INTERNATIONAL SOCIETY FOR INTELLIGENCE RESEARCH 2023 ANNUAL CONFERENCE JULY BERKELEY



1σ

HOTEL SHATTUCK PLAZA JULY 26–29, 2023

3σ

Cover design

Background photograph: A view of the city of Berkeley, looking westward from the Berkeley Hills. At center is downtown Berkeley and UC campus, and beyond is the San Francisco Bay, by Oleg, licensed under Creative Commons Attribution 2.0 Generic (CC BY 2.0).

Berkeley Golden Bear statue photographed by Wally Gobetz, licensed under Creative Commons Attribution-NonCommercial-NoDerivs 2.0 Generic (CC BY-NC-ND 2.0).

Lateral and midsaggittal brain section illustrations, normal distribution, and subsequent program were created by Emily Willoughby (willo074@umn.edu); program design based on template at Github by Maximelucas, licensed under GNU General Public License v3.0.

Contents

About	4
Conference information	4
ISIR President and Board 2023	4
Organizing Committee	4
Timetable	5
Wednesday, 26 th of July \ldots	5
Thursday, 27th th of July \ldots	6
Friday, 28 th of July \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots	7
Saturday, 29 th of July \ldots	9
Abstracts	10
Talks	11
Symposia	45
Posters	50
List of Participants	66
Useful Information	68
Navigating Berkeley	68
Acknowledgements	70
Future meetings	70
Notes	71

About

Founded in 2000, ISIR is the focal scientific society for the world's researchers on human intelligence. While the focus of the society is on human intelligence, we are also interested in cognitive abilities in other species. Artificial intelligence is not a current focus of the society. Intelligence research is currently represented by two major journals: *Intelligence*, edited by Richard Haier, and the *Journal of Intelligence*, an open-access MDPI journal edited by Andrew Conway. Both journals welcome well-conducted studies, as well as theoretical articles from a variety of perspectives including psychometrics, genetics, individual differences, evolutionary theory and neuroscience. Intelligence is a 'hot topic'. We share a commitment to civility, open dialogue, and respect. Intelligence is a trait. It is an important one with links to many significant outcomes through multiple pathways. Although scores on many measures, including intelligence-type tests, can be ranked from low to high, these ranks do not apply to people, nor to their value. In the absence of global pandemics, we hold an annual conference, usually in July. The venue alternates each year between the USA and Europe. Scholars attend from all over the world to present their latest research, listen to new findings, and explore older ones.

Conference information

The 23^{*rd*} ISIR Annual Conference 2023 takes place at the Shattuck Plaza hotel in Berkeley, California. The conference will be held from Thursday, July 27 to Saturday, July 29 with a special pre-conference event on the evening of Wednesday, July 26. Further information and updates will be announced on the ISIR website as they arise.

We will have a strong and exciting showing of researchers, including an unprecedented number of symposia on topics including gifted education and talent, test development, job performance, and whether neuroscience and genetics can boost the Flynn Effect. Our 2023 **Lifetime Achievement Awardee Wendy Johnson**, though unable to attend, will give a short Zoom thanks on Friday morning and will formally accept her award next year in Zürich. Our **Distinguished Contributor Frank C. Worrell** will be interviewed by David Lubinski on Friday evening.

ISIR President and Board 2023

President:	Rosalind Arden
President Elect:	Tom Coyle
Past Presidents:	Rex Jung and William Revelle
Treasurer and Treasurer Elect:	Rex Jung and Tobias Edwards
Board:	John Protzko, Andreas Demetriou, Roberto Colom,
	Timothy Bates, Kirsten Hilger, Guy Madison, and Emily Willoughby

Organizing Committee

Principal Organizer:	Rosalind Arden
Program Chair and Design:	Emily Willoughby

Timetable

All times listed in the schedule are in **Pacific Daylight Time** (PDT).

Schedule key:



Note: Student presenters are eligible for the **Best Student Paper** and **Best Student Poster awards**. For judges' convenience, student talks and posters are labeled with (S).

Wednesday, 26^{th} of July

3:45-4:00	Opening remarks		
4:00-5:00	KL	Frank C. Worrell University of California at Berkeley	Keynote lecture
5:00-6:00	KL	Steven Pinker Harvard University	Keynote lecture
6:00-8:00	Welcome session and refreshments courtesy of the IMC		

Thursday, 27th th of July

8:30-8:45	Registration		
8:45-9:00	Welcome		
9:00-10:00	KL	Steve Pinker Harvard University	Keynote
10:00-10:30		Morning coffee break	
10:30-11:00	Talks 1: Achievement		
10:30-10:45	RT	Sandra Oberleiter University of Vienna	Predicting cross-national sex differences in educational achievement by socioeconomic macro indicators S
10:45-11:00	RT	Jakob Pietschnig University of Vienna	Is there a Flynn effect for achievement g? Evidence from large-scale population-representative student assessments in Italy
11:00-12:00	Panel: Can neuroscience/genetics research boost the Flynn Effect?		
11:00-12:00	SY	Chaired by Richard Haier University of California at Irvine	With Erhan Genç, Johanna Popp, James Lee, and Joe Rodgers
12:00-1:30		Lunch	
1:30-3:30	Panel: Prospects of gifted education and challenges in the current political climate		
1:30-3:30	SY	Chaired by Avery Wang Apple Research Scientist	With Jim Milgram, Tom Loveless, and Brandon Wright
3:30-4:00	Afternoon coffee break		
4:00-6:00	Panel: Perspectives on giftedness and talent		
4:00-6:00	SY	Chaired by Jonathan Wai University of Arkansas	With Camilla Benbow, Mike Mhlolo, Harrison Kell, and Frank Worrell
	Poster session and drinks in courtyard		

