emphasize the importance of clearly distinguishing between the mode of information collection (i.e., subjective or objective) and the mode of information combination (i.e., clinical or actuarial; Meehl, 1954), to which the Lens Model contributes. We hope that our article will inspire further use of Brunswik's work in sports, leading to a deeper understanding of human judgment and decision-making, and ultimately, improving athlete assessment.

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## Towards a Pars Pro Toto Model of Selfhood-Attribution

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While the necessity of a concept of “self” for understanding human behavior remains subject to debate, the significance of this notion in everyday life is evident. Lay individuals ascribe selves not only to humans but also to animals and technical systems, shaping their interactions accordingly (see e.g., Epley et al., 2007; Reeves & Nass, 1996). While a layperson may not be able to provide a clear definition of a “self”, the literature suggests that there are behavioral cues that elicit attributions of selfhood. These eliciting cues may be as minimal as simple movement perceived as causal to some event as shown, for example, by Heider and Simmel (1944). In this study, participants were asked to describe films in which simple geometric shapes were moving and they did so referring to the shapes as people and attributed intentions and motivations.

Inspired by this classical study, the present work aimed to identify which types of behavioral cues may increase selfhood-attribution to other agents such as robots across two studies. Specifically, we compared behavior of non-humanoid robots suggesting either the presence or absence of behavioral cues for one of the characteristics of interest by asking participants to rate the robots separately on several already established selfhood-related questionnaires, Mind Attribution Scale (Bigman & Gray, 2018), Godspeed Scale (Bartneck et al., 2009) and Robotic Social Attributes Scale (Carpinella et al., 2017), and on our own scale about the perception of the behavioral characteristics. In the first study (Pohl et al., 2024, submitted), over five experiments we examined one by one the characteristics causality, equifinality, behavioral efficiency, learning sensitivity, and context sensitivity. In the second study, since the contribution of social interaction in developing a concept of “self” has been stressed in the literature (Cooley, 1998; Mead, 1913), we extended our manipulation to the characteristic’s social sensitivity, attention sharing and helping behavior. In both studies we used robots that look much more like a vehicle than like a human, similar to the Braitenberg vehicles (Braitenberg, 1984), as there is a bias for overly anthropomorphic agents in the literature that has been argued to create various kinds of artifacts and confounds (Thellman et al., 2022).

In both studies, results showed a consistent pattern of increased selfhood-attribution towards robots exhibiting any one of the examined minimal characteristics. Furthermore, the majority of perceived sentient characteristics of the robot were triggered by any single characteristic’s cue, though in the social experiments this was mostly limited to the social characteristics. Joint analyses over the experiments in each study also show that almost all characteristics and selfhood-related subscales are correlated significantly. We frame this in two versions of a Brunswikian lens-model

of selfhood-judgement, wherein selfhood is attributed based on the activation of (probably loosely defined) self-related characteristics.

Originally, we expected a 1:1 relationship between each behavioral cue ( $BC_1 \dots BC_n$ ) of an agent and the corresponding internal representation of the respective characteristic ( $C_1 \dots C_n$ ) of which some would converge on to some selfhood judgement (see Fig. 1A). Contrary to this, our results suggest that even a single cue of a selfhood related characteristic may be sufficient to trigger a change in overall selfhood-attribution to robots. In our alternative models we propose that not all representations of characteristics are directly triggered by their corresponding behavioral cues; rather, that the characteristics interact with each other (Fig. 1B) and/or behavioral cues activate more than one characteristic (Fig. 1C).

