May 9-11, 2024
Athens, OH
Ohio University
Baker Center

Midwest Cognitive Science Conference 2024 Meeting Information

About the Midwest Cognitive Science Conference

The Midwest Cognitive Science Conference showcases exciting new developments in cognitive research from a diverse range of perspectives, including psychology, philosophy, neuroscience, anthropology, education, and computer science. Our goal is to facilitate an intellectually stimulating event that celebrates the interdisciplinary nature of cognitive science and allows researchers from a variety of relevant fields to mingle and exchange ideas.

2024 Organizing Committee

Conference Director: Ron Vigo, Ph.D.
Logistics Coordinator: Cody B. Ross
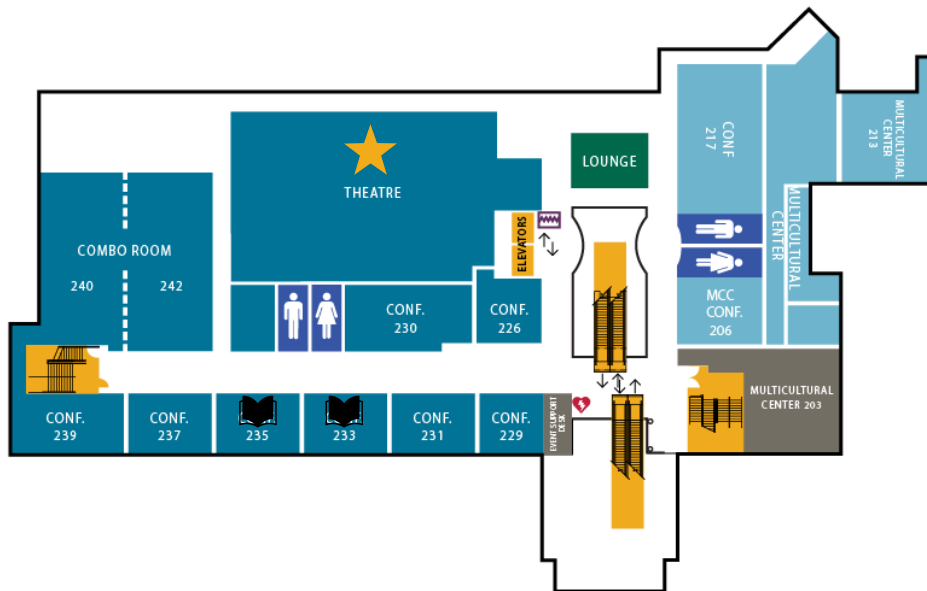Public Relations Coordinator: Abigail Bartlett
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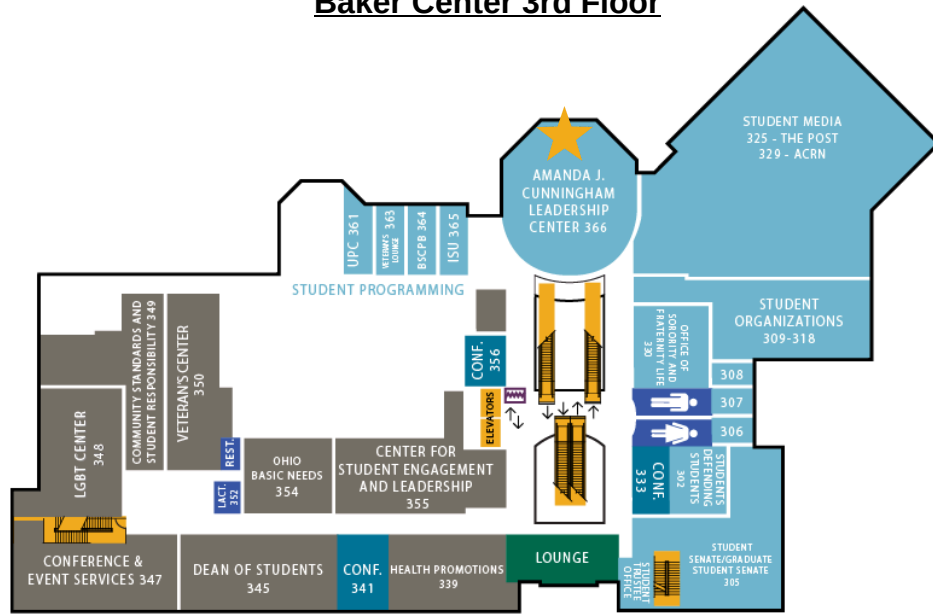
Baker Center 1st Floor

west 82 foodcourt

Life is Sweet

GENDER NEUTRAL RESTROOM

Bobcat Depot

LATITUDE39 CASUAL DINING

ELEVATORS

MAGGIE DAVIS ROOM

PARKING GARAGE ELEVATOR

ADMISSIONS INFO DESK

UNDERGRADUATE ADMISSIONS VISITORS LOUNGE

LOUNGE

LOUNGE

Baker Center 2nd Floor

COMBO ROOM

240   242

THEATRE

LOUNGE

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MULTICULTURAL CENTER 213

ELEVATORS

MULTICULTURAL CENTER

CONF. 230

CONF. 226

MCC CONF. 206

CONF. 239

CONF. 237

235

233

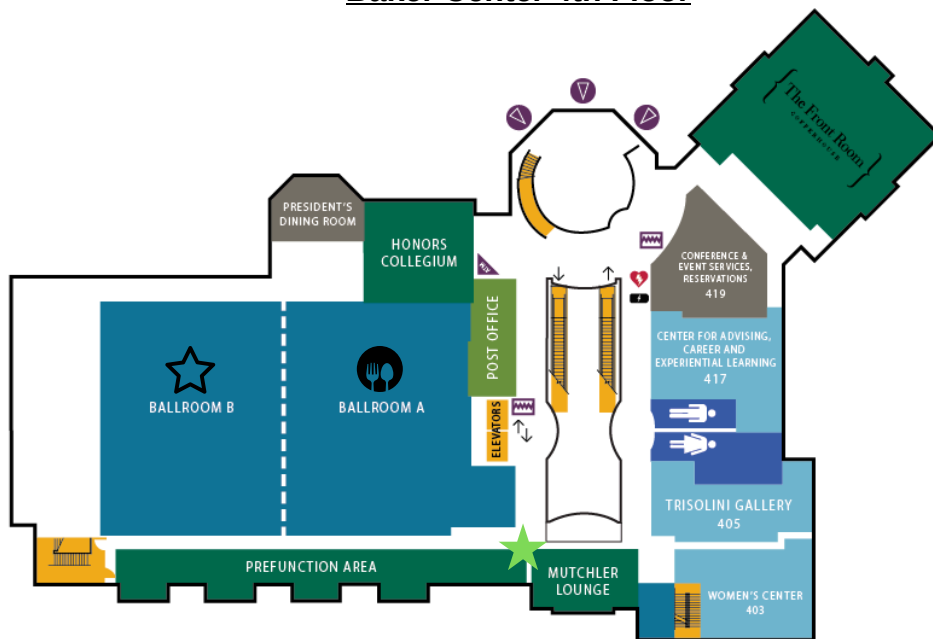CONF. 231

CONF. 229

EVENT SUPPORT DESK

MULTICULTURAL CENTER 203

Thursday Workshops | Friday and Saturday Quiet Rooms
Rooms 233 and 235

Friday and Saturday Talk Sessions
Theater

Baker Center 3rd Floor

Student Media
325 - THE POST
329 - ACRN

Amanda J. Cunningham Leadership Center 366

UPC 361
VETERAN'S 363 LOUNGE
BSCPB 364
ISU 365

STUDENT PROGRAMMING

CONF. 356

ELEVATORS

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STUDENT ORGANIZATIONS 309-318

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Veteran's Center 350

REST.
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LGBT Center 348

Conference & Event Services 347

Dean of Students 345

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Health Promotions 339

Lounge

STUDENT TRUSTEE OFFICE

Student Senate/Graduate Student Senate 305

Baker Center 4th Floor

The Front Room

PRESIDENT'S DINING ROOM

HONORS COLLEGIUM

POST OFFICE

CONFERENCE & EVENT SERVICES, RESERVATIONS 419

BALLROOM B

BALLROOM A

ELEVATORS

CENTER FOR ADVISING, CAREER AND EXPERIENTIAL LEARNING 417

TRISOLINI GALLERY 405

PREFUNCTION AREA

MUTCHLER LOUNGE

WOMEN'S CENTER 403

⭐ Check-in | Snack and Bar Area
Mutchler Lounge and Prefunction Area

⭐ Friday and Saturday Talk Sessions
Room 366

🍴 Friday Lunch and Banquet Dinner
Ballroom A

☆ Posters | Friday Poster Session
Ballroom B

Meeting Overview

Thursday, May 9

3:30 - 5:30 pm | Workshops

Baker 235	**Baker 233**
Workshop I	Workshop II
A Friendly Introduction to Generalized Invariance Structure Theory: A Unified Mathematical & Computational Theory of Cognition and Contextual Information Processing *Cody B. Ross, Ronaldo Vigo, Charles Doan, and Jay Wimsatt*	System Dynamics Models for the Cognitive Scientist Using Vensim *Jeffrey B. Vancouver*

5:30 - 7:30 pm | Reception
Mutchler Lounge and Prefunction Area
Coffee, tea, snacks, cash bar (one free drink ticket)

Friday, May 10

Designated Quiet Rooms
Friday and Saturday During Conference Hours
Baker 230, 233, and 235

7:45 - 8:10 am | Arrival
Mutchler Lounge and Prefunction Area
Coffee, tea, snacks

8:15 - 8:25am | Opening Remarks
Theater

8:30 - 9:45 am | Talk Session I

Theater	Baker 366
8:30 Analytical Transformation of Facial Holism: Unveiling Reversed Alchemy through Computational Modeling **Mario Fifić**, *Daniel R. Little, and Cheng-Ta Yang*	**8:30** Visual Adaptation and Successful Representation **A. T. Ramirez**
8:55 Using virtual environments to study decision making and individual differences **Joseph G. Johnson**, *Lauren Davidson, Benjamin Lemli, Kat Pikus, and Victoria Dusing*	**8:55** The Virtues of Gibson's Visual World and the Problem of Perspectival Properties **Alexander Webb**
9:20 Free Recall from Structured Domains **Nathan Couch**	**9:20** Learning in the Context of Partial Information **Nicole King**, *Qianqian Wan, Robert Ralston, Layla Unger, Vladimir Sloutsky, and Brandon Turner*

10:15 - 11:30 am | Talk Session II

Theater	Baker 366
10:15 *Fitting accumulator models to censored data **Joseph Houpt**	**10:15** EEG power band analysis of emotional processing in children **Adam M. Croom** *and Sage Halbritter*
10:40 *Universality in Two-Alternative Forced Choice Performance **John G. Holden**	**10:40** Evaluating the Moderating Effect of Executive Functioning on the Relation Between Hyperactivity and Peer Rejection **Emily M. Glatt**, *Darcey M. Allan, and John Monopoli*
11:05 Brain electrical activity depending on performance in travelling salesman problem task **Illia Kuznietsov** *and Sébastien Hélie*	**11:05** Examining neurocognitive differences between women with atypical anorexia nervosa, anorexia nervosa, and healthy controls with weight loss: Preliminary findings **Taylor L. Rezeppa** *and K. Jean Forney*

11:30 am - 1:00 pm | Lunch
Baker Ballroom A

1:00 - 2:00 pm | **Keynote: The Metacognition of Participation**
Aaron S. Benjamin
Professor and Acting Head of Psychology at the University of Illinois Urbana-Champaign
Theater

2:15 - 3:30 pm | Talk Session III

Theater

2:15   Inferring Constraints on Attention: An Across Species Analysis
Brandon Turner, *Matthew Broschard, John Freeman, Ellen O'Donoghue, Vladimir Sloutsky, and Ed Wasserman*

2:40   Cognitive Processing in the Tower of London with Working Memory Load
Oksana Rakovets, Illia Kuznietzov, and **Sébastien Hélie**

3:05   Exploring Concept Learning Difficulty as a Function of Category Exposure Time
Jay Wimsatt, *Ronaldo Vigo, Cody B. Ross, Raghu Yadav, and Abigail Bartlett*

Baker 366

2:15   No 'Easy' Problems of Consciousness: A Proposal for Formalizing Qualitative Metrics of Phenomenality
Deborah Cocheo

2:40   Indeterminacy and the moral significance of consciousness
Daniel Cappell

3:05   Psychological Frameworks of Animal Communication
Brian Mascaro

3:45 - 5:00 pm | Talk Session IV

3:45   Using the Dual-Discrimination Invariance Model to Account for Unsupervised Categorization of Separable and Integral-Dimension Stimuli
Charles Doan *and Ronaldo Vigo*

4:10   *Pattern Completion as a General Mechanism for Memory-Based Inference
Robert Ralston, *Brandon Turner, and Vladimir Sloutsky*

4:35   Human minds generate category prototypes from diverse realistic scenes
Shang-Hsuan Su, Hongjing Lu, and **Yi-Chia Chen**

3:45   Measuring the impact of different forms of contact on student course engagement and performance in large and/or online courses
Richard N. Tillman

4:10   Worth the Weight: An Examination of Unstructured and Structured Data in Graduate Admissions
James Adaryukov, *Tim Pleskac, Jeffrey Girard, Monica Biernat, and Adrian Villicana*

4:35   On the Conditions of Explainability for Explainable Network AI
Anthony F. Beavers

5:00 - 6:45pm | Poster Session
Baker Ballroom B
Snacks, cash bar
1st ($200), 2nd ($100), and 3rd ($50) place winners will be informed at 6:40pm
Winners will be announced at the banquet dinner

7:00pm | Banquet Dinner and Poster Awards
Baker Ballroom A

Saturday, May 11

8:30 - 9:00 am | Arrival
Mutchler Lounge and Prefunction Area
Coffee, tea, snacks