Friday, $\mathbf{28}^{th}$ of July

8:45-9:00	LA	Wendy Johnson University of Edinburgh	Lifetime Achievement Award Address
9:00-9:30	KL	Gregory Clark Southern Denmark University	Hypergamy revisited: Marriage in England, 1837–2021
9:30-10:00		Morning	coffee break
10:00-10:30		Lightning talks 1: Persona	lity, cognitive enhancement
10:00-10:10	LT	Minal Uprety Kirloskar Institute of Management	Impact of psychological well-being on job performance: An empirical study
10:10-10:20	LT	Guy Madison Umeå University	The association between intelligence and handedness, through the lens of sex and sex differences in personality
10:20-10:30	LT	Sandra Grinschgl University of Graz	Who wants to enhance their cognitive abilities? The relationship between intelligence and the acceptance of cognitive enhancement
10:30-12:00		Talks 2: Intelligence and I	behavioral genetic methods
10:30-10:45	RT	Emily A. Willoughby University of Minnesota Twin Cities	Testing for selective adoption placement with polygenic scores in the Minnesota Center for Twin and Family Research
10:45-11:00	RT	Damien Morris King's College London	Behavioural genetics, free will, and the fear of (genetic) determinism S
11:00-11:15	RT	Jordan Lasker Texas Tech University	Everything is smaller in Texas: A large-scale failure to replicate the Scarr-Rowe Effect S
11.15_11.20	рт	Alice J. Kim	
11.15-11.50	KI	University of Southern California	interaction in cognitive aging S
11:30-11:45	RT	University of Southern California Tobias Edwards University of Minnesota Twin Cities	Pleiotropy between cognitive traits and political beliefs S
11:30-11:45	RT	University of Southern California Tobias Edwards University of Minnesota Twin Cities Ilan Libedinsky Vrije Universiteit	Pleiotropy between cognitive traits and political beliefs S Genetic timeline of human brain and cognitive traits S
11:30-11:45 11:45-12:00 12:00-1:30	RT	University of Southern California Tobias Edwards University of Minnesota Twin Cities Ilan Libedinsky Vrije Universiteit	Pleiotropy between cognitive traits and political beliefs S Genetic timeline of human brain and cognitive traits S
11:30-11:45 11:45-12:00 12:00-1:30 1:30-2:40	RT	University of Southern California Tobias Edwards University of Minnesota Twin Cities Ilan Libedinsky Vrije Universiteit Lu Lightning talks 2: Educ	Pleiotropy between cognitive traits and political beliefs S Genetic timeline of human brain and cognitive traits S Inch ation, health and society
11:30-11:45 11:45-12:00 12:00-1:30 1:30-2:40 1:30-1:40	RT RT LT	University of Southern California Tobias Edwards University of Minnesota Twin Cities Ilan Libedinsky Vrije Universiteit Lightning talks 2: Educ Gabriella D. Noreen Vanderbilt University	Pleiotropy between cognitive traits and political beliefs S Genetic timeline of human brain and cognitive traits S Inch ation, health and society Amplifying the signal: A mixed methods exploration of precocious individuals' thoughts on educational practices S

		lonothan Fries	How intelligence predicts future health:	
1:50-2:00	LT	Jonathan Fries	A comprehensive meta-analysis of	
		University of Vienna	cognitive epidemiology research S	
		Tatiana da Cássia Nakana	A new look at giftedness: Examining	
2:00-2:10	LT	Dentifical Catholic University	socioemotional skills in Brazilian	
			Pontifical Catholic University	adolescents
		Alexandra N. Dafford	Letter-string analogies: Comparing	
2:10-2:20	LT	Liniversity of Amsterdam	analogical transfer in humans and	
		University of Amsterdam	machines S	
			When demographics predict	
2.20-2.30	ΙТ	Leah C. Jansen	intellectual outcomes: Why	
2.20 2.30	L.1	Michigan State University	considering intersectionality matters	
			3	
		April Bleske-Rechek	Trends in advanced placement	
2:30-2:40	LT	University of Wisconsin at	participation and performance,	
		Eau Claire	1992-2022	
2:40-4:00		Talks 3: Education, econon	nics, and cognitive psychology	
			Linear and quadratic relations for	
		Kavla M. Garner	cognitive ability with	
2:40-2:55	RT	Northwestern University	pro-environmental behavior, gun	
		Northwestern oniversity	control attitudes, and ORAIS interests	
			S	
		Thomas Coyle	Non-g factors and ability tilt predict	
2:55-3:10	RT	University of Texas at San	STEM and humanities criteria: Beyond	
		Antonio	general intelligence (g)	
			250 words written at age eleven	
3:10-3:25	RT	Tobias Wolfram	predict intelligence and final	
		Bielefeld University	educational attainment close to expert	
			assessment (S	
		James J. Lee	Intelligence and reaction time in the	
3:25-4:00	KL	University of Minnesota Twin	two-digit number-comparison task	
		Cities		
4:00-4:30		Afternoon coffee break		
4:30-5:30		Distinguished Co	ontributor Interview	
4.20 5.20	DC	Frank C. Worrell	International by Devid Lukinshi	
4:30-5:30	DC	University of California at	interviewed by David Lubinski	
		Berkeley		
		Panaulat and		

Saturday, 29th of July

9:00-10:00	Talks 4: Measurement, psychometrics, and education		
		Michael K. Mhlolo	Creating tomorrow's stars today:
9:00-9:15	RT	Central University of	Re-examining the STEM Intervention
		Technology	strategy through Dinaledi Schools in
			South Africa
9:15-9:30	RT	Moritz Breit	The stability of cognitive abilities: A
		University of Trier	meta-analysis of longitudinal studies
		Colin G. DeYoung	Personality and intelligence from an
9:30-9:45	RT	University of Minnesota Twin	observer perspective
		Cities	
			The Flynn Effect at the item level:
9:45-10:00	RT	Joseph L. Rodgers	Secular changes in PIAI-Math item
		Vanderbilt University	patterns in the NLSY-Children data,
10.00.10.00			1986-2004
10:00-10:30		Morning	coffee break
10:30-12:00		Taiks 5: Cognitive psycholog	gy, neuroscience and evolution
10 00 10 15	DT	Kirsten Hilger	Can machine learning-based predictive
10:30-10:45	КI	Würzburg University	modeling improve our understanding
		Eulose Cours	of numan intelligence?
		Ernan Genç	El construction de la construction de la construction
10:45-11:00	RT	Leibniz Research Centre for	Electrophysiological signatures link
		vvorking Environment and	polygenic scores to general intelligence
		Human Factors	
11 00 11 15	DT	Keith F. Widaman	Modeling effects of genes,
11:00-11:15	КI	University of California at	environments, and their interaction on
		Riverside	Intelligence and other phenotypes
11:15-11:30	RT	Santiago Hermo	Labor market returns and the evolution
		Brown University	of cognitive skins: Theory and evidence
11.20 11.45	рт	John Protzko	Building big teams to put theories of
11:30-11:45	RI	University	the positive manifold to strict tests
		Offiversity	Conoral Cognitive Ability is the major
		Michael A. Weedley of	source of ability covariance across
11.45-12.00	DT	Menie	mammals birds and fish. Traditional
11.45 12.00		London United Kingdom	and nhylogenetic meta- analyses of 82
		London, onited kingdom	studies on 36 taxa
12.00-1.30		Brown-bag lunch :	and husiness meeting
1:30-3:00	Drown-bag function and bag interpretation of test scores		
			With Andrew Conway, Scott Decker
1:30-3:00	SY	Chaired by Kristóf Kovács	Dawn Flanagan, Kevin McGrew and
		Eötvös Loránd University	Joel Schneider
3:00-3:30		Afternoon	coffee break
3:30-5:30		Panel: Job performance, g, pre	dictive bias, and stereotype threat
		Chaired by Nathan Kuncel	
3:30-5:30	SY	University of Minnesota Twin	With Paul Sackett, Saron Demeke, and
		Cities	others

Abstracts

Abstracts are listed in alphabetical order by presenting author's last name. If a given presentation has more than one author, presenting author's name is <u>underlined</u>.