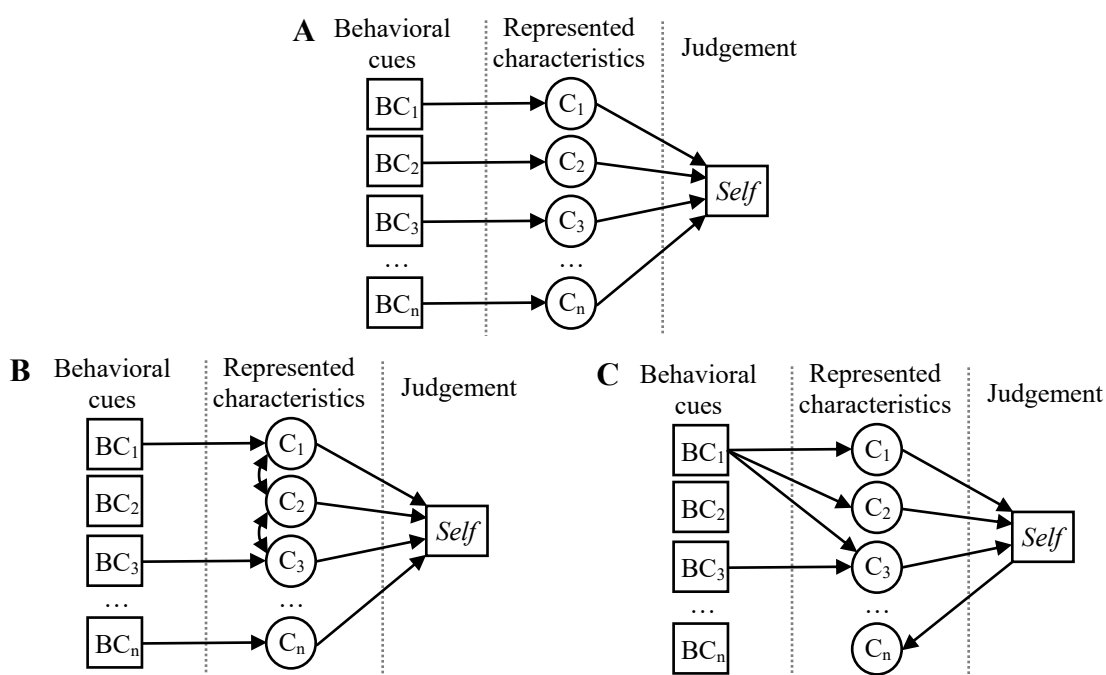


Figure 1. Towards a Pars Pro Toto account of selfhood-attribution.

The first version of these alternative models (Fig. 1B) shows a pattern similar to what has been referred to as the Halo effect (Thorndike, 1920): Assuming that each characteristic is an independent construct, what we observe is an over-generalization. For example, when participants perceive an agent as efficient, they also perceive it as more causal and learning-sensitive – even when there are no cues suggesting the agent might be capable of these characteristics.

Alternatively, as depicted in the second alternative version (Fig. 1C), it may be that the external concepts are less organized, and less well defined than we originally assumed. Indeed, Danziger (1997) has pointed out that most concepts used in cognitive research are derived from everyday language and not well-suited to provide clear-cut, unique concepts for driving mechanistic research. For our research, this would imply that the distal features that we aimed to manipulate in

the experiments may overlap conceptually. Hence, the actual everyday life meanings of concepts like causality or context sensitivity may not be completely distinct but may overlap. In the same way, it may be that the concept of self is much broader than we expected and includes what we assume to be independent characteristics. In model terms, this would imply that it is actually the behavioral cues that in some sense overlap, so that the same represented characteristic may be activated by various cues, or more precisely, by several features or future components that the behavioral cues entail. Similarly, activating some characteristics via one or more cues and thus triggering a selfhood judgement might in turn trigger the activation of other un-cued characteristics because these are simply included in people's definition of a self.

In conclusion, both alternatives can be considered Pars Pro Toto models of selfhood-judgement, explaining our strong evidence against a 1:1 relationship between behavioral cues and represented characteristics. Our data confirms the relevance of most of the investigated characteristics and shows that people go way beyond the information given when attributing selfhood even to non-humanoid agents.