9:00 - 10:15 am | Talk Session V

Theater	**Baker 366**
9:00 Where are the Context Effects? ***Xiaohong Cai*** *and Tim Pleskac*	9:00 Using Intersubject Functional Correlation to Study Schema Learning ***Yi Xu***, *Chris Baldassano, and Matthew Siegelman*
9:25 A registered report on presentation factors that influence the attraction effect ***Eeshan Hasan***, *Yanjun Liu, Nicole Owens, and Jennifer S. Trueblood*	9:25 Implicit biases embedded in first- versus second-order word co-occurrence in natural language ***Molly Apsel*** *and Michael N. Jones*
9:50 Task Designs and Effort-Based Decision Making ***Alyssa Randez*** *and Sébastien Hélie*	9:50 Categorizing Higher-Weight Women as Lesbians Through Spreading Node Activation ***William Silvia, Jr.*** *and Kimberly Rios*

10:45 am - 12:00 pm | Talk Session VI

10:45 Some Preliminary Results Regarding the Aesthetics of Acoustical Concept Structures ***Cody B. Ross***, *Ronaldo Vigo, and Raghu Yadav*	10:45 Investigating Compatibility Effects for Affective Words ***Hailey Arreola***, *Sébastien Hélie, and Robert W. Proctor*
11:10 The Horizontal Spatial-Musical Association of Response Code (SMARC) Effect: Effects of Tone Laterality and Musical Experience ***Qi Zhong***, *Kim-Phuong Vu, Sébastien Hélie, and Robert W. Proctor*	11:10 Investigation of Individual Differences in Lexical-based Word Segmentation ***Yuzhe Gu*** *and Mark Pitt*
11:35 Categorization of Tinnitus Quality ***Abdullah Binshulhub*** *and Jennifer Lentz*	11:35 Humor, Intelligence, and Creativity ***Arie Sover***

12:00pm | Conference Ends

Abstracts

Keynote

The Metacognition of Participation

Aaron S. Benjamin

Professor and Acting Head of Psychology at the University of Illinois Urbana-Champaign

The applied science of cognition often takes the classroom as a model situation. In a classroom, students play only a small role in choosing learning activities, and those activities are shared across students with a wide spectrum of abilities and interests. In most other arenas in life, the cognitive activities in which we participate are ones for which we volunteer, and in which we play the major role in scheduling our work and deciding when we quit. In this talk, I explore the consequences of self-selection on a wide variety of cognitive activities. Choice over participation affects the interpretation of group data, the extent to which individuals benefit from cognitively enhancing events like memory tests, how crowd wisdom can be harnessed, and how artificial agents can be designed to have fruitful interactions with human users. I hope to convince you that questions of *participation* should be front and center in any applied science of cognition.

Workshops

<u>Baker 235 – Workshop I</u>

A Friendly Introduction to Generalized Invariance Structure Theory: A Unified Mathematical & Computational Theory of Cognition and Contextual Information Processing

Cody B. Ross[1], Ronaldo Vigo[1], Jay Wimsatt[2], and Charles Doan[3]

1. Ohio University
2. Arizona State University
3. Marietta College

In this workshop, we demonstrate how to compute a selection of models from Generalized Invariance Structure Theory (GIST; Vigo, 2013, 2015), a unified general theory of cognition based on invariance and symmetry detection principles and processes as determinants of a) contextual information processing, b) perceived group coherence, c) degrees of dimensional diagnosticity, and d) stimulus generalization. We demonstrate the application of these models to the domains of concept learning and categorization, information theory, and decision making. We discuss the theoretical basis for the models, as well as how they have been applied to accurately predict a variety of empirical results, and we offer interactive step-by-step guidance for their calculation and application. The co-organizer of this workshop and creator of GIST, Dr. Ronaldo Vigo, was a recipient of the NIH Mathematical Modeling Training Grant and has 30 publications on mathematical and/or computational modeling in the cognitive science field, including a book titled "Mathematical Principles of Human Conceptual Behavior: The Structural Nature of Conceptual Representation and Processing."

<u>Target audience</u>: This workshop is of interest to those with a general enthusiasm for mathematical and computational modeling, as well as those who work in any area of cognitive research, including concept learning and categorization, theories of information, and decision making. Participants do not require any specific background knowledge in order to learn to apply the models, so undergraduates, graduates, and experts alike are welcome.

<u>Necessary equipment</u>: No special equipment required.

System Dynamics Models for the Cognitive Scientist Using Vensim

Jeffrey B. Vancouver

Ohio University

The workshop will be a hands-on workshop with lecture. We will discuss computational models generally as well as the logic and value of the system dynamics approach to modeling. Then during the hands-on part of the workshop, we will go through the model building process, first with a worked example and then with a modeling problem. During the worked example, participants will build the model along with the presenter. For the modeling problem participants will team up to build a simple model of a classic study. Finally, we will leave time for any unanswered questions. Note, the lead instructor for this workshop, Dr. Jeff Vancouver, has published 24 computational models or papers on computational modeling in the organization science field at both the micro and meso-levels of analysis.

Target audience: Graduate student or higher.

Necessary equipment: Individuals are required to bring laptops with the free software already installed, which can be found at http://www.vensim.com/. (Some laptops may be available.)

Session I

Theater

Analytical Transformation of Facial Holism: Unveiling Reversed Alchemy through Computational Modeling

Mario Fifić[1], Daniel R. Little[2], and Cheng-Ta Yang[3,4]

1. Grand Valley State University
2. The University of Melbourne
3. National Cheng Kung University
4. Graduate Institute of Health and Biotechnology Law, Taipei Medical University

Historically, a significant body of research on face processing has been method-driven rather than theory-driven. Notably, developments in research methodologies, such as the part-to-whole and composite faces paradigms, have played a central role in shaping this field. These methodological approaches have laid the logical groundwork for inferring the underlying processes involved in facial perception. However, recent advancements in theoretical tools, like the Modular Serial Parallel Networks (MSPN), have opened new avenues for exploring facial perception with exceptional granularity. These developments allow for a deeper understanding of the various cognitive and perceptual processes underlying facial recognition. In this study, we utilize MSPN to establish convergent validity by scrutinizing the outcomes from the two dominant facial paradigms. By doing so, we aim to gather additional evidence that either supports or challenges the results revealed by MSPN. The exploration of these results questions conventional approaches to facial perception, introducing a paradigm shift in our understanding of this intricate cognitive process.

Using virtual environments to study decision making and individual differences

Joseph G. Johnson, Lauren Davidson, Benjamin Lemli, Kat Pikus, and Victoria Dusing

Miami University

The accessibility and power of virtual reality devices and virtual environments (VE) have exploded in recent years. Here we present these as an excellent tool for researchers to measure real-time, real-world behavior, with numerous advantages over some basic experimental tasks and self-reports. We present two examples from our work to demonstrate the capabilities and unique theoretical and methodological contributions of using VEs. First, we extend lab-based process-tracing techniques from a desktop setup to a virtual "supermarket shelf." We connect cognitive processes such as attention and preference formation with measures such as eye- and response-tracking that are easily attainable in VEs. In addition to informative behavioral measures, we use a computational model to relate these process variables to address questions about the dynamics of decision making. Second, we use a VE to address questions of individual differences relevant in I/O psychology and personnel selection, particularly. In addition to typical self-report measures of job-relevant traits such as industriousness and teamwork, we used a custom-made VE to simulate both basic, daily encounters as well as job-specific scenarios to measure these traits. This provides an opportunity to directly measure the relevant traits when in actual, realistic situations (rather than participants rating items). We provide data from a validation study using both measures to identify relationships, underlying factor structures, and scoring methods for relating VE task variables. Together, these studies highlight the benefits of this work and will be used to springboard discussion of other potential applications across a number of domains.

Free recall from structured domains

Nathan Couch

Northwestern University

Many domains are characterized by the relations among their members, rather those members' intrinsic features — for instance, a family, an ecological web, or (more subtly) a story. Despite this, memory research tends to focus on memory of and for individual items, while relations among items are generally regarded as a nuisance to be controlled for. The present study addresses how free recall is influenced by relational structure. Participants learned about a domain with a hierarchical structure and subsequently asked to recall its members. Domains were construed as either a genealogical tree ("X is the parent of Y") or a causal network ("X causes the production of Y"), while a third group participated in structurally identical task that lacked a meaningful construal. When recalling members of a family, participants produced sequences that faithfully reflected domain structure in two ways. In addition to starting with the most ancestral member of the family, participants were more likely to recall the descendants of previous recall than other family members. In contrast, recall was relatively disorganized in the causal and meaningless conditions. As the conditions did not differ in their rate of acquisition, nor on a final memory test, the observed differences in recall are unlikely to be accounted for by simple differences in memory strength. Taken together, these results are evidence that conceptual structure can guide retrieval from long-term memory, but that this influence is mediated by prior familiarity with domain schemas.

Visual Adaptation and Successful Representation

A.T. Ramirez

Washington University in St. Louis

Visual adaptation effects have been a topic of recent discussion in philosophy and psychology. Two points of contention have emerged to the fore. The first concerns whether adaptation effects are a theoretically useful tool for marking the distinction between perception and cognition – a topic that has already been discussed in careful detail (Block 2022; 2023; Phillips and Firestone 2022). A second, and relatively under discussed matter, concerns what function adaptation effects have in vision. A common way to characterize the effects emphasizes how the visual system tunes out redundant stimuli (McDermott et al. 2010; Block 2022). Features of the visual system that produce a constant signal are filtered out in order to better perceive novel stimuli. If so then signal suppression is thought to contribute to successful representation. This paper makes a clear distinction between two ways adaptation effects could promote successful representation: by improving representational accuracy or representational precision. I provide psychophysical evidence to show that in most cases adaptation promotes neither accuracy nor precision. Lastly, I discuss consequences that bear significance to the debate about the perception cognition distinction.

The Virtues of Gibson's Visual World and the Problem of Perspectival Properties

Alexander Webb

Indiana University Bloomington

A popular account of visual experience maintains that proximal stimulation elicits certain sensations which form the basis for mental representations of the world. Yet, this account has its problems. One is the classic problem of restoring the "missing dimension" of depth. Another is the problem of perceptual constancy. There is an alternative picture, however, which neatly avoids these problems altogether. In his seminal (1950) Perception of the Visual World, James Gibson introduces a different scheme in terms of what he calls the visual world. The visual world is immediately accessible to the perceiver. It is not the result of inference, but rather the result of the direct pickup of information embedded in the structure of the stimulus. In the visual world depth is supplied by a ground surface and objects remain constant. Hence, the problem of depth and the problem of constancy do not get off the ground. However, another problem emerges. There remains the task of explaining the perspectival aspects of experience. In order to account for such perspectival aspects, Gibson relies on the notion of a visual field, understood as a two-dimensional array of sensations. In this presentation I will argue that while Gibson was on the right track in developing his concept of the visual world, his reliance on the visual field to account for perspectival properties creates serious tensions for his account and any account that wishes to take the visual world seriously. To explain the perspectival aspect of experience we must look for solutions elsewhere.

Learning in the Context of Partial Information

Nicole King[1], Qianqian Wan[1], Robert Ralston[1], Layla Unger[2], Vladimir Sloutsky[1], and Brandon Turner[1]

1. The Ohio State University
2. The University of York

In our everyday lives, there are often more aspects of the environment than we can reasonably attend. As a consequence, we selectively attend to some aspects of the environment -- usually those aspects which are most relevant to our goals -- and ignore aspects that are deemed irrelevant. It follows then, that using selective attention can limit a learner's impression of an environment, because the information that is stored in memory is only a biased sample or partially encoded version of that environment. However, previous theories assume perfect and consistent access to all available dimensions, regardless of how attention is distributed. Here, we build upon existing models of categorization to illustrate how partial encoding can account for differences in learning. We use three benchmark datasets to demonstrate how the model can flexibly capture different learning strategies within the same task by creating a map of the corresponding representation. Most importantly, models equipped with partial encoding readily account for unique behavioral profiles suggesting failure of selective attention to relevant dimensions.

Session II

<u>Theater</u>

*Fitting accumulator models to censored data

Joseph W. Houpt

The University of Texas at San Antonio

Modeling joint choice-RT data with accumulator models has become a dominant theme in mathematical psychology and these models are increasingly influential in many areas psychological research. These models are often applied to censored data: Experiments usually include an upper limit for a response time before a trial automatically ends and the experiment moves on. It is also common practice to throw out early response times, assuming they are too fast to be a true response to the task. However, the standard approaches to fitting the models, whether maximum-likelihood or Bayesian, do not account for this censoring. Depending on the number of responses that are dropped, this can lead to varying degrees of bias in the model fit. I will present a framework for fitting accumulator models to censored data that accounts for the censoring process, and hence eliminates that source of bias in the parameter estimates. This approach relies on a functional version of a regression model with Gaussian process error and can be used with both maximum likelihood fitting and Bayesian estimation. I will show results from a simulation study and demonstrate an application to data from the psychomotor vigilance task.

*Universality in two-alternative forced choice performance

John G. Holden

University of Cincinnati

Recently, sequential effects in the response time and error rates of two-alternative force choice performances were successfully modeled with a discrete version of the Haken Kelso Bunz bimanual coordination model. The model is a classic nonlinear sine-circle map used to characterized the dynamics of coupled oscillators. An analysis many two-alternative forced choice data sets revealed that cognitive manipulations stretch or rescale the sequential effects.

A number of one dimensional nonlinear maps, such as the sine-circle map are members of a single universality class. Universality refers to common behavioral patterns shared among many complex physical, chemical, and mathematical systems. Under specific conditions, systems comprised of widely distinct substances, mathematical, or architectural elements display identical scaling behavior. The benefit of identifying a system with a universality class is the simplest system in the class can be used to characterize all the members of the class. One implication is the sine-circle map provides a complete model for forced choice response time.