Note: Student presenters are eligible for the **Best Student Paper** and **Best Student Poster awards**. For judges' convenience, student talks and posters are labeled with (s).

LT

Talks

Trends in advanced placement participation and performance, 1992–2022

Dr. April Bleske-Rechek

University of Wisconsin-Eau Claire, Eau Claire, WI, USA

The Advanced Placement (AP) program was launched in the 1950s with the purpose of providing intellectually precocious, motivated students exposure to college-level coursework while still in high school. Over time, presumably in response to concerns about low levels of participation in the program among low-income and disadvantaged minority students, the AP program shifted its commitment to the provision of a standardized college preparatory experience to essentially all students (College Board, 2014).

Indeed, access to AP has expanded dramatically since the 1990s. Between 1997 and 2017, the percent of public high schools offering AP exams went from 52% to 71%, and the percent of students to take an AP exam increased from 8% to 34%. Moreover, black and Hispanic students' participation rates grew at almost twice the rate of white and Asian students (Finn & Scanlan, 2020).

However, access to AP coursework does not necessarily translate to performing well on AP exams (Judson & Hobson, 2015; Kolluri, 2018). From 1997 to 2017, "pass" rates (a score of 3 or above on an AP exam) fell for black and Hispanic students. In 2017, 70% of black students' exam scores were a 1 or 2 (Finn & Scanlan, 2020).

I have just signed an agreement with the College Board to obtain more data on AP participation rates and performance distributions. Assuming the College Board follows through, I will soon have a spreadsheet containing the number of individuals participating in AP by race and sex, and exam score distributions by race and sex, for 15 common courses (such as English Language, U.S. History, Psychology, Computer Science A, etc.). The College Board has agreed to provide data for the even years between 1992 and 2022 (except 2020).

I look forward to sharing what those numbers have to say and to discussing their implications.

The stability of cognitive abilities: A meta-analysis of longitudinal studies

Dr. Vsevolod Scherrer¹, Prof. Franzis Preckel¹, Prof. Elliot M Tucker-Drob², <u>Dr. Moritz Breit¹</u> RT

¹University of Trier, Trier, RLP, Germany ²University of Texas at Austin, Austin, Texas, USA

Cognitive abilities are regarded as some of the most stable psychological traits, yet there exist no large-scale systematic efforts to document the specific patterns by which the rank order stability of cognitive abilities changes over age and time interval, and differs across abilities, tests, and populations. Determining the conditions under which cognitive abilities exhibit high degrees of stability, and those in which stability is ephemeral is critical not just to theory development, but to applied contexts in which cognitive assessments routinely guide decisions regarding clinical and educational recommendations and treatments with long-term consequences for individuals. We present a meta-analysis of longitudinal studies investigating the rank-order stability of cognitive abilities. A total of 1288 manifest test-retest correlation coefficients were compiled from 205 longitudinal studies from the past 100 years investigating a total of 87,508 participants. For an age of 20 years and a test-retest interval of 5 years, we found a mean rank-order stability of ρ =.77. The effect of mean sample age on stability was best described by an inverse exponential function, with low stability in preschool children and high stability from late adolescence to late adulthood. Stability declined with increasing test-retest interval. This decline leveled off after an interval of about 5 years. According to the age and interval moderation models, minimum stability sufficient for individual level diagnostic decisions (r_{tt} = .80) of general intelligence can only be expected over the age of seven and for short time intervals in children. In adults, high stability can be expected for more than five years. Stability varied between cognitive abilities, with higher stability in knowledge-based abilities (highest: Comprehension Knowledge; ρ =.79) than in abilities based on effortful processing (lowest: Auditory Processing; ρ =.65). These differences diminished when test reliability was controlled for in a subset of effect sizes.

Hypergamy revisited: Marriage in England, 1837-2021

Prof. Gregory Clark¹, **Prof.** Neil J Cummins²



¹Southern Denmark University, Odense, Denmark ²LSE, London, United Kingdom

It is widely believed that women value social status in marital partners more than men, leading to female marital hypergamy, and more female intergenerational social mobility. A recent paper on Norway, for example, reports significant female hypergamy, even today, as measured by parental status of men and women in partnerships. Using evidence from more than 33 million marriages and 67 million births in England and Wales 1837-2022 we show that there was never within this era any period of significant hypergamous marriage by women. The average status of women's fathers was always close to that of their husbands' fathers.

Consistent with this there was no differential tendency in England of men and women to marry by social status. The evidence is of strong symmetry in marital behaviors between men and women throughout. There is also ancillary evidence that physical attraction cannot have been a very significant factor in marriages in any period 1837–2021, based on the correlation observed in underlying social abilities.

Non-g factors and ability tilt predict STEM and humanities criteria: Beyond general ontelligence (g)

Thomas Coyle



University of Texas at San Antonio, San Antonio, Texas, USA

General intelligence (g) represents variance common to mental tests, indicating that people who do well on one test generally do well on all others. In general, tests with high g loadings strongly predict school and work criteria, whereas tests with low g loadings have negligible predictive power. Two exceptions are ability tilt and non-g residuals of standardized tests (e.g., SAT and ACT). Ability tilt is based on within subject differences in math and verbal tests, yielding math tilt (math > verbal) and verbal tilt (verbal > math). Non-g residuals are based on non-g variance in math and verbal tests, obtained after removing g. Both tilt and non-g residuals are unrelated to g, yet robustly predict criteria in specific domains. Math tilt and residuals predict STEM (science, technology, engineering, math) criteria, whereas verbal tilt and residuals predict humanities criteria. In this talk, I will review research on tilt and non-g residuals involving diverse tests (SAT, ACT, PSAT, ASVAB) and large, representative samples (National Longitudinal Survey of Youth, N = 1,950; College Board Validity Study, N = 160,670). I will show that ability tilt and non-g residuals robustly predict domain specific criteria (jobs, college majors, GPAs, test scores) in STEM and humanities. I will argue that these findings support investment theories, which assume that investment in a specific domain (STEM) boosts the development of analogous abilities (math) but inhibits the development of competing abilities (verbal). I will conclude with a discussion of future research on tilt and non-g residuals, highlighting the need to examine non-g factors in different developmental periods and at different ability levels.