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## Smiles Serve as a Window into Personality, Providing Others with the Opportunity to See Through

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Smiles do more than just express emotion—when posed in photographs, they may offer a glimpse into our personalities. In today’s world, where we frequently share our smiles through social media, professional profiles, and dating apps, understanding what our smiles reveal is more important than ever.

Not all smiles are the same; subtle individual differences can be observed in how people configure this facial expression. One particular type of smile, the Duchenne smile, involves the simultaneous activation of two muscles: the Zygomatic Major, which lifts the corners of the mouth, and the Orbicularis Oculi, which creates wrinkles at the lateral corners of the eyes. Traditionally, Duchenne smiles were thought to exclusively express rapid onsets of happiness (e.g., Ekman et al., 1990). However, more recent research has shown that Duchenne smiles can be intentionally posed (Gunnery et al., 2013; Krumhuber et al., 2014), even in the absence of rapid onsets of positive emotion, such as in yearbook photographs (Harker & Keltner, 2001; Noah et al., 2018; Krumhuber & Kappas, 2022). In the present work, we therefore challenge the conventional understanding of the Duchenne smile as an instinctive and uncontrollable emotional reaction, instead establishing it as a form of self-expression that, when posed, may reveal meaningful information about personality.

To do this, we first used a bottom-up data-driven approach to explore how facial muscle activations are associated with personality traits, paying careful attention to the Duchenne smile. Next, in Study 2 we applied a Brunswick lens model approach (e.g., Brunswick, 1943, 1955), to determine whether observers viewing smiling photographs form accurate personality judgments, and if this accuracy is explained by the expression and utilization of Duchenne smiles.

### Research Overview

To explore whether Duchenne smiles encode personality, and are utilized by observers to form accurate personality judgments, we conducted two studies, detailed in Witkower, Tracy, and Rule (2024):

- **Study 1:** Three hundred three participants self-reported their warmth, trustworthiness, aggression, conscientiousness, and hubris. Each participant was photographed displaying a neutral expression (“Please relax your face while looking directly into the camera”), and a smiling expression (“Please smile the way you normally do when having your photograph taken”). Using the Facial Action Coding System (FACS; Ekman & Friesen, 1978), we

analyzed the facial muscles participants used to form their smile, paying careful attention to the muscles that characterize the Duchenne smile.

- **Study 2:** An independent sample of 978 participants evaluated the personality traits of the individuals from Study 1, based on either their neutral or smiling photographs. They rated each participant on the same five traits that participants from Study 1 self-reported.

### **Key Findings**

Individuals who are warmer, more trustworthy, and more conscientious, or less aggressive and hubristic, were more likely to pose with a Duchenne smile when smiling for a photograph. When observers viewed smiling photographs, they accurately assessed each of the five personality traits, such that perceptions of each participant's trait collected in Study 2 correlated with participants' self-report of the corresponding trait collected in Study 1. Furthermore, using a Brunswik Lens Model approach, we demonstrated that the accuracy of these judgments was mediated by the expression and proper utilization of Duchenne smiles, in particular.

Additionally, we demonstrated that observers made slightly more accurate personality assessments from smiling photographs when compared to neutral photographs. This suggests that smiles, especially Duchenne smiles, serve as reliable indicators of personality traits, helping others form more accurate impressions.

### **Discussion**

These insights reveal that posed Duchenne smiles act as a window into personality, providing others with the opportunity to see through. Beyond advancing our scientific understanding of smiles, these findings carry significant societal implications. In today's digital age, where smiling photographs are frequently shared on platforms like Facebook, Instagram, and LinkedIn, this research raises important privacy concerns. Our smiling images may reveal more about our personalities than we intend, potentially exposing us to unintended profiling or privacy violations. As many social networking websites require profile pictures to be publicly accessible, the risk of inadvertently sharing personal information through our smiles is heightened. However, this transparency is not necessarily negative; showcasing our personality through a smile may help us connect with more compatible partners on virtual dating platforms, or authentically present ourselves as the right fit for a job. In these contexts, our smiles can act as a powerful and honest tool in social and professional interactions.

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