Brain electrical activity depending on performance in travelling salesman problem task

Illia Kuznietsov[1,2] and Sébastien Hélie[1]

1. Purdue University
2. Volyn National University, Ukraine

The Travelling Salesman Problem (TSP) is a well-known optimization task in computational sciences. Linear increase in the number of cities in the TSP should result in exponential increase of solution time. However, for human subjects, increase in number of cities results in sub-optimal solutions produced in linear time. The architecture of cognitive processes and neurological underpinnings of effective human performance in the TSP are still not completely clear. Sixty subjects took part in our study which consisted of 2 experimental conditions: 1) continuous EEG was recorded during solving TSP (10, 20, 30, 40, 50 cities) 2) event-related potentials (ERPs) were recorded while presenting random maps, where subjects had to rate each map for a) subjective complexity, b) expected solving duration and c) subjective map attractiveness. It was shown that for both low- and high-performers, solution time linearly depends on map complexity. However, high-performers spend more time on solving the task. Brain electrical activity during solving TSP task may be described by 4 microstates. Increase in map complexity is followed by increased duration of microstate 2, which is usually associated with visual information processing. Low- and high-performers statistically differ in ERP responses during assessment of map subjective complexity and map subjective attractiveness.

EEG power band analysis of emotional processing in children

Adam M. Croom[1] and Sage Halbritter[2]

1. Case Western Reserve University
2. Bethany College

Cognitive processes such as language and emotional processing demonstrate lateralization in the human brain (Costanzo et al. 2015). For example, previous electroencephalography (EEG) research on emotions by Muller et al. (1999) found that the processing of negative emotional stimuli resulted in greater gamma band activity (30-50 Hz) in the left hemisphere whereas the processing of positive emotional stimuli resulted in greater gamma band activity in the right hemisphere. However, conflicting results have been reported in the literature and scholars have proposed alternative models for the lateralization of emotional processing (Jones & Fox 1992; Mouri, Valderrama & Camorlinga 2023). Further, previous EEG research remains limited since it focused largely on male, adult participants, leaving it unclear whether similar results will be found in children, females, and others. The purpose of this research is therefore to contribute to the EEG literature on emotional processing by measuring power band activity in children (8-11 year-olds) while they view positively and negatively valenced stimuli (photos of puppies and spiders, respectively). Using new mobile EEG hardware (an Emotiv Insight 5-channel headset), results from our initial research on children replicate and extend results from previous research on adults (Muller et al. 1999) by demonstrating increased gamma band activity for negative stimuli compared to positive stimuli in the left temporal area as well as increased gamma band activity for positive stimuli compared to negative stimuli in the right temporal area. Here we discuss the purpose, methods, results, and limitations of our initial research, as well as prospects for future work.

Evaluating the Moderating Effect of Executive Functioning on the Relation Between Hyperactivity and Peer Rejection

Emily M. Glatt[1], Darcey M. Allan[1], and John Monopoli[2]

1. Ohio University
2. Susquehanna University

In preschool, executive functions (EF) are rapidly developing. Conduct problems (CP) in preschool may be influenced by EF and impact social status. However, research examining the links between hyperactivity, CP, and social status has been mixed such that hyperactivity and comorbid CP are only sometimes associated with peer rejection (PR). These inconsistent findings may be due to differing levels of EF that may influence how CP are related to peer rejection (PR). The purpose of this study was to examine whether EF moderates the extent to which CP mediates the link between hyperactivity and peer rejection.

One hundred and ten preschool students completed an EF task known as Head-Toes-Knees-Shoulders. Teachers completed the Strengths and Difficulties Questionnaire, Preschool Social Behavior Scale, and the ADHD-5 Ratings Scale midway through the school year to index CP, PR, and hyperactivity, respectively.

Hypotheses were tested in a second-stage moderated mediation model. The direct effect of hyperactivity on PR did not retain its significance (b = -.01, 95% CI [-.02, .001]). The moderation component (EF x CP; b = .007, 95% CI [.002, .01]) and the indirect effect index (index = .0006, 95% CI [.0002, .001]) were significant, indicating that higher EF impairment resulted in an indirect effect with a larger magnitude.

Findings suggest that EF may play an important role in modulating the links between hyperactivity, CP, and peer rejection in young children. Implications for assessment and treatment will be discussed.

Examining neurocognitive differences between women with atypical anorexia nervosa, anorexia nervosa, and healthy controls with weight loss: Preliminary findings

Tayler L. Rezeppa and K. Jean Forney

Ohio University

Atypical anorexia nervosa (AAN) is an other specified feeding or eating disorder characterized by significant weight loss, coupled with the cognitive and behavioral symptoms of anorexia nervosa (AN) in an individual who is not underweight (i.e., BMI > 18.5 kg/m2). Individuals with AN tend to have deficits in decision-making, cognitive flexibility, and central coherence. It is unclear to what extent AAN is distinct from normative weight loss as well as AN. We present data from an ongoing, preregistered study (https://osf.io/wapqd). We hypothesized that women with AAN (n=21) would have impairments in decision-making, cognitive flexibility, and central coherence (d = |.50|) compared to women without an eating disorder who were matched for age and BMI (n=6). We hypothesized that women with AAN (n=21) would not differ (i.e., d 0.5) and similar performance between the AAN and AN groups (d<0.5). As hypothesized, the AAN and AN diagnostic groups exhibited similar performance (d= 0.17 to 0.25). Compared to healthy controls, women with AAN had worse performance on tasks of decision-making (d=0.81) and cognitive flexibility (d=0.71) but similar central coherence (d=0.40). These findings suggest that neurocognitive deficits associated with AN may also be present within AAN presentations, consistent with prior work suggesting few clinical differences between AAN and AN.

Session III

<u>Theater</u>

Inferring Constraints on Attention: An Across Species Analysis

Brandon Turner[1], Matthew Broschard[2], John Freeman[3], Ellen O'Donoghue[4], Vladimir Sloutsky[1], and Ed Wasserman[3]

1. The Ohio State University
2. Massachusetts Institute of Technology
3. University of Iowa
4. Cardiff University

The rule-based and information integration tasks have been a staple across a myriad of experiments in comparative psychology as a means to test for the presence of selective attention through the relative differences in the speed of learning. Specifically, rule-based tasks are generally learned faster relative to information integration tasks for learners who possess selective attention, whereas the two tasks are learned equally quickly for learners who lack selective attention. Although Smith et al (2012) documented RB vs. II performance across four species, less is known about species such as rats who have reportedly expressed selective attention. In addition, we present a new experiment involving a switch from one subtask to another. For example, if learners first perform an RB task in which the rule is associated with Dimension 1, then after the switch learners perform another RB task in which the rule is now associated with Dimension 2. This unique manipulation allows us to detect the presence of selective attention by examining how knowledge is transferred from one phase of the experiment to the next. We report results from this experiment on four species: pigeons, rats, rats with prefrontal cortex lesions, and humans.

Cognitive Processing in the Tower of London with Working Memory Load

Oksana Rakovets, Illia Kuznietsov, and Sébastien Hélie

Purdue University

The Tower of London problem (TOL) is known to critically rely on the activity of the prefrontal cortex, and it is one of the most popular tests for assessing executive functions in clinical and experimental neuropsychology. The TOL is used as a measure of planning ability: i.e. poor performance is interpreted as inability to plan efficiently (Morice & Delahunty, 1996). Visuo-spatial working memory (WM) capacity plays a crucial role in TOL performance. Executive and spatial components of WM are both important for successful task solving but their impact on planning processes in the TOL is still in question (D'Antuono et al., 2016). The goal of our study was to determine how WM load affects TOL solving performance. Young adults took part in an experiment that consisted of eight experimental conditions – 4 with WM load preceding TOL and 4 with WM load interfering with the TOL solving process. There were two types of working memory tasks – spatial and verbal, and two levels of TOL complexity – easy (can be solved in less than 4 moves) and hard (can be solved in 6-8 moves). As expected, high complexity TOL problems were more difficult to solve than low complexity problems. Further. planning time was longer for hard TOL trials than easy TOL trials, but only with the spatial WM task. These results support the greater role of visuospatial WM memory in solving the TOL compared to verbal WM.

Exploring Concept Learning Difficulty as a Function of Category Exposure Time

Jay Wimsatt[1], Ronaldo Vigo[2], Cody B. Ross[2], Raghu Yadav[2], and Abigail Bartlett[2]

1. Arizona State University
2. Ohio University

In this talk we discuss possible limits for the temporal span of conceptual apprehension: in other words, the minimal amount of time required for learning a concept from a full presentation of its corresponding category. We explore this question from the general perspective of concept learning difficulty, and particularly from the perspective of the 3-2[4] family ordering. In our experiment, participants are tasked with learning sets of objects, presented simultaneously (i.e., parainformatively), within a prescribed exposure duration (ranging from 20 seconds to less than one second). We present preliminary findings that suggest a gradient of decline in the discriminability of category structure as exposure time to a categorical stimulus becomes more constrained. We apply the Law of Invariance from Generalized Invariance Structure Theory (Vigo, 2013, 2015) to account for these findings. We also discuss possible implications of our findings for related cognitive capacities within the visual conceptual system, including iconic memory and visual working memory.

No 'Easy' Problems of Consciousness: A Proposal for Formalizing Qualitative Metrics of Phenomenality

Deborah Cocheo

Indiana University Bloomington

There is an apparent deadlock presently between physicalist and anti-reductive interpretations of the ontological status of phenomenal experience. In this talk, I begin by briefly outlining my motivating argument that if physicalism is false, we are stuck with a more fundamentally dualist account of consciousness -- that is, of our experiential reality -- than Chalmers' "hard vs. easy"-problems distinction has so far been taken to entail. In short, I reason that: (i) Any complete explanation of any "easy problem" requires explanation of some relevant sensory processing; (ii) Sensory processing entails phenomenality; Therefore, (iii) if we cannot explain phenomenality, we cannot give a complete explanation for any supposedly-easy problem.

That the easy problems turn out to be fundamentally hard when physicalism is denied motivates my proposal for a return to physicalism that I explore for the bulk of this talk. Developing David Chalmers' suggestion that we need a new formalism for talk about phenomenality, I propose an analytic formalism for capturing both quantitative and qualitative features of our felt experience. I discuss metrics of network neuroscience modeling that might provide useful analogues in designing a robustly interdisciplinary formal language for phenomenality-talk. And, drawing on neurobiological research, I suggest that a scale-free principle of homeostasis could underlie our qualitatively graded experience. One way to answer the "why are there any 'feels' at all" question is, then, that the qualitative measure of a given experience orients one to or away from certain stimuli and environments quickly and without any need of higher-order cognition.

Indeterminacy and the moral significance of consciousness

Daniel Cappell

Northern Illinois University

The bumblebee, sand dollar, and etruscan shrew are intriguing creatures. We may ask if they are sentient--that is, if there is ever "something it is like" to be them à la Nagel (1974)--if they have the capacity for phenomenally conscious experiences like smelling cinnamon, seeing violet, or enduring chills. "Is it sentient?" seems to call for an answer of either yes or no, but researchers pose a third option: there is no available fact of the matter. Cases of such indeterminacy are the alleged consequence of materialism, or the prevalent hypothesis that minds wholly comprise non-mental fundamental properties and substances.

Indeterminacy is urgent in light of the moral significance of consciousness: if the bumblebee et al. turn out sentient, this presumably secures them moral priority. But cherishing sentient creatures is confounded by indeterminate cases. Thus indeterminacy incites materialists to reconsider sentientism, or the view that phenomenal consciousness has moral significance. I argue that sentientism is indispensable to everyday practice, moral theory, and the science of consciousness; but the sentientist need not eschew materialism, for the indeterminacy of phenomenal consciousness is in fact harmless or spurious.

Indeterminacy is a Cerberus: epistemic, borderline, and referential indeterminacies respectively emerge from the problems of other minds, the heap, and semantic underdetermination. I argue that epistemic indeterminacy is salved by decision principles; borderline indeterminacy leaves only negligible sentience in the balance; and referential indeterminacy is always avoided by using a possible Cognitive Consciousness Meter to fix the referent of "phenomenal consciousness".

Psychological Frameworks of Animal Communication

Brian Mascaro

Ohio University

In the evolution of language, researchers and scholars have proposed various theories of animal communication that provide a picture of the conditions necessary and jointly sufficient for the development of human language. Theories that use psychological frameworks offer pre-Gricean mappings that account for referential communicative acts where the representational state of the sender is shared, through arbitrary signals, with the receiver. These theories diverge not only in their inclusion of certain psychological processes but also in their assessment of the agents' capacities, encompassing aspects such as intentionality, the sharing of meta-representational states, and inferences regarding the mental states of others. The theories are unified, however, by the belief that experimental evidence has shown psychological processes take place in animal communication. Through analyzing the experiments and applying the theories' conditions, I show whether communication is obtained. For the theories presented, although these psychological frameworks may show individual psychological abilities, the experimental results do not meet the conditions that must obtain for communicative acts between sender and receiver due to no pairing of psychological states.

Session IV

Theater

Using the Dual-Discrimination Invariance Model to Account for Unsupervised Categorization of Separable and Integral-Dimension Stimuli

Charles Doan[1] and Ronaldo Vigo[2]

1. Marietta College
2. Ohio University

In a recent paper by the authors (Vigo, Doan, & Zhao, 2022), we show how a new model derived from Generalized Invariance Structure Theory, the Dual-Discrimination Invariance Model (DDIM), accounts for supervised learning of categories defined by only separable or by only integral dimensions (e.g., colors). In particular, the model accurately accounts for the learning difficulty of the classic SHJ category structures when defined by either separable or integral dimensions (Shepard et al., 1961; Nosofsky & Palmeri, 1996). In this talk, we use the Generalized Representational Information Measure (Vigo, 2012) and the DDIM to account for differences observed across several different unsupervised categorization experiments. The experiments vary in both how exemplars are presented to observers (sequential vs. simultaneous) and the nature of the underlying stimulus dimensions (separable vs. integral). We conclude our talk by discussing how the parametric version of the model may be used to account for individual differences.