Personality and intelligence from an observer perspective

Dr. Colin G. DeYoung, Ms. Hannah Asis, Mr. Tyler A. Sassenberg, Mr. Edward Chou RT

University of Minnesota, Minneapolis, MN, USA

The associations of intelligence with a wide variety of personality traits have been wellstudied. Multiple meta-analyses have shown that the Openness/Intellect dimension of the Big Five routinely shows the strongest association with intelligence, whereas some other dimensions show smaller but still robust associations. In contrast, much less is known regarding how intelligence is associated with peer-ratings of personality. It is well-established that peer-ratings of personality contain valid incremental variance beyond self-ratings (and vice versa), so it is possible that they could be differently related to intelligence, and this could inform our understanding of how intelligence influences observers' perceptions of personality. In two adult samples (N = 234 and 309) we compared the associations of intelligence with self- and peer ratings of personality using the Big Five Aspect Scales (BFAS). Results differed across samples, such that effects were generally stronger in the sample with an average of 2 rather than 1 peer rating and a higher-quality test of intelligence. However, associations did not differ for self- versus peer ratings, suggesting that to whatever extent intelligence influences perceptions of personality, it does so similarly for people perceiving themselves and for people perceiving others. As expected, Openness/Intellect was strongly positively associated with intelligence, with expected differences in strength of effects for the Intellect versus Openness subdimensions. Conscientiousness was negatively associated with intelligence. Results are discussed in relation to existing knowledge regarding associations between personality and intelligence.

Pleiotropy between cognitive traits and political beliefs S

<u>Mr. Tobias Edwards</u>, Mr. Alexandros Giannelis, Dr. Emily Willoughby, Prof. James Lee

Minnesota Twin Cities, Minneapolis, MN, USA

Educational attainment and intelligence are robustly related to religious and political beliefs. However, the correlations alone cannot identify whether the relationships are causal or through what mechanism they act. In particular, variation in the non-shared environment and family background may confound relations between educational attainment and cognitive performance with political beliefs. In this study we test for pleiotropy, a causal genetic relationship between cognitive traits and political opinion, using sibling pairs from over 300 families in the Minnesota Sibling Interaction and Behavior Study. We find that polygenic scores estimating educational attainment, cognitive performance, non-cognitive ability and mathematical tilt are related to authoritarianism, egalitarianism, economic and social liberalism. Whilst cognitive performance and educational attainment are predictive of left-wing views, mathematical tilt is predictive of right-wing views. We employ within-family analyses and control for socioeconomic mediators to identify and interpret the causal effects of genotypic variation in cognitive abilities. To overcome the error-in-variables bias, induced by the noise in the polygenic scores, we exploit a two-stage least squares estimator to standardize the genotypic effects in terms of phenotypic units. This allows us to show that the effect of "genotypic years of education" is significantly larger than that of "phenotypic years of education".

How intelligence predicts future health: A comprehensive meta-analysis of cognitive epidemiology research (5)

Mr. Jonathan Fries, Dr. Jakob Pietschnig



University of Vienna, Vienna, Austria

The impact of intelligence on an individual's life outcomes, including their mental and physical health, has been widely studied and established. Despite this, there has been no formal meta-analytical synthesis of the research available to date.

To address this gap, we conducted a systematic literature search, identifying over 68,000 potentially relevant results which yielded k = 350+ includable independent studies.

In our analysis, we used several publication bias detection methods to account for potential influences of dissemination bias as well as specification curve analysis to examine the effects of different study characteristics and their interaction on summary effect strengths and direction.

Across all analyses, we found that higher intelligence was consistently associated with better overall health (OR = 0.77). Interestingly, this association was differentiated according to disease type, with higher intelligence being more strongly associated with a reduced risk of cancer (OR = 0.87) and cardiovascular diseases (OR = 0.78), compared to diabetes (OR = 0.68) and depression (OR = 0.69).

We also identified health behavior and health literacy as moderators of the intelligencehealth association. We found no substantial indications of dissemination bias, indicating that our results were not biased by incomplete or selective reporting.

In summary, our study provides robust evidence that intelligence is a predictor of various physical and mental health outcomes. However, the strength of this association varies according to the type of disease. Moreover, within-person factors such as health literacy and treatment compliance explained a meaningful proportion of variance in the intelligence and health link.

Linear and quadratic relations for cognitive ability with pro-environmental behavior, gun control attitudes, and ORAIS interests

Ms. Kayla M Garner, Dr. William Revelle



Northwestern University, Evanston, IL, USA

Intelligence is a fundamental aspect of personality and is informative in predicting various psychological outcomes. An understanding of how intelligence functions in its prediction of particular attitudes and interests would assist personality psychologists attempting to understand the effects of a wide range of individual differences on individual outcomes. To accomplish this, SAPA data on over 800,000 participants were analyzed to explore how cognitive ability, measured via the ICAR (Condon & Revelle, 2014), relate to a variety of interests and attitudes including interest in green activities, gun control attitudes, orientations toward science (i.e., interest, openness, understanding, and answers/trust), as well as a variety of additional interests measured by the Oregon Avocational Interest Scale (ORAIS; Goldberg, 2010).

Cognitive ability was evaluated as both a single factor and multiple subscales (i.e., Verbal, 3D-rotation, Letter Number Series, Mental rotation) for the current study. Analysis of powered vectors was done to examine the shape of the associations examined for the current study and specifically, investigate whether the associations were linear or quadratic. Regression models were cross-validated on a holdout sample to test for generalizability, and cross-validated adequately. Powered vectors were used because of previous findings suggesting a possible quadratic relationship between economic attitudes and intelligence (Lin & Bates, 2022). Cognitive ability (i.e., domain and sub-factor level) significantly predicted pro-environmental behavior, gun control attitudes, orientations toward science, and ORAIS interests; and adding quadratic terms increased the variance explained in almost all the models. Additionally, 3D-rotation had a significant negative quadratic association with pro-environmental behavior, all orientation towards science scales, and all the ORAIS interest scales except interest in television and interest in religion and spirituality. The single factor ICAR score also had a significant quadratic association with pro-environmental behavior, openness to and understanding of science, and all the ORAIS interest scales except being alone.

RT

Electrophysiological signatures link polygenic scores to general intelligence

Ms. Dorothea Metzen¹, Dr. Christoph Fraenz², <u>Dr. Erhan Genc²</u>

¹Ruhr University, Bochum, Germany

²IfADo - Leibniz Research Centre for Working Environment and Human Factors, Dortmund, Germany

Intelligence is a highly polygenetic trait. Polygenetic scores, a genetic summary measure, for intelligence was calculated in representative sample (Dortmund Vital Study) of 520 individuals. These individuals also completed a test battery of different cognitive test and resting-state EEG recordings on a 64-channel system. From the test scores of the test battery a factor for general intelligence (g) was calculated. Resting-state EEG recordings were quantified as the brain's electrophysiological functional connectivity (across different frequencies: delta, theta, high alpha, low alpha, beta) by means of graph theory. We tested whether graph theoretical metrics, like efficiency and clustering, mediated the association between polygenic scores and intelligence. We investigated that on the level of the whole brain as well as local brain areas as reconstructed sources. Our results confirm that also in our sample g was related to polygenic scores for intelligence. Furthermore, we found that polygenic scores were related to graph metrics of different frequencies across various brain areas. Interestingly, for brain areas predominantly located in parieto-frontal regions, we found that efficiency as well as clustering in the frequency range of theta and beta mediated the link between genes and intelligence. This effect was more pronounce in young than old individuals. These findings are a crucial step forward in decoding the neurogenetic underpinning of intelligence.

Who wants to enhance their cognitive abilities? The relationship between intelligence and the acceptance of cognitive enhancement **s**

Dr. Sandra Grinschgl, Ms. Anna-Lena Berdnik, Ms. Elisabeth Stehling, Dr. Gabriela Hofer, Prof. Aljoscha C Neubauer

University of Graz, Graz, Austria

Within science and the general public, the enhancement of humans' core cognitive abilities-such as intelligence-is a frequently debated topic. Different enhancement methods like brain stimulation, smart drugs, and working memory trainings are supposed to help individuals in improving their cognition. Although these methods have proven to be rather ineffective so far, they are used increasingly. Thus, in the present studies we aimed at a deeper understanding of individuals who seek to enhance themselves. This is especially important, as enhancement might be accompanied by certain risks in the long run. In a preregistered online study, we asked 257 participants about their acceptance of various enhancement methods and tested predictors thereof. While both, measured and self-estimated intelligence, as well as participants' implicit beliefs about intelligence, did not predict participants' acceptance of enhancement, a younger age, higher interest in Science Fiction, and (partially) higher openness as well as lower conscientiousness did. Thus, certain interests and personality traits might contribute to the willingness to enhance one's cognition. We also conducted a preregistered in-lab study (N = 200) to replicate those findings and to extend the list of possible predictors with the RIASEC interests. We will critically discuss our findings in light of the current debates around cognitive enhancement. Furthermore, we will highlight how psychological research—and intelligence research more specifically—can contribute to those debates.

Simulating the process overlap theory of intelligence: A unified framework bridging psychometric and cognitive perspectives

<u>Dr. Han Hao¹</u>, Dr. Andrew R. A. Conway¹, Dr. Kristóf Kovács², Dr. Jean-Paul Snijder³ RT

¹New Mexico State University, Las Cruces, NM, USA ²Eotvos Lorand University, Budapest, Hungary ³Heidelberg University, Heidelberg, Germany

Traditional theories of intelligence either prioritize a psychometric or a cognitive perspective, but their limitations and incompatibilities hinder a comprehensive understanding. Contemporary theories, like the process overlap theory (POT; Kovács & Conway, 2016; 2019), aim to bridge the gap between both perspectives, by explaining inter-individual differences in intelligence through intra-individual psychological processes.

The current study investigates POT as a unified framework for understanding human intelligence, incorporating psychometric and cognitive theories. POT proposes a novel psychometric structure and cognitive architecture that explains individual differences in cognitive abilities. We developed dynamics to simulate potential correlational/causal structures of cognitive processes involved in human cognitive activities based on POT, examining how these structures align with psychometric models.

Test scores were generated from a sampling of simulated cognitive processes and fitted by typical latent factor models. Despite the absence of a general cognitive ability in generating the data, results showed that a standard higher-order "general intelligence" model fit the data well.

As POT rejects the notion of a general factor of intelligence (g) psychometric network models (Borsboom et al., 2021; Epskamp et al., 2018) were also implemented to simulated test scores, as they align better with the theory. Finally, we implemented a network structure at the latent factor level to retain latent factor models' benefits in accounting for measurement errors. Estimated factor scores for simulated broad abilities from the three different models are compared and discussed.

This study demonstrates POT's compatibility with standard psychometric models, including the general intelligence factor, without assuming a common cognitive cause. The results support POT and provide an alternative theoretical and statistical framework for contemporary research on human cognition, combining psychometric and cognitive theories of intelligence.

Labor market returns and the evolution of cognitive skills: Theory and evidence

Santiago Hermo¹, Miika Päällysaho², David Seim², Jesse M Shapiro³

RT

¹Brown University, Providence, RI, USA

²Stockholm University, Stockholm, Södermanland and Uppland, Sweden ³Harvard University, Cambridge, MA, USA

A large literature in cognitive science studies the puzzling "Flynn effect" of rising fluid intelligence (reasoning skill) in rich countries. We develop an economic model in which a cohort's mix of skills is determined by different skills' relative returns in the labor market and by the technology for producing skills. We estimate the model using administrative data from Sweden. Combining data from exams taken at military enlistment with earnings records from the tax register, we document an increase in the relative labor market return to logical reasoning skill as compared to vocabulary knowledge. The estimated model implies that changes in labor market returns explain 37 percent of the measured increase in reasoning skill, and can also explain the decline in knowledge. An original survey of parents, an analysis of trends in school curricula, and an analysis of occupational characteristics show evidence of increasing emphasis on reasoning as compared to knowledge.

DOI: https://doi.org/10.1093/qje/qjac022

Can machine learning-based predictive modelling improve our understanding of human intelligence?

Dr. Kirsten Hilger¹, Dr. Joshua Faskowitz², Prof. Olaf Sporns², Mr. Jonas A Thiele¹ RT

¹Würzburg University, Würzburg, Germany ²Indiana University Bloomington, Bloomington, Indiana, USA

A growing body of research demonstrates that individual levels of intelligence can be predicted from differences in brain characteristics such as functional brain connectivity. Most of this research is, however, conceptualized to reach the highest possible prediction performance, while insights into neurobiological processes underlying the predicted concepts are limited or even lacking. In this talk, I will encourage predictive modelling studies to choose their design on the basis of a specific conceptual question, whose answer contributes to our understanding about human intelligence.

Following this idea, I will present a preregistered study in which we investigated the relative importance of functional brain networks for predicting general, fluid, and crystalized intelligence of 806 (main sample) and 322 (replication sample) adults with simulated functional brain network lesioning. General, fluid and crystalized intelligence were predicted from different selections of functional brain connections: From whole-brain connectivity, from connectivity within and between specific functional brain networks, and from connectivity proposed as relevant by different intelligence theories.

Overall, general and crystalized intelligence were more accurately predicted than fluid intelligence. Multiple functional brain networks were involved in this prediction and simulated lesioning of functional brain networks could well be compensated by other systems. Notably, localized connectivity as suggested by different intelligence theories did not excel in prediction performance compared to widely distributed brain connections and especially whole-brain connectivity.

I will conclude that future research on the neural bases of human intelligence should select their prediction strategy based on interpretability and on conceptual insights rather than exclusively on prediction performance. Finally, the talk will close with outlining a future project idea in which the focus will be shifted away from region-specific and static brain connectivity to global time-varying (dynamic) prediction features—with the ultimate goal of deriving a more comprehensive view on the neural bases of human intelligence.