*Pattern Completion as a General Mechanism for Memory-Based Inference

Robert Ralston, Brandon Turner, and Vladimir Sloutsky

The Ohio State University

Pattern completion is a fundamental cognitive process where missing details of an incomplete representation are 'filled in' based on present information. Many cognitive tasks can be understood as instances of pattern completion, including episodic retrieval, prototype extraction, and categorization. Given its broad relevance, one may ask whether a general theory pattern completion can be used to explain competence in a range of cognitive tasks. While prior computational models have examined certain combinations of tasks, the relationship between specific computational models and more general pattern completion architectures is often left unexplored. In this research, we show that such connections are widespread and of theoretical importance. Using categorization models as a starting point, we show that these models are special cases of a discrete-time attractor network, a common model of pattern completion. From this perspective, a wide range of mechanisms can be implemented in the same architecture by using different input representations, forms of memory competition, and learning mechanisms. We call the resulting family of models AuToassociative and Heteroassociative Neural Attention (ATHENA). Furthermore, as pattern completion networks, models in the ATHENA family can be straightforwardly extended beyond categorization and retrieval. We show that, when augmented with idealized, brain-inspired connections, ATHENA models exhibit flexible sequence learning and can achieve multi-step transitive inferences and one-shot reinforcement learning. Our results suggest that the mechanisms used to explain categorization can be understood as a special case of a domain-general pattern completion mechanism, providing a link between simple cognitive models and more general neural architectures.

Human minds generate category prototypes from diverse realistic scenes

Shang-Hsuan Su, Hongjing Lu, & Yi-Chia Chen

University of California, Los Angeles

Most of the time when we open our eyes, we see holistic and meaningful scenes. What kind of mental representations give rise to such rich experiences? Using a generative-adversarial network (GAN) model, we examined how scene images are represented in a continuous multidimensional feature space. We tested one characteristic of such representations—the prototype effect: Prototypical members of a category are prioritized after exposures to other instances in the category. We used the GAN model to generate realistic images for instances and prototypes from two arbitrary indoor scene categories. In the experiment, subjects first viewed instances from one of the categories, and then received a surprise memory recognition test and an aesthetics assessment. No effect of category exposure was observed in aesthetic judgments. However, we found a prototype effect in memory recognition, where subjects misremembered seeing the scene prototype from the category they viewed much more than that from the other category, despite having seen neither prototype images. This finding suggests that the visual experiences from realistic scenes are spontaneously summarized as representations of category prototypes. At the same time, they showed that the kind of continuous feature spaces discovered in GAN models can shed light on addressing the question of how our minds represent the rich scenes we see every day.

Measuring the impact of different forms of contact on student course engagement and performance in large and/or online courses

Richard Tillman

University of Cincinnati

Frequent and high-quality social connections have been shown to be important for emotional well-being, resilience, and performance. This has implications for how many fields and situations can facilitate deeper connections, affecting better results. In the field of education, for instance, Sandstrom (2023) demonstrated that even minimal interactions can increase student enjoyment, engagement, and connectedness. Educators are teaching increasingly more students, so it can be difficult to connect with students in the way that is most effective, especially in large lecture or online classes. Bingham et al. (2022) studied different modalities of student-instructor contact and found that post class interactions were most effective in student-instructor communication. However, these were voluntary connections, and many students in their 1st or 2nd year in higher education may not know the benefits of connecting with their instructor, or feel they have time for anything outside of mandated coursework. In this presentation, I will explain different levels of contact (frequent/periodic/standard), and from different sources (initiated by professor/TA/standard). I have conducted pilot versions of this study and have gained insight as to some areas of focus, and how to connect with different student populations (demographics, course performance, etc.). I will discuss ways to implement high quality contact, without a large degree of time. How to measure success for an educational environment, next steps for investigation, and overall impact on social cognition will be discussed.

Worth the Weight: An Examination of Unstructured and Structured Data in Graduate Admissions

James Adaryukov[1], Tim Pleskac[1], Jeffrey Girard[2], Monica Biernat[2], and Adrian Villicana[3]

1. Indiana University
2. University of Kansas
3. Western Washington University

In graduate admissions, as in many multiattribute decisions, evaluators must judge candidates from a flood of information, including recommendation letters, personal statements, grades, and standardized test scores. Some of this information is structured, while some is unstructured. This creates a challenge for those studying these decisions, as most theories of behavioral economics specifically focus on decisions made from highly structured information. The goal of this study was to evaluate how structured and unstructured information is used within graduate admissions decisions. We examined a uniquely comprehensive dataset of 2,231 graduate applications to the University of Kansas, containing full application packages, demographics, and final admissions decisions for each applicant. To make sense of our documents, we applied structural topic modeling, an extension of correlated topic modeling that allows topic content and prevalence to covary based on other metadata (e.g., department of study). This allowed us to examine not only what information the letters and statements contain, but also the effects of gender, race, and department on how that information was conveyed. We found that most topics in the unstructured data related to specific fields of study and were difficult to generalize outside of that field. Consequently, we found that admissions committees behaved as if they prioritized structured numeric metrics, using unstructured information to check for disqualifications if at all. Furthermore, we found that applicant race and gender was associated with the prevalence of topics in their letters and statements.

On the Conditions of Explainability for Explainable Network AI

Anthony F. Beavers

The University of Evansville; Indiana University

In this talk, I will set a relatively high bar for the proper specificity and level of explanation needed to claim that network AI is sufficiently explained, describe who the target audience should be to pitch such an explanation, and lay out the terms in which this explanation needs to be expressed.

To qualify as explained, the basic principles of AI must be fully comprehensible to any earnest high school graduate wishing to take a year to learn them. The demonstration, I will argue, then needs to be expressed in terms of cellular computing, a methodology fully within the reach of the target audience. Subsequently, the proper specificity and level of explanation needed to claim that an AI is explained will turn out to be at the level of the system architecture itself, not at the level of an abstract algorithm.

Due to the target audience and the time frame of one year for understanding, I will further stipulate that in order for AI to be considered "explained," we must also furnish a pedagogy for one-year's instruction dedicated to learning how to interpret networks built using this type of architecture.

Running in the background of these proposals are my contentions that much of the existing successes of AI can be realized on such an explanatory architecture and that the part of it that cannot is "monstrous and mutant," something to be avoided at all costs.

Session V

Theater

Where Are The Context Effects?

Xiaohong Cai and Tim Pleskac

Indiana University Bloomington

Context effects, including attraction, similarity, and compromise effects, have been widely studied. These effects occur when choices among existing alternatives are impacted by adding new alternatives to the choice set. Sometimes the addition of a new alternative impacts the relative choice share (RCS) for one alternative compared to another. In other cases, adding a new alternative simply increases the absolute choice share (ACS) one alternative receives. Here we report a meta-analysis of all three effects asking how reliably, across 23 papers with 29,538 observations, these effects impact the RCS and ACS. The results revealed that these three context effects robustly impacted the RCS of an option. While the attraction and compromise effects only weakly impacted the ACS. Results further showed that the context effects depend on the configuration of attributes across the choice set, yet nearly all the studies to date have focused on a very specific configuration. Furthermore, simulations with leading choice models that predict context effects like MDFT and MLBA make very different predictions about how different configurations of attributes give rise to these effects. Altogether our results establish a great need to map out how these context effects change over a much larger configuration of alternatives.

A registered report on presentation factors that influence the attraction effect

Eeshan Hasan[1], Yanjun Liu[2], Nicole Owens[3], Jennifer S. Trueblood[1]

1. Indiana University Bloomington
2. University of New South Wales
3. Vanderbilt University

Context effects occur when the preference between two alternatives is affected by the presence of an extra alternative. These effects are some of the most well studied phenomena in multi-alternative, multi-attribute decision making. Recent research in this area has revealed an intriguing pattern of results. On the one hand, these effects are robust and ubiquitous. That is, they have been demonstrated in many domains and different choice settings. On the other hand, they are fragile and they disappear or even reverse under different conditions. This pattern of results has spurred debate and speculation about the cognitive mechanisms that drive these choices. The attraction effect, where the preference for an option increases in the presence of a dominated decoy, has generated the most controversy. In this registered report, we systematically vary factors that are known to be associated with the attraction effect to build a solid foundation of empirical results to aid future theory development. We find a robust attraction effect across the different conditions. The strength of this effect is modulated by the display order (e.g., decoy top, target middle, competitor bottom) and mode (numeric vs. graphical) but not display layout (by-attribute vs. by-alternative).

Task Designs and Effort-Based Decision Making

Alyssa Randez and Sébastien Hélie

Purdue University

Effort-based decision making has typically focused on the amount of effort a person would invest in a given task with less interest in what type of task was being offered. Past studies tend to focus on the differences in difficulty (typically measured by performance) while using a singular task and then making inferences about how participants choose between these difficulty levels. However, this approach ignores the fact that tasks vary in their cognitive components and demands, which could influence the motivation to pursue one effortful task over another. The current study investigated different task designs as a possible source of variance seen in effort-based decision-making. Using two experiments, this study investigated whether these preferences are influenced by these factors using three cognitive tasks across different incentive-related manipulations. The results of this study suggest that preferences for an option can be influenced by various task-related factors such as the cognitive components required to complete a task (e.g., motor- or memory-related), how demanding the options are relative to each other, and the number of elements used in the task design. Contrary to previously established literature, results suggest that task characteristics can sometimes explain preferences better than monetary reward or demand levels.

Using Intersubject Functional Correlation to Study Schema Learning

Yi Xu, Chris Baldassano, and Matthew Siegelman

Columbia University

The study looks at how schema learning changes brain processing. Schema is an important topic in psychology. It is a mental scaffold that is used to solve problems, explore new environments and situations, and organize new knowledge in the brain. It is a shortcut that we use in our daily lives. Many research on memory involves schema, but there are fewer studies focusing on schema itself and how it alters the way people see the world. Thus, the study tries to answer whether the brain changes its way of processing due to the learning of schema. The hypothesis is that after a schema is learned, the brain will switch from bottom-up processing to top-down processing. The higher-level regions no longer need information from the lower-level sensory regions, so the sensory regions are less connected to the higher-order regions and contribute less to how people make their decisions. Intersubject Functional Correlation (ISFC) and Intersubject correlation (ISC) are used to calculate the correlation of activities between different regions in different brains and the correlation between the same regions in different brains. The result shows that, indeed, schema learning leads to a change from bottom-up processing to top-down processing from pre- to post-learning.

Implicit biases embedded in first- versus second-order word co-occurrence in natural language

Molly Apsel and Michael N. Jones

Indiana University

In recent years, researchers have demonstrated that distributional semantic models (DSMs) develop associations that mirror human implicit biases after being trained on natural language data. These findings suggest that the statistical regularities observed in the language environment contribute to the acquisition of implicit biases. Caliskan et al. (2017) measured biases documented by past psychological experiments in a pretrained GloVe model using the Word Embedding Association Test, a metric they developed to be analogous to the Implicit Association Test. DSMs like GloVe use distributional statistics and machine learning to infer the relationships between words from co-occurrence patterns. Biases learned by such models may stem from direct or indirect co-occurrences. To pinpoint the source of these semantic biases, we used Caliskan et al.'s methods and stimuli to test whether the same associations can be captured by an algorithm that measures only first-order (direct) associations or only second-order (indirect) associations. All but one of the ten tests showed a significant effect for either first-order bias, second-order bias, or both. Notably, neither the first- nor second-order tests showed an effect for all of the stereotypes tested. Rather, the type of association present varied by stereotype. These results suggest that different implicit biases may come from different sources. The type of signal transmitting a particular bias also seems to vary by linguistic domain (e.g., social media, educational contexts, news media). This work brings us closer to understanding the role of language environment and semantic memory in implicit bias formation.

Categorizing Higher-Weight Women as Lesbians Through Spreading Node Activation

William Silvia, Jr. and Kimberly Rios

University of Illinois Urbana-Champaign

Mental representations of the prototypical woman typically include thinness, while prototypes of lesbians are typically associated with male rather than female traits. We hypothesized that women of higher weight would be more likely to be categorized as lesbians and that concepts of femininity and masculinity would mediate that association. In Study 1 (N = 203), weight/sexual orientation Implicit Association Test results and explicit ratings demonstrated that higher weight was correlated with participants' concepts of "lesbian" and that both were associated with higher masculinity and lower femininity. In Study 2, analysis of archival data (N = 685 faces) demonstrated a correlation between a target's subjective weight and ratings of masculinity and femininity. In Study 3 (N = 111), higher-weight female faces were rated as more likely to be lesbian or bisexual than were lower-weight faces. Across three studies, we found support for the predictions that higher-weight women activate concepts of high masculinity and low femininity and are more likely to be categorized as lesbians than lower-weight women. This may suggest that higher-weight women share a cognitive category with lesbians and may be subjected to similar forms of bias.

Session VI

Theater

Some Preliminary Results Regarding the Aesthetics of Acoustical Concept Structures

Cody B. Ross, Ronaldo Vigo, and Raghu Yadav

Ohio University

The majority of research on goodness of pattern judgments has focused on visual stimuli, examining how goodness of pattern is related to such constructs as symmetry, redundancy, and regularity. Comparatively little research has explored goodness of pattern judgments for acoustical stimuli, and the exclusively visual operationalization of these key constructs in many prior studies renders them inapplicable to non-visual sensory modalities. We present a study exploring how acoustical pleasantness judgments are influenced by concept structure and, by extension, concept learnability. We created acoustical stimuli conforming to the well-known SHJ category set (Shepard et al., 1961), which consists of the 70 possible four-member categories defined by three binary dimensions. We generated 70 sequences of four tones each, which could vary along the dimensions of pitch (low/high), volume (soft/loud), and duration (short/long). We presented participants with randomized pair-wise comparisons between sequences conforming to different category structure types, and participants selected which sequence from each pair was more pleasant. Our preliminary results suggest a pleasantness ordering among structure types. We provide an updated analysis of our data and discuss our preliminary results in terms of categorical invariance (Vigo, 2013, 2015), a more general measure and notion of symmetry that subsumes classical symmetry and redundancy and that is appropriate for stimuli of any sensory modality.

The Horizontal Spatial-Musical Association of Response Code (SMARC) Effect: Effects of Tone Laterality and Musical Experience

Qi Zhong[1], Kim-Phuong Vu[2], Sébastien Hélie[1], and Robert W. Proctor

1. Purdue University
2. California State University, Long Beach

The spatial-musical association of response code (SMARC) effect refers to better performance when low pitch tones are mapped to low or left responses and high pitch tones are mapped to high or right responses than vice versa. Several studies show that the association between pitch-height and locations on the vertical dimension are automatic, making the vertical SMARC effect robust and prevalent. However, the occurrence of the horizontal SMARC effect is affected by many factors, such as musical experience and task setting. In this study, two experiments were conducted to investigate the role of tone laterality and musical experience in producing the horizontal SMARC effect. Both musicians and nonmusicians were asked to perform a color judgment task in which they were asked to respond to the color of a centered fixation cross with an assigned left or right keypress. A low- or high-pitch tone was presented, binaurally in Experiment 1 and monaurally in Experiment 2, at the same time as the colored cross. For musicians, a significant SMARC effect was found regardless of whether the auditory stimuli were presented monaurally or binaurally. However, for nonmusicians, a significant SMARC effect was observed only when the auditory stimuli were presented monaurally. This result is consistent with the hypothesis that musicians are able to automatically associate pitch height to horizontal locations from their musical training, but nonmusicians need to be provided with a frame of reference (i.e., lateral presentation of the tones) to be able to associate the pitch height with the horizontal dimension.

Categorization of Tinnitus Quality

Abdullah Binshulhub and Jennifer Lentz

Indiana University Bloomington

INTRODUCTION: This study aimed to investigate if individuals with tinnitus classify their tinnitus quality into subgroup categories using questionnaire words commonly used by patients to describe their tinnitus quality.
METHOD: Thirteen subjects with tinnitus participated in the study, where they heard 25 sounds modeled after tinnitus and rated the similarity of each sound to their own tinnitus quality. Participants also described the categories of each sound, using a set of pre-determined terms. Each rating and categorization was repeated three times to ensure reliability.
RESULTS: In the high similarity level, participants consistently categorized sounds into three groups: tonal, noisy, and high-pitched whistling, reflecting their tinnitus qualities. Conversely, in mid and low similarity levels, there was a high variance in describing the sounds. Furthermore, the experimental questionnaire words closely matched the pre-determined sets, particularly evident in the high similarity level. However, there was no significant association between the case history terms and the set of predetermined terms. Also, participants demonstrated a significant matching in describing the words to the predetermined terms.
CONCLUSION: Results are consistent with the words used in the predetermined set, especially evident in their strong correlation with participants' descriptions during high similarity rating tasks. Nevertheless, the presence of description variances within mid and low levels of similarity, where the terms used in the case history did not show notable agreement with the predetermined set, highlights the need for additional research.

Investigating Compatibility Effects for Affective Words

Hailey Arreola, Sébastien Hélie, and Robert W. Proctor

Purdue University

The Affective Simon Effect (ASE) is observed when compatibility effects of stimuli and responses overlap within the affective valence dimension. Current theoretical understanding for this effect suggests that either emotional arousal or semantic information is retrieved. However, upon examining the literature, additional theories such as the ideomotor theory or levels of processing may help explain the ASE. The goal of this study was to investigate stimulus and response compatibility effects (SRC) for emotionally valanced words. In the first experiment, we systematically investigated direct mapping effects of people responding to the emotional valence of words using 'positive' and 'negative', or 'good' and 'bad' as both visual stimuli and vocal responses in all combinations of compatible and incompatible mappings. We predicted SRC effects across the four possible combinations of stimulus and response sets. However, if perceptual overlap between the sets contributes to the SRC effect, then the effect should be larger when stimulus and response words match. If conceptual overlap is the primary factor, then there should be little to no difference in SRC magnitude across the four sets. Results of Experiment 1 supported the hypothesis where the primary factor of this effect is conceptual overlap. To further explore whether findings would be similar if affect is processed more automatically, we modified the task so that stimulus affect is now task irrelevant. Preliminary results in Experiment 2 also show support for conceptual overlap. Therefore, perceptual matching of stimulus and response sets may not effect affective word compatibility effects.

Investigation of Individual Differences in Lexical-based Word Segmentation

Yuzhe Gu and Mark Pitt

The Ohio State University

Word segmentation, splitting spoken language into individual words, is important in language comprehension, and requires the involvement of multiple cognitive processes. Previous research demonstrated that listeners' knowledge of words could help with identifying their boundaries. Participants were more likely to segment word pairs with unclear word boundaries when the pairs were formed by words they knew. Individual differences were also observed: participants differed in the number of word pairs they segmented, which suggested the influence of other cognitive abilities. The present study aims to further explore word segmentation by investigating what cognitive abilities contribute to the observed individual differences. In the experiment, participants complete four tasks, which include the word segmentation task used in previous word segmentation experiments (e.g. segmenting word pairs with unclear word boundaries) and a task for each cognitive ability that is suggested to be involved in word segmentation: lexical reliance, working memory capacity, and language exposure. Data will be analyzed to investigate the correlations between participants' performance in each task. Correlations between the performance of the word segmentation task and the tasks of the other three cognitive abilities would suggest the involvement of these abilities in word segmentation. The findings of the present study would contribute to the research of word segmentation.

Humor, Intelligence and Creativity

Arie Sover

The Open University of Israel

Many studies have been written about humor and intelligence. From them, one can learn about the creative personality of a person who produces humor. The ability to produce humor is directly related to mental flexibility and openness and the need to experience something new. There is similarity in the way the brain processes functioning towards humor and creativity. When it comes to humor, the brain activates in two different ways: one is deciphering humor, and the other, producing humor. When we place the normative language against the meta-language of humor, we confront each other with two contradictory cognitive behaviors: the conventional thinking vis a vis the unconventional thinking.

This paper examines the connection between humor, intelligence and creativity. The paper is divided into three parts. The first part is the theoretical one including studies that found that there is a connection between humor and creativity, and that creative people have been found to decipher and produce humor more than others. The second part describes the connection between a sense of humor, creativity, and the human defense mechanism. The third part empirically examines through deciphering humorous images and texts, the cognitive processes that are created during the absorption of a humorous situation.

Posters

Note: Poster order for the conference was chosen by random number generator.

<u>Baker Ballroom B</u>

1
Exploring Causal Relationships in Between Lack of Control in One's Life, Interpretation of Events and Conspiratorial Beliefs

Elias Ghazal[1], Mario Fifić[2], Mya Hanna[2], Josh Kopich[2], Brian Bowdle[2], Elizabeth Wehner[2], and Lauryn Babb[2]

1. Independent
2. Grand Valley State University

Exploring the individual tendency towards embracing conspiratorial beliefs presents a considerable challenge for researchers, frequently uncovering weak and inconsistent correlations with factors such as personality traits, perception of cognitive processes, decision-making capabilities, and sensory sensitivity. A major limitation of this research is the reliance on correlational, self-report measures. To address this gap, our study introduces an experimental approach, the "Broken Fridge" task, designed to place participants in a scenario where they must attempt to control the temperature of a refrigerator. This setting uniquely positions participants to experience a loss of control, thereby allowing for a more direct manipulation of their locus of control. Furthermore, our study additionally investigates how individuals infer causality of a series of events by using a series of narratives with variations in their structure and the elements of the narrative that are emphasized. This additional area of investigation provides added insight into the cognitive processes involved in conspiratorial beliefs. Our methodology aims to provide more detailed insights into the effect of an individual's locus of control, and their views on causal relations, on their propensity towards conspiratorial beliefs. This experimental procedure not only circumvents the limitations of traditional self-report measures but also offers a novel perspective on the intricate dynamics underlying the formation of conspiratorial thinking. Through this approach, our study endeavors to shed light on the detailed interplay between psychological control and the endorsement of conspiracy theories, offering a more robust understanding of the factors that contribute to conspiratorial beliefs.

Differential Neural Processing of Negative Polarity Items: Evidence from EEG Analysis of Ever and Any

So Young Lee

Miami University

This study explores the neural processing of Negative Polarity Items (NPIs) "ever" and "any" using EEG to observe event-related potentials (ERPs) in different syntactic contexts. Utilizing a 32-channel EEG system, responses from 15 native English speakers were recorded as they encountered sentences containing these NPIs in varied structures.

The findings reveal distinct neural responses for each NPI. "Ever" primarily elicited a pronounced N400 effect, indicative of semantic processing difficulties in unlicensed contexts, concentrated in central brain regions. In contrast, "any" triggered a broader N400 effect across multiple channels and a late P600 component, suggesting complex syntactic reanalysis or repair needs, reflecting its intricate interaction with syntactic and semantic constraints.

The topographical distribution of ERP effects showed that "any" involved more extensive activation, including parietal sites, suggesting deeper levels of semantic processing and syntactic analysis. This pattern for "any" included an early anterior negativity followed by a P600 peak, underscoring substantial syntactic processing efforts.

Overall, the study underscores how lexical nuances between "any" and "ever" are reflected in their neural processing, providing insights into the real-time brain dynamics involved in comprehending NPIs within diverse linguistic frameworks. This enhances our understanding of language comprehension and cognitive processing related to NPI usage.

3

Using a modified Stroop task to assess auditory-spatial attention and distraction: a preliminary study

Megan M. Cunningham and Travis L. Riffle

Indiana University Bloomington

The purpose of this experiment was to evaluate the impact of different types of working memory (WM) load on an auditory-spatial Stroop task. Stroop tasks have been widely used in cognitive psychology to evaluate selective attention and inhibitory control. Special Load Theory states that information held in WM can be either inhibitory or facilitative for target selection based on the WM load's relationship to the task goals. It was hypothesized that target selection performance would decrease when the WM load shared features of the target selection goals and improve when the WM load shared features of the distractors.

Data were collected for 43 adult participants with normal hearing, vision, and cognition. Experimental conditions consisted of an auditory-spatial Stroop task utilizing a verbal WM load, a spatial WM load, and no WM load. Results showed that target selection performance was significantly better in the Verbal Load condition compared to the Spatial Load and No-Load conditions. There was not a significant difference in performance between Spatial Load and No-Load conditions.

These findings show that when a WM load shares features of the task target goal (spatial location detection), target selection performance suffers. However, when the WM load shares features with the distracting component (verbal/semantic meaning), processing of concurrent distracting information decreases and thus improves task performance. This study provides insight into the attentional mechanisms involved in auditory-spatial cognitive tasks, and may offer an avenue for future research to evaluate specific attentional involvement in patients with bothersome tinnitus.

4

Category Learning Differences in Architectural Differences using Systems Factorial Technology

Allan J. Collins, Janelle Olegario, Olivia Michaels, Mark J. Rick, and Robin D. Thomas

Miami University

The human brain has an innate ability to group sensory information together into discriminable categories. Therefore the ability to create these categories and understand the cognitive mechanisms behind their creation is of great interest to cognitive psychologists. There are three classic category learning tasks: the rule-based task, the information-integration task, and the prototype task. We investigate architectural differences in visual and decisional processing across these category learning tasks. The theoretical approach used to address this architectural question has been referred to as Systems Factorial Technology (SFT) which is a set of analytic tools that makes use of mean and distributional level response time patterns to distinguish serial, parallel, coactive, and other cognitive mechanisms. We present SFT predictions from the mean interaction contrast and survivor interaction contrast across the three category learning tasks to discern architectural differences.

5

Anomaly Hunting: The Role of Contextual Violations and Conspiracy Mentality

David Sweeney and Keith Markman

Ohio University

This study examines how individuals with varying levels of conspiracy mentality integrate anomalous details into coherent narratives derived from news headlines. The research builds on the understanding that most Americans read headlines without delving into full stories, simplifying diverse headlines into singular narratives. In this study, participants are presented with sets of headlines about an event, one set containing consistent headlines (Control Condition) and another including a single anomalous headline (Experimental Condition). Participants are then asked to create narratives based on these headlines. The primary independent variables are the individual's predisposition towards conspiracy mentality, and political affiliation. The dependent variables include the perceived congruence of headlines, centrality and inclusion of the anomalous detail in their narratives. The aim is to explore how conspiracy beliefs might influence the processing and interpretation of information in a digital age characterized by brief, often isolated pieces of news. This study seeks to contribute to our understanding of cognitive processing in information simplification, especially under the influence of underlying belief systems.

6

Peer-Assisted Learning Benefits Low-Ability Learners

Preston Menke, Ion Juvina, Jarean Carson, Bethany Rodgers, Josh Wong, and Afra Moharrami Nasirabadi

Wright State University

We investigated the effectiveness of peer-assisted learning (PAL) on individual performance in a relatively complex task. Past research has shown positive and negative outcomes resulting from peer-assisted learning. The mixed findings of past literature indicate that it is unclear what mechanisms produce learning benefits and costs. It is possible that benefits are present when the value of exchanged knowledge between peer learners is relatively high. The present study used a relatively complex task, the Miller Analogies Task, where we expected its relative complexity would increase the value of exchanged knowledge to produce greater benefits over simpler tasks of past research. Results indicated that PAL was effective for low-ability learners whereas high ability learners performed equally between a PAL and individual condition. This finding may be explained by a trust mechanism. The present research operationalized trust as a mechanism for filtering out or accepting peer knowledge to explain benefits in PAL. We found that PAL learners who correctly identified an accurate peer through the learning sessions had greater final task performance. It is possible that low-ability learners used a trust mechanism to identify important sources of knowledge in the task when unable to rely on other sources of knowledge such as experience. These findings suggest that classrooms may leverage PAL to teach low-ability learners, particularly when the learners can identify trustworthy and accurate peers.