When demographics predict intellectual outcomes - Why considering intersectionality matters (5)

Ms. Leah C Jansen, Dr. Dante D Dixson, Ms. Ersie Gentzis, Ms. Skye Taylor



Michigan State University, East Lansing, MI, USA

Researchers have long studied group mean differences between students of different demographics [e.g., race, socio-economic status (SES), gender]. For example, group mean differences on standardized tests of cognitive ability between Black and White students, or high-SES and low-SES students, are frequently discussed and analyzed. Recently, however, scholars have begun to note that researching differences between singular aspects of one's demographic background (i.e., race *or* SES) do not yield nuanced explanations to the complex interplay that exists between multiple aspects of one's identity. For example, instead of noting differences in cognitive scores between Black and White students, a deeper understanding can be uncovered when comparing cognitive scores of various race/ethnic groups across various SES groups (e.g., high-SES Black students vs. low-SES White students). Such comparisons are likely to yield more detailed results.

In this study, academic and intellectual outcomes were compared across the intersections of race and SES from a sample of 2,196 students from a diverse high school in a Western state. The cumulative GPA, special education eligibility, standardized English language (ELA) scores, and standardized math scores were compared for students identifying as White, Asian-American Pacific Islander, Black, and Hispanic from high- and low-SES backgrounds. A series of one-way ANOVAs and post-hoc tests indicated large effect size (d > .8) differences across GPA (13 of 28, 46%), ELA scores (16 of 28, 57%), and math scores (14 of 28, 50%), and medium effect size (d > .8) differences across special education eligibility (8 of 28, 29%).

If only race or SES had been compared for each outcome variable, a maximum of 10 possible differences would have been found, whereas in this study, most outcome variables found more than 10 *statistically significant* differences with *large* effect sizes. Consideration of intersectionality allows for a more nuanced and accurate understanding of how demographics predict intellectual outcomes.

RT

Measuring gene-environment interaction in cognitive aging S

<u>Ms. Alice J. Kim¹, Mr. Evan J. Giangrande², Dr. Christopher R. Beam¹</u>

¹University of Southern California, Los Angeles, CA, USA ²University of Virginia, Charlottesville, VA, USA

Although genetic influences appear to account for the majority of variance in cognitive aging outcomes, the processes that maintain significant heritability in older adulthood remain unclear. Gene-environment interaction ($G \times E$) is a statistic that often quantifies differences in developmental outcomes wherein phenotypic variation due to genetic influences depends on environmental exposure or, conversely, phenotypic variation due to environmental influences depends on genotype. $G \times E$ models in twin/family studies of childhood through young adulthood have pointed to specific environmental exposures that moderate the heritability of cognitive ability (e.g., Tucker-Drob & Bates, 2016), but few such studies exist when examining cognition in middle and older adulthood. Moreover, the classical twin model assumes independent genetic and environmental variance components despite the reality that genes and environments interact (Jinks & Fulker, 1970).

Using an approach proposed by Molenaar & Dolan (2014) to test $G \times E$ within the classical univariate ACE model, we analyzed six waves of data collected every two years between 1995–2005 in the Longitudinal Study of Aging Danish Twins from 4,457 same-sex twins out of a population sample of 4,731 (\geq 70 years; 58.9% women; MZ = 1,576; DZ = 2,881). We used moderated nonlinear factor analysis on each wave's cognitive assessments to create general cognitive ability scores invariant across age, sex, and wave. We then modelled unmeasured A×E and A×C interactions in a univariate Bayesian ACE model using RStan.

In univariate models assuming independence among ACE components, h^2 ranged from 7–62%, c^2 ranged from 11–35%, and e^2 ranged from 27–58%. In the G×E models, h^2 ranged from 31–57%, c^2 ranged from 4–17%, and e^2 ranged from 34–58%. Overall, by modeling interdependence among ACE components, we observed increases in variance attributed to additive genetic and nonshared environmental variance components. In contrast, we observed decreases in the purported influence of shared environment in cognitive aging.

Everything is smaller in Texas: A large-scale failure to replicate the Scarr-Rowe Effect (S)

Mr. Jordan Lasker

RT

Texas Tech University, Lubbock, Texas, USA

The Scarr-Rowe hypothesis holds that environmental favorability underpins the extent to which genes influence variance in cognitive ability. Unfortunately, most studies of this phenomenon have been limited by modest sample sizes or indirect identification of the Scarr-Rowe effect.

This study addresses these gaps by extending the Scarr-Rowe hypothesis literature through the use of the State of Texas Assessments of Academic Readiness (STAAR) results for every year that data has been collected: 2011–2019 and 2021. Longitudinal data was available for nearly every grade 3–11 public school student in the state of Texas, as well as links for monozygotic and inferred dizygotic twins, full, half, and adoptive siblings, cousins, and foster children. With nearly 35 million person-year observations of parental education, child-reported income, divorce, marriage, immigration and imprisonment status, alongside student full subtest-level data, disability status, age-for-grade, and more, this study was larger and more detailed than the rest of the literature on the Scarr-Rowe effect combined.

The heritability of the *g* factor of STAAR tests followed the typical age trajectory both longitudinally and cross-sectionally, increasing from 0.45/0.42 at ages 8–9 to 0.84/0.89 at ages 16–17. Significant Scarr-Rowe effects were observed at all ages for various moderators, but interaction signs varied and magnitudes were universally minuscule. Across specifications, the Scarr-Rowe effect was rarely observed among adopted or fostered children. Additionally, there was no evidence that the Scarr-Rowe effect applied to twin-specific or dominance genetic variance.

Results diverged at the observed score level where, for children who were neither adopted nor in foster care, the Scarr-Rowe effect was typically evident and largely directionally-consistent. The Scarr-Rowe effect applies to sources of variance other than *g*, induces psychometric bias, and, importantly, is tied to Spearman's Law of Diminishing Returns.

Intelligence and reaction time in the two-digit number-comparison task

Prof. James J. Lee, Dr. Emily A. Willoughby



University of Minnesota Twin Cities, Minneapolis, MN, USA

General intelligence (g) is associated with faster times in simple laboratory tasks, and it is a priority to characterize the precise stage between stimulus onset and terminal response where the speedup occurs. For this purpose we administered a two-digit version of the symbolic number-comparison task in an extreme-groups design (126 higher-g and 88 lower-g participants). Applying the diffusion-model partition of reaction time, we found that g is associated with the accumulation rate of the stochastic decision-making stage but not the low-variability residual time. We replicated the well-known distance effect—an increase in speed and accuracy as the stimulus becomes numerically farther from the memorized standard—as well as the mediation of the effect in this version of the task by independent influences of the decade and unit. We found that a Stroop-like conflict between decade and unit leads to both a decrease in the accumulation rate and increase in the residual time. By the logic of additive factors, g should show no statistical interaction with the effect of decade-unit incompatibility on the residual time, and the data were consistent with this prediction. Our results confirm that the number-comparison task requires multiple separable processing stages with rather different computational properties, and the one stage selectively influenced by numerical magnitude per se is associated with g.

Genetic timeline of human brain and cognitive traits (S)

Mr. Ilan Libedinsky¹, Dr. Yongbin Wei², Dr. Christiaan de Leeuw¹, Prof. James K Rilling³, Prof. Danielle Posthuma¹, Prof. Martijn van den Heuvel¹

¹Vrije Universiteit, Amsterdam, North Holland, Netherlands ²Beijing University of Posts and Telecommunications, Beijing, China ³Emory University, Atlanta, USA

Humans have undergone several anatomical adaptations throughout evolution. Paleontological records are a prime method to study these adaptations, but they can unfortunately provide a limited view of how modifications of 'soft traits' such as brain and cognition have contributed to the emergence of *Homo sapiens*. An additional approach includes the examination of when genetic variations associated with human phenotypes emerged in our history. Combining data from genome-wide association studies with dating data on the human genome, we systematically analysed the temporal emergence of single-nucleotide polymorphisms (SNPs) associated with modern-day human phenotypes over the last five million years. The genetic timeline of human-characteristic phenotypes follows a distinct pattern with two bursts of genetic variation that co-emerge with milestones in the human lineage. Our findings suggest that SNPs associated with neocortical, neuropsychiatric, and ophthalmological traits appeared recently in hominin evolution, with genes containing recently emerged SNPs linked to intelligence and neocortical area.

The association between intelligence and handedness, through the lens of sex and sex differences in personality

Prof. Guy Madison



Umeå University, Umeå, Sweden

The association between handedness and intelligence is often attributed to brain lateralization of language. Left-handedness implies better hand control in the right hemisphere, which in turn implies left hemisphere dominance of verbal function. There is a sex difference in verbal-spatial ability tilt, and we therefore analyse sex differences in the relation between handedness and intelligence. More than eight thousand adults self-reported writing with the right, with the left, or sometimes with the left and sometimes with the right hand (ambidextrous) and completed the Wiener Matrizen Test (WMT). Right-handed participants exhibited higher WMT scores than the other two groups, but this difference was much larger for males: The effect of handedness was \sim 2.5 times stronger than for females. In order to control for many possible confounding variables associated with sex, we applied a masculinity-femininity score, based on self-rated personality traits (BFI-44). For both sexes, non-right-handers exhibited a trend of higher masculinity, in particular for the ambidextrous. More specifically, there was a significant correlation between masculinity-femininity and WMT for males (r = .13, p < .00001), but no correlation for females.

Creating tomorrow's stars today: Re-examining the STEM intervention strategy through Dinaledi schools in South Africa

Prof. Michael K. Mhlolo



Central University of Technology, Bloemfontein, Free State, South Africa

The Dinaledi Schools Project (DSP) has its genesis in the White Paper 1 on education transformation, which was publicised during the infancy of South African democracy in 1995. The paper described the pernicious legacy of apartheid on STEM in paragraphs 49 and 50 as follows:

There is a dearth of Black students with STEM qualifying for normal entry to higher education, fewer still continuing in STEM-based programmes, and a trickle entering STEM professional and technological fields in the economy. If this cycle is wasteful from an educational point of view, it is catastrophic from the perspective of national developmental needs.

Responding to the pernicious legacy, in 2001 cabinet adopted the national STEM strategy and the most significant initiative to emerge out of that strategy was the DSP. Although the initiative has achieved several important gains, there are fears that it might not have achieved the level of positive impact that was intended. This study aimed at an in-depth understanding of how and why certain outcomes were not achieved. A Capability Approach theory was used to analyse the conversion factors that were prioritised and those that were ignored in the implementation of the DSP. There is significant consensus in research that personal characteristics (such as giftedness, motivation, passion, resilience, attitudes) have more influence on how a person can convert the means/resources into a functioning or achievement. This suggests that gifted students should have been identified before resources were provided.

However, results show that the DSP prioritised the provision of external resources without considering the potential of the students. This could explain why the programme failed to make significant impact at the national level. The study recommends that the DSP is still a noble initiative that should just focus on gifted students instead of average students.

Behavioural genetics, free will, and the fear of (genetic) determinism

Mr. Damien Morris



King's College London, London, United Kingdom

This paper argues that misplaced philosophical anxieties about the nature of free will risk retarding scientific progress by prejudicing researchers against genetic explanations for individual differences in human behaviour. This risk is particularly high for socially valued traits like cognitive ability, educational attainment, or criminal behaviour. We present a detailed critique of Eric Turkheimer's writings on free will, heritability, and genetic causation to illustrate this dynamic.

Turkheimer's theory that free will can be measured by the behavioural variation left unexplained by science leads him to openly root against progress in behavioural genetics under the banner of what he calls "the gloomy prospect." While Turkheimer seeks to carve out a space for human agency that is unravaged by the advances of behavioural science, we will argue that, in fact, his theory radically curtails the scope of human freedom. This implication is teased out in Kathryn Paige Harden's recapitulation of his theory in ?The Genetic Lottery' where she all but rejects the concepts of personal responsibility, merit, and desert.

We argue that Turkheimer's theory of human agency is untenable, as it implies that our knowledge of the causes of human behaviour encroaches on human freedom, rather than the causes themselves. Additionally, we argue that his interpretation of heritability is inconsistent and trivialises the role of genetic differences in explaining individual differences. Drawing heavily on the work of Daniel Dennett, we conclude by showing how a "compatibilist" account of free will can rescue our intuitive conceptions of personal responsibility, merit, and desert and remove the perceived threats to human agency posed by both genetic and environmental predictors of human behaviour.

A new look at giftedness: Examining socioemotional skills in Brazilian adolescents

<u>Dr. Tatiana de Cássia Nakano¹</u>, Dr. Ricardo Primi², Dr. Oliver John³

LT

¹Pontifical Catholic University of Campinas, Campinas, São Paulo, Brazil
²Universidade São Francisco, Campinas, São Paulo, Brazil
³University of California, Berkeley, Berkeley, California, USA

Socioemotional skills are increasingly recognized as important for social, academic, and professional success in the 21st century. However, a lack of consensus exists on whether gifted students exhibit higher or lower levels of socioemotional skills compared to their nongifted peers. To address this issue, we examined differences in the socioemotional skills of gifted and nongifted students in Brazil, while also considering the effects of sex and grade level. We began by selecting a random sample of 110,354 Brazilian students from the state of São Paulo, and identified gifted students who achieved a percentile of 95 on a standardized achievement measure used to assess Portuguese and mathematics in São Paulo school system. We then selected a control group as a random sample matched with grade and gender to the gifted group. A total of 9,121 gifted students (50.8% female) and a control group of nongifted students completed a self-report inventory of Social-emotional skills called SENNA based on social and emotional big five framework, which assessed five broad domains: self-management, engaging with others, amity, negative emotion regulation, and open-mindedness, further grouped into 18 facet scales. We conducted several factorial ANOVAs comparing SEMS skills by group (gifted, nongifted), grade level (5th, 10th, and 12th), and gender. The results indicated that the gifted group displayed higher means on all five broad domains of socioemotional skills, and both groups showed a decline in skills during the 9th grade before recovering in later grades. Furthermore, socioemotional skills were significantly influenced by sex and grade level. Overall, our findings suggest that gifted students do not experience increased social and emotional difficulties compared to nongifted peers and may even possess socioemotional skills that serve as a protective resource for dealing with challenges and finding opportunities for growth.