7

Assessing independence and invariance of attribute perception in novel object identification: a first study

Mark J. Rick, Alan J. Collins, and Robin D. Thomas

Miami University

The current study is a first step in an overall research program designed to examine the visual perception of attributes of novel objects in different contexts that may be supported differentially by the ventral and dorsal processing streams. It is known that the ventral visual stream supports object identification whereas the dorsal stream allows for visually guided actions. In the full investigations, we will assess whether object attributes interact or are processed independently across contexts we believe will differentially recruit one or both of the visual streams. The objects were designed to be novel yet have two shape attributes that could be used for specific actions (such as poking or scooping). These contexts start with a static identification scenario suspected to tap into ventral stream processes. Follow up studies are selected to increasingly rely on perception-action pathways as stimulus presentation modalities and observer instructions change (e.g., using movies and then physical objects, rate the shape property vs how good of an example of something that can scoop). In this initial work, we present the findings from a standard object identification task using 2D images of novel objects generated by a 3D object modeling program. We apply tests derived from a theory of perception, termed General Recognition Theory (GRT) and find that in this static identification task, these particular object attributes generally are perceived separably.

8

Morality in the Face of Good and Bad Consequences

Jessica Saki[1], Evan Clarkson[2], and John Jasper[1]

1. University of Toledo
2. Indiana University Bloomington

Moral psychology has, for a long time, used dilemmas that require extreme choices. Research has begun to argue the dilemmas are unable to accurately predict participants' actual ethical reasoning and behavior in everyday situations. Thus, the current study sought to explore if participants' moral judgments in hypothetical dilemmas are predictive of behavior in more real-world situations involving dishonesty—specifically when given opportunities to lie for selfish versus altruistic reasons, will participants behave in accordance with or against their moral judgments? 338 MTurk participants responded to moral dilemmas and were classified according to the moral theory they followed (i.e. utilitarians, deontologists, or typical people). Then, participants were informed they were going to roll a dice two times, and the sum of the dice rolls would determine how large of a bonus they would earn. The bonus was framed as a gain or a loss and would either go to the participant or a charity. Results showed that the way the bonus was framed changed participants' decisions to lie or tell the truth regarding the dice roll they had gotten. When the money was going to a charity and was framed as a gain, utilitarians lied more. When the money was going to the participants and was framed as a loss, deontologists lied more. Thus, the framing of a bonus influenced participants' decisions to lie more than their moral decision-making type did. This supported the idea that moral dilemmas may not be the best predictor for behavior in real life.

9

The Role of Speech Rhythm in Speech Understanding in Zoom-like Conditions

Kyle Oliver[1], Yi Shen[2], and Devin McAuley[1]

1. Michigan State University
2. University of Washington

Over the last decade, more of our social encounters have transitioned to online spaces. The ubiquity of these spaces (Zoom, FaceTime, etc.) raises an important question: What factors impact people's ability to understand speech when using these technologies? One previously established factor is speech rhythm. According to a Selective Entrainment Hypothesis (SEH), selective attention to a target speech stimulus is entrained (synchronized) by the natural speech rhythm of the target, leading to the prediction that speech recognition is better when target speech rhythm is intact compared to when it is altered, while conversely better, when the speech rhythm of any to-be-ignored background material is altered compared to when it is intact. Two experiments tested the SEH in a simulated audiovisual (AV) environment. In Experiment 1 participants listened to five-word sentences and selected one of ten possible options for each word. On screen, there was both audio and an accompanying video of the face of the to-be-attended-to target talker and the face of a competing to-be-ignored background talker. The AV speech rhythm of the target speech was either intact or altered using a sinusoidal pattern of acceleration and deceleration. In Experiment 2 the same two-talker paradigm was used, but the AV speech rhythm of the to-be-ignored background talker was instead manipulated. Consistent with SEH, in Experiment 1 speech recognition was better when the rhythm of the target talker was intact compared to when it was altered, while the opposite pattern was found in Experiment 2 for the background speech rhythm manipulation.

10

Learning in Poverty: Understanding Relationships Between Math Learning, Motivation, and Self-Efficacy

Anvitha Katamneni, Mia Hensley, James Kelley, and Heidi Kloos

University of Cincinnati

We investigated the relationship between motivation, self-efficacy, and math improvement in the context of a math enrichment program for first and second graders in an inner-city school. Our sample (n = 20) comprised students from primarily low-SES backgrounds, who engaged in two math practice sessions per week over the course of a semester. Students selected the math topics they worked on each day, providing flexibility in difficulty conducive to measuring the effects of self-efficacy and motivation. We measured math improvement via a pretest and posttest using Woodcock Johnson's T5 and T10, which assess math calculation and math fact fluency, respectively. The children also completed a brief survey that measured self-efficacy and motivation. We found that the children's math scores improved from the pretest to the posttest by an average of 28.44%. We found evidence for a strong correlation between self-efficacy and T10 improvement (r = 0.499), and a moderate correlation between T10 improvement and motivation (r = 0.358). However, there was little correlation between T5 improvement and either variable. These figures might be explained by a productive relationship between motivation, self-efficacy, and cognitive engagement or attention. Self-efficacy has a stronger correlation with math fact fluency improvement when compared to motivation, suggesting that self-efficacy may have a stronger contribution to persistence. Additionally, it seems that while motivation and self-efficacy correlate with improved automaticity of basic calculations, ability in difficult problem solving seems to correlate with different cognitive-emotional attributes, which is further supported by our finding of low correlation between T10 and T5 improvement. Overall, our research suggests self-efficacy has a stronger impact on cognitive engagement and persistence when practicing basic math skills. However, our research also leaves open questions about how to improve persistence with difficult math learning and calculation.

11

Individual differences impact the relationship between cardiorespiratory fitness, visual episodic memory, and parahippocampal cortex thickness

Jillian H. Graham, Jessica Cloud, and Scott M. Hayes

The Ohio State University

Cardiorespiratory fitness has been associated with visual episodic memory performance and cortical thickness in older adults. This study examined sex and age differences within this relationship. Healthy adults (n=110; age range: 18-85 years) enrolled in the Fitness, Aging, Stress, and TBI Exposure Repository (FASTER) completed neuropsychological testing and brain magnetic resonance imaging (MRI). Cardiorespiratory fitness was assessed with a maximal graded exercise testing. Visual episodic memory was assessed with the Brief Visual Memory Test-Revised and the NIH Toolbox Picture Sequence Test. MRI data were processed with FreeSurfer, which calculated cortical thickness. Right paraphippocampal cortex was chosen as a region of interest due to its relationship with visual episodic memory. Hierarchical regressions showed that age was negatively associated with right parahippocampal cortex thickness. Sex was associated with right parahippocampal cortex thickness, with greater thickness observed in females. After accounting for sex and age, cardiorespiratory fitness was positively associated with right parahippocampal cortex thickness. Finally, an Age X Cardiorespiratory Fitness X Sex interaction was observed. Cardiorespiratory fitness was associated with greater right parahippocampal cortex thickness in females regardless of age. In contrast, cardiorespiratory fitness was associated with greater right parahippocampal cortex thickness only in older males. Further, a mediation analysis revealed an indirect effect of right parahippocampal cortex thickness on the relationship between cardiorespiratory fitness and visual episodic memory, regardless of sex or age. These findings indicate that associations between cardiorespiratory fitness and cortical thickness may be dependent on both age and sex.

12

Dishonest Foraging

Tyler Kelly[1], Peter Todd[1], Kinneret Teodorescu[2], and Nathaniel Kurosky[1]

1. Indiana University
2. Technion – Israel Institute of Technology

How does dishonesty influence search behavior within a space? We are developing a game which aims to create an environment where an individual can make decisions that are framed as being either dishonest or hazardous. We want to use this paradigm to study how an individuals' inclination towards dishonesty impacts their behavior and decision making, and assess whether this leads to increased exploration of possible actions to achieve a goal. We assess participants' inclination towards dishonesty using a short questionnaire, and pair their score with their in-game behavior. Within the context of the game, participants are asked to make deliveries for a fictional queen, and in the game space there are a number of different routes to take, across our two conditions (risky and dishonest) there is one safe route and multiple unsafe routes which have some form of adaptive enforcement/hazard. We seek to compare how search strategies and route selection within this space are affected by the context of the game. Initial data indicates that there may be some differences in route switching between the two conditions, however the data does not show a distinct difference in the total number of times the unsafe routes are selected. In this study, participants quickly learned the optimal search strategy, and rarely deviated, and so we plan to use this information to update and refine the game by incorporating greater switching cost, and potentially modifying the enforcement algorithms to better create a decision space that requires a longer period of learning.

13

It's not as Bad as you Think it is: Affective Forecasting and the Psychology of Heartbreak

Anthony Campolattara[1] and Belem Oseguera[2]

1. The University of Chicago
2. Amherst College

At some point in our lives, each of us will inevitably encounter some form of heartbreak. Whether triggered by the loss of a loved one, a failed romantic relationship, or a once-in-a-lifetime opportunity that evaded our grasp, heartbreak has a way of affecting us all. During periods of heartbreak, individuals commonly struggle to accurately forecast the duration and intensity of their negative emotions. This phenomenon, known as the impact bias, stems from our tendency to anticipate experiences as more intense than they typically are. Moreover, our predictive abilities are further hindered by the focusing illusion—a cognitive tendency to overemphasize certain aspects of an event or situation while neglecting others. This can lead individuals to believe that heartbreak will consume us indefinitely when in reality, emotions tend to fluctuate and heal over time. This poster aims to provide individuals with effective strategies to enhance their ability to predict the length and intensity of negative emotions following heartbreak. One such strategy involves seeking insight from a "surrogate," someone who has undergone a similar experience, which can significantly improve affective forecasting. Given that most people overestimate the length and severity of negative emotions associated with heartbreak, these strategies aim to offer a more accurate and realistic emotional timeline, thereby providing a pathway toward emotional healing and resilience.

14

A meta-analysis on the effectiveness of music listening on the reduction of cortisol

Adam M. Croom, Sofia Castro, Jeehoo Kim, Charles Prince, Nikita Rammohan, and Suman Sanghera

Case Western Reserve University

In the US, 27% of all adults (and 46% of adults under the age of 35) reported that they are so stressed most days that they are unable to function adequately, and work-related stress is estimated to cost the US economy $300 billion in losses due to absenteeism, accidents, and diminished productivity. 76% of adults in the US have reported diminished mental and physical health due to stress within the last month and stress is estimated to cost $190 billion in annual healthcare (APA 2022; AIS 2023). Stress is a serious problem for individuals around the world and developing effective treatments is of growing importance. Music listening is convenient, affordable, and widely enjoyed (Croom 2012), so this research investigated whether music listening may decrease the main physiological marker of stress: cortisol. Cortisol has been considered the main biomarker in stress research so studies that have investigated methods for reducing stress in individuals have often measured reductions in cortisol levels as a physiological marker of stress reduction (Hellhammer, Wust & Kudielka 2009). But how effective, if at all, is music listening for the reduction of cortisol? To answer this question, we conducted a meta-analysis on all randomized controlled trials (RCTs) that compared the effectiveness of music listening versus no-music listening controls on cortisol levels. Using a random effects model, our initial results show a small (approaching medium) effect for music listening on cortisol reduction. Here we discuss the results, implications, and limitations of our initial research along with prospects for future work.

15

Are slurs always used pejoratively? A corpus linguistics analysis of the slur "bitch"

Adam M. Croom, Zoe Buff, Bidinga Kapapi, Chelsea Kodiaga, Jocelyn Martinez, and Hayla Latta

Case Western Reserve University

Research on slurs is of growing interest in linguistics and cognitive science, with some scholars arguing that slurs are always used in a pejorative manner and others arguing that slurs are used in a pejorative or ameliorative manner based on the social and linguistic context (for discussion see Croom 2013). To better understand the actual usage of slurs from an empirical perspective, we analyzed over 3,200 natural language occurrences of the slur "bitch" from 2012 to 2019 using the TV Corpus. Results from our initial research suggest that the slur "bitch" was most frequently used for targeted abuse, less frequently used in a grammatical manner, and least frequently used for appropriation. We found this for all years between 2012 and 2019. Several interesting results emerge from this research. First, although the slur "bitch" may have different possible uses in different contexts, it is still primarily used for targeted abuse towards targets (supporting the default status of slurs as pejorative terms). Second, although the slur "bitch" is primarily used for targeted abuse towards targets, it is still appropriated in many genuine cases in order to subvert abuse, undermine status hierarchies, and ameliorate this slur (supporting other empirical research on slur appropriation). Third, and somewhat surprisingly, the slur "bitch" is also frequently used, neither in a pejorative manner for targeted abuse nor in an ameliorative manner for appropriation, but in a primarily grammatical way. Here we discuss the details, implications, and limitations of our research, along with prospects for future work.

16

A Combined SFT-MRT Approach to Measuring and Predicting Performance with Multimodal Signals

Sarah Sinclair-Amend[1,2], Ying-Yu Chen[2], Mark Parent[3], Kash Todi[3], Joseph Houpt[2]

1. Wright State University
2. University of Texas San Antonio
3. Meta Reality Labs

Many technologies leverage multiple modalities to deliver information to a user, especially auditory and visual information. In some cases, dividing up information across modalities can allow more information to be communicated, however, the information also has the potential to overwhelm a user. Multiple resource theory (MRT) is one model of how information sources that vary in terms of modality and content (e.g., semantic versus spatial information) may or may not interfere with each other. We developed a model that leverages both the qualitative structure of multiple resource theory and the quantitative precision of Systems Factorial Technology. This model includes parameters associated with individual workload levels within and between modalities across the perception and action cycle. This allows for post hoc assessment of performance, and quantitative predictions for future performance, particularly for counterfactual predictions. Our findings will support individualized, adaptive information delivery to users while also minimizing overwhelming modality information. We will present the model along with a simulation study and an application to an audio-visual motion discrimination task.

17

The Effect of a Summer Math Program on Emotional Regulation Skills (ERS) in Children Experiencing Poverty

Aiden McGinnis, Henry Emch, Heidi Kloos, and Caleb Bagley

University of Cincinnati

Prior research shows that having emotional regulation skills (ERS) is essential to learning. However, research on this topic often excludes children from lower socioeconomic backgrounds. In our study, we assessed ERS in a group of 114 children experiencing poverty at the beginning and end of a six-week summer program. The program was specifically designed to strengthen their socio-emotional skills. We measured children's ERS using the Devereux Student Strengths Assessment (DESSA), which was administered by the teachers. Children's ERS ratings were derived from a composite score based on competency in eight areas: self-awareness, self-management, social awareness, goal-directed behavior, personal responsibility, decision making, and optimistic thinking. For every measure of ERS, we found that the children scored significantly higher on the posttest than on the pretest. We also found a significant difference between the rural and the urban location, with higher improvement in ERS ratings for children at the rural location. Additionally, significant differences in pretest scores were found between girls and boys, with girls scoring higher than boys on every measure of ERS. Our findings suggest that summer programs can improve ERS for children faced with extreme poverty. Programs in rural areas may be more effective than programs in urban areas; and boys might need these interventions more.

18

What Word Associations Teach Us About Conceptual Development

Michaela Miller[1], Olivera Savic[2], Hyungwook Yim[3], Simon De Deyne[4], Vladimir Sloutsky[1]

1. The Ohio State University
2. Basque Center on Cognition, Brain & Language
3. Hanyang University
4. University of Melbourne

Word association task has been suggested to reveal important developmental changes in conceptual knowledge organization. The most influential findings are ones of a change in word association types from dominantly syntagmatic (context-based) to paradigmatic (category-based), around the age of 6-7 years (Brown & Berko, 1960; Wojcik & Kandhadai, 2020). The current study aims to evaluate the reported developmental changes in tendency to produce paradigmatic and syntagmatic word associations in children (4-9-year-olds) and adults. To overcome disadvantages of prior work, we aim to provide a well-powered investigation and acknowledge the plurality of semantic relations in participants' responses. Thus, (1) we utilized a large set of developmental association norms (ages 4-9) collected in our lab and a large dataset of adult norms (De Deyne et al., 2018) and (2) coded each response for presence of each type of cue-response relation - i.e., syntagmatic, paradigmatic, both (syntagmatic and paradigmatic), or other (e.g., form-based). Contrary to prior studies, our findings indicate no syntagmatic-to-paradigmatic shift. Instead, we found a clear dominance of syntagmatic associations across development and a developmental change only in responses which are both syntagmatically and paradigmatically related, which become more frequent with age. The findings underscore the potential overestimation of the presence of paradigmatic responses in previous studies. We discuss these findings in the context of developmental trajectories of different types of semantic relations and the role and use of free association tasks in this line of research.

19

A Systematic Review on the Association Between ADHD, Psychological Trauma on Motivation Deficit

Jordan Lowe and Laila Murphy

Miami University

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by persistent patterns of inattention and hyperactivity-impulsivity. Previous research has suggested a potential association between ADHD and experiences of psychological trauma, which may exacerbate other symptoms, particularly motivation deficits. This systematic review aims to investigate 1) the association between ADHD, psychological trauma, and motivation deficit; 2) psychological trauma on ADHD and the effect on motivation deficit; and 3) the later onset of psychological trauma on adolescents with ADHD and the effect on motivation. To ensure methodological rigor and transparency, the review employs the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method. A comprehensive search was conducted across electronic databases, including Academic Search Complete, APA PsychInfo, and Psychology and Behavioral Sciences Collection. Eligible studies were selected based on predetermined inclusion and exclusion criteria. A better understanding of this relationship can contribute to significant implications for developing targeted interventions and treatment strategies.

20

Attentional capacity of low-level multisensory integration in individuals with tinnitus

Yi Liu and Jennifer Lentz

Indiana University Bloomington

Sensory integration in individuals with tinnitus (the perception of sound in its absence) may be unique due to cortical reorganization and potential impact on attentional mechanisms. This research explores whether behavioral advantages of sensory integration differ between individuals with and without tinnitus. Here, we test the hypothesis that tinnitus may attract a part of limited cognitive resources, leading to the disruption of information processing leading to reduced sensory integration . A Go/no-go paradigm in exhaustive processing was conducted under both multisensory (audio-visual [AV]) and unisensory (auditory-only [AA], and visual-only [VV]) conditions. Eleven young adults with normal hearing and no tinnitus and 12 adults with tinnitus with a range of hearing levels responded to single/dual targets as quickly and accurately as possible by pressing a button. Using a suite of tools called Systems Factorial Technology, we calculated measures of workload capacity using response time distributions for dual and single targets as a function of time. All individuals demonstrated super capacity (greater processing efficiency when referenced to a parallel model) for dual-item conditions in all modalities and a similar relative advantage of multisensory integration over unisensory integration. K-means clustering based on the capacity functions did not result in a robust two-cluster solution, although we observed a trend toward lower workload capacity in the older individuals with tinnitus and hearing loss, perhaps due to age or hearing loss rather than tinnitus. These data suggest that tinnitus may not be a substantive drain on workload capacity.

21
EEG Band Patterns for Top-Down vs Bottom-Up Control During the Psychomotor Vigilance Task

Dominic Meszaros[1], Christopher A. Stevens[2], and Taylor Curley[2]

1. Bowling Green State University
2. 711th Human Performance Wing AFRL

Monitoring vigilance during attentive tasks, such as the Psychomotor Vigilance Task (PVT), helps evaluate cognitive performance. EEG can be used to track the type of attentive control being used during task progression: top-down (TD; goal-driven) or bottom-up (BU; salience driven). This is contingent on the dichotomous view of attention (Gaspelin & Luck, 2018) which excludes a third proposed mechanism: selection bias (Awh et al., 2012). In this project, we propose that low frequency beta (β) waves are a strong index of TD control. BU control, however, lacks a clear EEG metric such as proposed gamma (γ) waves (Buschman & Miller, 2007). Ideally, concurrent spatial fMRI and temporal EGG could be used to validate wave activity based on BOLD signatures during task progression. However, mission constraints prevent this. For such a metric, a follow up investigation measuring changes in β wave activity from baseline may provide an indirect metric of BU control. Furthermore, a general lack of understanding of BU control and its possible task subsets warrants exploration.

22
Relational Similarity Judgements on Concept Structures of the 3-2-3 Family

Raghu Yadav, Ronaldo Vigo, Abigail Bartlett, and Cody B. Ross

Ohio University

Similarity assessment lies at the core of many computational models of categorization and concept learning. While some models of similarity have focused on similarity at the object level, others have attempted to account for people's ability to assess similarity between object relationships. To extend previous work in this area, in this study we explore people's relational similarity judgments as a function of Boolean concept structure. As an extension to previous work involving the 3-2-4 family of Boolean concept structures and pairwise inconsistent dimensional assignments, this time we use the 3-2-3 family with pairwise consistent assignments. These consist of three binary dimensions and three positive examples. More specifically, participants in our experiment were presented with pairs of concept structures from this family. They were then asked to rate their relational similarity. We report our preliminary findings, including descriptive evidence suggesting that people's perception of degree of similarity on identical structures increases as the homogeneity of the structures decreases.

23

Learning from the Best: Using Cognitive Psychology to Practice More Effectively

Anthony Campolattara

The University of Chicago

When it comes to learning new skills, whether for professional advancement or personal enrichment, there is an abundance of tactics that individuals can employ. By examining the practice habits of masters in their respective fields, valuable insight can be taken to inform and build upon skill development techniques. This project will dive into the research behind mastery, drawing upon previous research on effective learning strategies, including the role of contextual interference, which involves purposeful interruptions during practice sessions and has been shown to be beneficial for skill learning. This research aims to bridge the gap between theory and practical application, providing actionable strategies grounded in empirical evidence and cognitive theories for individuals to optimize their learning processes, effectively apply acquired knowledge, and ultimately achieve mastery in their chosen domains. Ultimately, this project aims to uncover the most effective ways individuals can enrich their lives through skill acquisition, contributing to personal growth, professional development, and overall well-being. By understanding and implementing these evidence-based strategies, individuals can optimize their learning processes and unlock their full potential across various domains, fostering a continuous cycle of improvement and advancement in their chosen pursuits.

24

Recalibrated Wisdom of Crowds in Detection of AI-Generated Images

Phillip Hegeman and Jennifer S. Trueblood

Indiana University Bloomington

As AI models have made it easier than ever to create believable synthetic media, it is of ever-increasing societal importance to improve the accuracy of inauthentic media detection. Judgment aggregation is one method of producing judgments more accurate than the typical individual by harnessing the wisdom of crowds. Here, we investigate the performance of individuals and crowds in the authenticity judgment of photorealistic images of human faces. Through analysis of prior published data (Miller et al., 2023, N=121) and our own experiment (N=295) with a more diverse set of stimuli, we evaluate the impact of judgment type (binary choice, BC vs continuous judgment, CJ, such as confidence or probability rating on a 0-100 scale) and recalibration (response-conditional accuracy weighting for BC and Platt scaling for CJ) on accuracy. Across both studies, we find that individuals perform at or below chance for both BC and CJ, with particularly low performance for AI-generated images (compared to authentic images). Naïve crowd aggregates maintain or exacerbate this poor performance (Miller et al., accuracy: BC = 31.0%, CJ = 31.9%; our experiment: BC = 48.4%, CJ = 51.4%). However, accuracy of crowd judgments is improved by recalibrating (or response-conditional accuracy weighting) judgments based on responses to a small number of stimuli (after weighting/recalibration, Miller et al., accuracy: BC = 87.2%, CJ = 88.7%; our experiment: BC = 65.1%, CJ = 68.8%). In sum, we show that recalibration of individual judgments can boost the wisdom of the crowd for difficult perceptual tasks.

25

Simulation of Judicious Resource Allocation in Self-Regulated Learning: comparing a learning rate model versus a performance noise model

Keisuke Mikami and Jeffrey B. Vancouver

Ohio University

Theories of self-regulation have become a central framework for understanding current workplace learning. Self-regulated learning underscores the critical importance for learners to effectively regulate their own learning to maximize learning outcomes. Given the limited pool of resources (e.g., time), judiciously allocating resources is ideal for effective learning. Yet, results of a study by Hall et al. (2016) showed that learners might face challenges in optimizing their limited resources particularly in the self-regulated learning context. With the aim to provide a potential answer for such learners' suboptimal resource allocation, the present study developed a computational model of self-regulatory processes of resource allocation to explicate the underlying processes of how a learner could determine one's resource allocation policy. Specifically, we compared simulation results by changing two parameters: learning rate and random noise in performance. Simulation results indicated that the learning rate model endorsed Hall et al.'s (2016) findings. Thus, judicious resource allocation might be difficult to achieve primarily because of the slow learning rate. Theoretical and practical implications were discussed.

26

Exploring the Impact of Cerebellar tDCS on Generalized Anxiety Disorder (GAD)

Shivangi Bhardwaj and Ted Maldonado

Indiana State University

Cognitions, such as working memory, can be greatly diminished due to pathological traits like anxiety, such that high levels of trait anxiety create large demands of available cognitive resources, hindering task performance. As work continues to develop newer, more efficient, and accessible treatments, like Transcranial Direct Current Stimulation (tDCS), it is important to be mindful of this interaction. tDCS over the cerebellum has not received much attention compared to the cerebrum, despite work demonstrating cerebellar involvement in emotion processing and working memory. Thus, the current work examines whether individual differences in WMC may impact the effectiveness of cerebellar tDCS when modulating emotion centers in the cerebellum. We predict anodal tDCS would decrease the level of anxiety an individual experiences due to the inhibitory nature of cells involved, relative to cathodal and sham. Critically, WMC would noderate these effects as high WMC individuals have enough cognitive capacity to compensate for any change created by cerebellar tDCS whereas those with lower WMC may receive greater benefit. Preliminary analyses suggest that tDCS could modulate emotion processing, particularly in clinical populations as they were endorsing higher ratings of anxiety pre stimulation than post for cathodal, however stimulation type was not significant. Additionally, OSPAN scores are significantly lower in the Clinical condition compared to Controls, suggesting anxiety may be contributing to WMC. These finding suggest that cerebellar tDCS modulates neural activity as there was significant differences between clinical and controls; although further research is warranted before tDCS is a promoted treatment device for anxiety symptoms.

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Relationship between working memory and auditory rhythm discrimination in adults who stutter

Bailey Rann, Toni Smith, J. Devin McAuley, Soo-Eun Chang, Nick Mularoni, and Emily Garnett

Children and adults who stutter (AWS) show poorer auditory rhythm discrimination (RD) than those who do not stutter, especially for complex rhythms that don't have a consistently marked beat (Wieland et al., 2015; Garnett et al., 2023). This suggests that individuals who stutter may have a reduced ability to internally generate a periodic beat (the internal beat-deficit hypothesis: Alm, 2004; Garnett et al., 2023). Entrainment models of short-interval timing assume that an oscillatory mechanism entrained by the beat of to-be-discriminated rhythms underlies RD, whereas interval models assume that RD is based on interval-by-interval comparisons of rhythms (McAuley & Jones, 2003). If individuals who stutter rely more on interval-by-interval duration comparisons than on beat-based timing, a stronger relationship between working memory (WM) and RD might be expected for AWS compared to typical adults. To test this hypothesis, the current study examined the relationship between WM and RD in AWS and typical adults (controls). Data was combined from three different datasets where participants performed the same RD and WM tasks. As hypothesized, AWS showed a stronger relationship between WM and RD compared to controls, and group differences in WM and/or RD do not explain these findings. As predicted by the internal beat-deficit hypothesis and consistent with entrainment models, AWS do not appear to engage beat-based timing mechanisms to the same degree as controls. Rather, our findings support greater reliance on an interval timing mechanism (and, consequently, working memory) for AWS in rhythm discrimination compared to controls.

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Perceptual brightness rating differences between instruments

Chad Bullard and Jennifer Lentz

Indiana University

In this study, we asked musician participants to rate the auditory perceptual brightness of 5 different instruments: piano, glockenspiel, trumpet, saxophone, and bass guitar. We hypothesized that participants are more accustomed to small changes in the sound of their primary instrument class. Thus, a trumpet player would find the brightness changes more significant with the trumpet than with the piano, and vice versa for a piano player. Stimuli consisted of the 12 notes on the chromatic scale that were then processed through a simulation of three room reverberation modes. As a result, there were 60 total notes and 180 total stimuli. Stimuli were presented to participants in pairs: the stimulus pairs were the same instrument and note but generated at different reverberation modes. Participants then rated the brightness of sound 2 in comparison to sound 1, using a 7-point Likert-style scale with descriptors ranging from much less bright to same brightness to much more bright. In this presentation, we explore the relations between participants' primary instruments compared with their brightness ratings of the different instrument classes. We examine the brightness ratings between instrument classes for individuals as well as for the overall group to determine which rating effects are primarily due to the participants' experience-based cognitive differences rather than the instrument class differences overall.

A Preliminary Dive into Metaphor Comprehension and Cognitive Abilities Across Age: The Case of Non-native Speakers of English

Chaimae Harrag[1,2], Abdelkader Sabil[1], Manuel Conceição[3], and Gabriel Radyansky[2]

1. Hassan I University
2. The University of Notre Dame
3. Algarve University

Objective: This study explored the interrelations between metaphor comprehension, short-term memory, and fluid intelligence across different age groups.

Method: The study included two age cohorts: younger adults, aged 20 to 27 years (N = 29), and middle-aged adults, aged 45 to 60 years (N = 12). All participants were non-native English speakers. Both groups underwent a series of assessments. These were a metaphor interpretation test (16 metaphors scored on a scale from abstract complete to unrelated interpretations), forward and backward digit span tests (short-term memory), and Raven's matrix reasoning test (fluid intelligence).

Results: Analysis showed a strong correlation between fluid intelligence and short-term memory in younger adults, with higher fluid intelligence predicting better metaphor interpretation (r = .664, p < .001). Conversely, middle-aged adults displayed a different pattern; while fluid intelligence remained positively correlated with the backward digit span (r = .815, p = .001), no other correlation results emerged. Moreover, the older adults demonstrated a superior ability to provide abstract complete metaphor interpretations compared to younger adults but exhibited reduced performance on other cognitive measures.

Conclusion: The findings underscore that fluid intelligence and short-term memory significantly contribute to metaphor comprehension among young adults. However, our middle-aged adults maintain their ability to comprehend abstract metaphors, possibly through experiential or compensatory mechanisms, despite cognitive declines in other areas. This is consistent with other research showing age-related changes in processing emphasis. Specifically, there are declines in lower-level processes, as exemplified by span task but preserved or improved processing in semantic memory and mental model level comprehension.

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Implicit Rumination and Physiological Recovery

Nathan Stuart, Peggy Zoccola, and Alex Woody

Ohio University

Rumination, or repetitive negative thought, is linked to less physiological recovery in the laboratory and negative health outcomes. However, substantial variance remains after controlling for conscious rumination. This study examined implicit rumination and its links to cortisol and heart rate variability (HRV) recovery to a standardized psychosocial stressor that consistently activates the HPA axis and negative emotion. Methods: Healthy adult participants (n=78; mean age = 19.8; 41 men, 37 women) completed various cognitive and physiological measures prior to and following a speech and arithmetic laboratory stressor, including the lexical decision task to assess post-speech implicit rumination. Response latencies for task relevant negative words were subtracted from task relevant neutral words to capture implicit rumination. HRV was quantified by the root mean of successive difference (RMSSD). After data cleaning, only n=36 participants remained for analyses. Results: A multiple linear regression analysis controlling for baseline levels revealed no significant effects of implicit rumination on cortisol (p=.523) nor HRV (p=.312) recovery levels. However, an exploratory robustness analysis testing these effects adjusting for explicit rumination suggest a trend toward higher implicit rumination being linked to decreased HRV following a speech task ($\Delta R2$ = .013, p=.18). Cognitive tasks were completed after the stressor task and may have attenuated the effects of implicit rumination on HRV. Further, cortisol recovery captured levels over a long lab session, rather than just the speech task. Future work should investigate implicit ruminative processes on physiological recovery to a discrete stressor over and above explicit rumination in a larger sample.

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Irrational Beliefs: Cognitive Failure or a Rational Way of Navigating an Irrational World?

Veronika Izmaylova and Almaz Mesghina

Northwestern University

Much research on irrational beliefs has focused on the cognitive limitations of believers (e.g., lower probabilistic reasoning abilities). Still, others have argued that irrational beliefs could facilitate coping with uncertainty and stress through control-seeking. However, it is unclear whether (1) different types of irrational beliefs respond to perceived uncertainty differently, (2) individual risk factors, such as baseline anxiety, increase susceptibility to irrational belief, (3) cognitive limitations play a role in this relationship. The present study assessed whether experimentally priming individuals to feel uncertain can predict increased endorsement of irrational beliefs despite sound probabilistic reasoning abilities. Additionally, we add to the literature by exploring the moderating role of baseline trait and existential anxiety in this relationship. Using the randomness priming task introduced by Kay et al. (2010), we randomly assigned 80 individuals to unscramble sentences containing words either related to randomness (experimental group) or with negative connotations (control group). Contrary to prior work, the prime did not predict belief in the paranormal or conspiracies broadly construed. However, randomness did predict several subscales of paranormal belief: psi (psychokinesis), superstition, and precognition (astrology and predicting the future). Existential anxiety was found to predict belief in the paranormal, though it did not moderate the relationship between the prime and belief as hypothesized. Interestingly, despite research suggesting common mechanisms and functions behind paranormal and conspiracy beliefs, we found an inverse relationship between them. Our findings suggest more complex and heterogeneous mechanisms underlying different types of irrational beliefs and their relations to felt uncertainty and randomness.

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Testing Prototype Theory using a Forced Choice Task on Stimuli Defined over Binary Dimensions

Sharnee Carter, Ronaldo Vigo, Abigail Bartlett, and Aliyah Szojka

Ohio University

Prototype theory and the related construct of family resemblance (Rosch & Mervis, 1975) have been highly influential in cognitive psychology and widely applied to understand how individuals conceptualize and categorize information. We conducted a controlled exploratory study investigating the practical implications of prototype theory using a binary forced-choice task involving artificial stimuli and categories defined over three binary dimensions. The task was to select one of two given stimuli as the most representative of the displayed category. The results revealed a significant deviation from the predictions made by Rosch's prototypicality model, with participants identifying prototypical stimuli less frequently than expected by chance alone. These findings challenge the predictive validity of prototype theory (at least with respect to artificial categories defined over binary dimensions) and prompt further exploration into alternative predictive models such as the generalized representational information measure (Vigo, 2012). In addition, this study highlights the intricate nature of categorization processes and emphasizes the need for theoretical frameworks in cognitive psychology that can account for information processing limits as a function of the dimensional nature of categorical stimuli (Vigo et al, 2023).

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Cardiovascular Risk Scores are Associated with Cerebral Perfusion in Middle-Aged but not Older Adults

Abigail Bowsher[1], Jessica Cloud[1], Jessica Stark[1], Jasmeet P. Hayes[1], Meher R. Juttukonda[2,3], and Scott M. Hayes[1]

1. The Ohio State University
2. Massachusetts General Hospital
3. Harvard Medical School

Poor cardiovascular health is associated with increased risk for dementia, with reductions in cerebral blood flow serving as a mechanistic link between cardiovascular function and cognition. The current study aimed to examine the relationship between aging, cardiovascular risk, and regional cerebral blood flow in middle-aged and older adults. Adults (n = 53; age range=35-86 years; mean=62.8; SD=12.0) enrolled in the Fitness, Aging, Stress, and Traumatic Brain Injury Exposure Repository were selected for analysis. Cardiovascular risk was assessed using Framingham 10-year cardiovascular risk score. Arterial spin labeling magnetic resonance imaging (ASL-MRI) and T1- and T2-weighted structural MRI were collected on a 3T Siemens Prisma scanner. ASL-MRI and structural images were pre-processed, ASL-MRI was aligned to participants' structural space, and cerebral blood flow was extracted from regions of interest. Regression models were used to examine associations between cardiovascular risk and cerebral blood flow. In all cortical regions examined, a significant negative association was observed between cerebral blood flow and Framingham risk score in both middle-aged and older adults. However, a significant Age Group X Framingham risk score interaction was observed in the left hippocampus ($p < 0.05$). This interaction was driven by a negative association between Framingham risk score and cerebral blood flow in middle-aged adults, whereas no association was observed in older adults. Decreased cerebral blood flow in the left hippocampus in middle-aged adults may serve as an early marker for increased risk of cognitive decline.

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Problem-Solving Skills and Peer Relationships of Youth with and without ADHD: Moderation by Emotion Regulation

Hannah Brockstein, Steven W. Evans, and Julie Sarno Owens

Ohio University

Children with ADHD have deficits in both problem-solving (PS) and emotion regulation (ER) related to their social impairment. To solve social problems, a child must understand the social context, make connections between events, and create an accurate representation of the situation. ER skills require downward cognitive regulation of affect, and failure to do this can lead to skipping the steps necessary to solve problems effectively and inappropriate social behavior.

I examined the moderating relationship of ER, measured by mood lability/negativity (LN), on the association between PS and peer social functioning in children with and without ADHD using a three-way interaction. The sample included 233 children ages 8-10 (M = 8.83, SD = .81). The three-way interaction effect (PS x LN x ADHD status) was significant, 95% CI [.01, .17; -.16, -.01] for two indices of social functioning (B = .09, p = .03; B = -.08, p = .04). When children with ADHD had low levels of LN, there was a significant association between PS and peer sociometric ratings. When children with ADHD had high levels of LN, there was no significant association between PS and peer sociometric ratings. Conversely, for children without ADHD and high levels of LN, there was a significant association between PS skills and peer sociometric ratings but no such significant relationship for children without ADHD and low levels of LN.

ER and PS skills may be promising future intervention targets to improve the social functioning of youth with ADHD and prevent the adverse outcomes associated with poor social functioning.

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The effectiveness of neurofeedback and brain-computer interface (NFB-BCI) training for the treatment of ADHD: A meta-analysis and BCI demonstration

Adam M. Croom, Sofia DeThomasis, Maya Najm, Omar Nassim, and Douglas O'Dea

Case Western Reserve University

Attention-deficit/hyperactivity disorder (ADHD) is the most commonly diagnosed neurodevelopmental disorder in children with a prevalence of 8.7% (5,300,000 children) in the USA (Bozinovic et al. 2021). ADHD negatively impacts the lives of individuals and societies, with those diagnosed showing a 12% reduction in employment, 34% reduction in earnings, twice the rate of attempted suicide, and six times the rate of suicide completion compared to typically developing individuals (Faraone et al. 2021). Conducting systematic research and developing effective treatments for ADHD is of growing importance, and recently, scholars have investigated the possibility of using neurofeedback (NFB) training through game-based brain-computer interfaces (BCIs) as a possible non-pharmacological treatment for ADHD. But how effective, if at all, is NFB-BCI training for the treatment of ADHD? To provide an up-to-date answer to this question, we conducted a systematic literature review and meta-analysis on all randomized controlled trials (RCTs) that compared the effectiveness of NFB-BCI training versus different controls (waitlist, placebo) on ADHD symptoms (such as inattention). Using a random effects model, we found a large effect for the use of NFB-BCI training vs waitlisted controls on the reduction of ADHD symptoms. Yet we found no statistically significant effect for the use of NFB-BCI vs placebo controls. Here we discuss the results of our initial research on NFB-BCI training for ADHD treatment as well as methodological issues with current placebo controlled studies. Here we also provide a demonstration of NFB-BCI training on a novel cube rotation game using mobile electroencephalography (EEG).

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Falling behind; learning disparity in poverty

Julianne Huraeu, Sarah Richter, James Kelley, Emmy Sager, and Heidi Kloos

University of Cincinnati

It is well-documented that poverty exacerbates learning difficulties among children. However, while this correlation is well-documented, it is not clear whether the trauma of poverty has a lasting effect on children's ability to learn. In the current research, we sought to investigate this question by looking at children's development of math fluency. Specifically, we asked whether children fall steadily behind in math fluency, or whether their proficiency level remains stable across years. Our method was to analyze an existing data set of children faced with extreme poverty. The data set consists of children's proficiency in math fluency across two or more years (N = 109; 45% girls). The data set was obtained from a non-profit organization that serves the educational needs for children faced with homelessness or insecure housing. These children range in age from 5 to 12 years, and they went to school either in a rural neighborhood (51%) or in an urban neighborhood (49%). As expected, we found that math proficiency was low during the first year of testing: Children were an average of 1.33 years behind math fluency. This average was slightly higher for young children from the rural neighborhood (M = -1.09), compared to their urban counterparts (M = -1.59). Regarding the change over time, we found that many children (53.21%) improved in math fluency from Year 1 to Year 2. Thus, the trauma of poverty hindered only some children (45.87%) from making consistent progress in math fluency. For the children with data for more than 2 years (N = 19; number of data points: 3 to 6 years), there was high variability in children's trajectories over time. These findings were unaffected by the child's age or the location of schooling. Taken together, our results show instances of remarkable resilience and improvement defying the bleak prognosis often associated with poverty-induced learning challenges. They point towards a more nuanced understanding of the relationship between poverty and the development of math fluency. Specifically, our research emphasizes the potential for growth and development at any age. Rather than yielding to expectations, these findings reinforce the need to strengthen our efforts to provide targeted support and resources to children faced with extreme poverty.

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Cognitive Processing Deficits in Students with Attention Deficit Hyperactivity Disorder (ADHD): Implications for Interventions

Martha Wise

Ohio University

Recent research suggests that students with ADHD have executive function and working memory deficits. These deficits have trickle-down effects that touch on a wide range of quality-of-life indicators and correlates–including educational performance (Barkley, 2015). Bar et al found that many interventions directly aimed at working memory have underperformed among students with ADHD (Bar et al., 2020). Therefore, building an understanding of fundamental cognitive processes is key to developing and selecting effective interventions. This brief overview of the literature explores how robust cognitive findings on working memory and cognition, in general, may help educators address intervention barriers. More specifically, we propose a set of hypotheses that link robust research on the limits of working memory and attention to the design of improved intervention strategies for students with ADHD. We hope that these hypotheses will increase awareness regarding cognitive factors that should be considered when designing and implementing intervention strategies for students with ADHD.