Amplifying the signal: A mixed methods exploration of precocious individuals' thoughts on educational practices (5)

Gabriella D. Noreen, Prof. David Lubinski, Prof. Camilla P. Benbow



Vanderbilt University, Nashville, TN, USA

Despite decades of well-replicated and large-scale findings on meeting the learning needs of intellectually precocious youth, a mismatch between research and policy continues, such that "...the U.S. educational system too frequently fails to identify and develop our most talented and motivated students who will become the next generation of innovators" (National Science Board, 2010, p. 5). Best practices suggest that it is educationally and psychologically efficacious to afford precocious and highly motivated students curricula tailored to the specific rate at which they best assimilate abstract/conceptual material. Doing so not only enhances their educational accomplishments and psychological wellbeing but has the potential to nurture future innovators to address some of society's most urgent problems (e.g., climate change, cybersecurity, & managing pandemics). In response to these educational and societal needs, the current study takes a mixed methods approach to add a personal touch to the conversation surrounding appropriate developmental placement—namely, the practice of aligning educational curriculum with student readiness (Benbow & Stanley, 1996; Stanley, 2000). In Study 1, the open-ended responses of two cohorts of high-potential participants, identified and psychologically profiled at age 12 and tracked to age 50 (N = 1,395), are analyzed regarding their views on educational practices. In Study 2, Simonton's (1999, 2014) methodological considerations regarding "significant samples" for studying eminence are leveraged for conducting generalization probes. Study 2 analyzes the open-ended responses of profoundly gifted participants (N =312, identified at age 12 and tracked to age 50) and an age-matched cohort of elite STEM doctoral students (N = 475, identified at age 25 and tracked to age 50). By aggregating their own words (expressed in different ways), themes emerge that reveal participants largely endorse diverse forms of appropriate developmental placement to meet the learning needs of the populations from which they were sampled.

Predicting cross-national sex differences in educational achievement by socioeconomic macro indicators (S)

<u>Ms. Sandra Oberleiter</u>, Mr. Jonathan Fries, Ms. Laura Sophia Schock, Mr. Benedikt Steininger, Dr. Jakob Pietschnig

University of Vienna, Vienna, Austria

Over the past decade, sex differences in educational achievement have been a subject of debate and controversy. Some have suggested that these differences may be linked to varying national prosperity and social (in-)equality, but there is no conclusive empirical literature to support this claim. Here, we present evidence for an association of socio-economic macro indicators and sex differences in international large-scale assessments of reading literacy, mathematics, and science on almost four million students in 90 countries across 16 cohorts.

Our analyses of data from PIRLS and TIMSS showed consistent advantages of girls in reading literacy (d range: -0.02 to 0.66). However, the results for mathematics and science were less straightforward, yielding non-trivial effects in both directions (d ranges: -0.44 to 0.36 and -0.50 to 0.46, respectively). Our results indicate that sex differences are linked to country-level socioeconomic factors. In all three domains, sex differences were more pronounced in more egalitarian countries (β range 0.16 to 0.20). Higher national prosperity and educational investment predicted larger sex differences favoring fourth grade boys in mathematics and science (β range: 0.07 to 0.39), although these association were smaller in higher grades (β range for eighth graders: 0.17 to 0.21).

In all, our findings suggest that the effects of socioeconomic macro-indicators are differentiated according to the investigated achievement domain, with mathematics and science achievement in favor of boys relative to girls being driven by national prosperity and equality indicators.

Letter-string analogies: Comparing analogical transfer in humans and machines S

Ms. Alexandra N Pafford, Dr. Claire E Stevenson



University of Amsterdam, Amsterdam, Noord-Holland, Netherlands

Analogical reasoning is a cornerstone of human cognition. It involves the ability to transfer information from a known context to a new one through relational similarity, such as learning about consciousness from an iceberg through their similar below the surface depth and complexity. In humans, the ability to solve analogies such as "body : feet :: table :?" emerges between 4 to 6 years of age, and appears to transfer easily to other domains, like visual analogy solving such as "< : > :: [: ?". Very recently, it seems that analogical reasoning ability is emerging in large language models (LLMs), such as ChatGPT. However, can LLMs transfer analogical reasoning to new domains in a similar fashion to humans? To investigate this, we had children, adults, and AI models solve a series of letter-string analogy problems (e.g., a b c : a b d :: p q r : ?) in the Latin alphabet, in a near transfer domain (other alphabet system), and a far transfer domain (other symbol list). While we expect LLMs to perform well within familiar alphabetical domains, we do not expect them to generalize to untrained domains. We expect this to be a key difference between human and AI performance. Should we find evidence of humanlike analogical reasoning in AI, this may give us reason to believe that emergent abstract reasoning is present in these systems, which holds strong scientific, societal, and philosophical implications.

Is there a Flynn effect for achievement g? Evidence from large-scale populationrepresentative student assessments in Italy

Dr. Jakob Pietschnig, Ms. Sandra Oberleiter, Dr. Enrico Toffalini, Prof. David Giofre RT

University of Vienna, Vienna, Austria

Introduction: Generational IQ test score gains of the general population (the Flynn effect) have been shown to be negatively related to psychometric *g*. It has been speculated that this observation can be attributed to increasing environmental reinforcement for expertise in specific cognitive areas over the past decades. In fact, recent observations of an increasing volatility of cross-temporal IQ (sub-)domain trajectories may be interpreted as consequences of a weakening of the positive manifold of intelligence. Because school achievement is strongly associated with cognitive ability, examining cross-temporal interdomain associations of formal scholastic achievement tests are useful to investigate *g*-related changes.

Methods: Here, we examine scholastic student achievement data across 13 years (2010 to 2022) from students of four school grades (i.e., 2nd, 5th, 8th, and 10th) based on formal student assessment examinations in Italy (the INVALSI program). Cross-temporal associations of consistency estimates (R^2 and McDonald's Omega) with formal assessment years may be plausibly interpreted as changes in the positive manifold of intelligence.

Results: Based on N = 1,900,000+ observations across grades and years, we show that the INVALSI-based factor structure remained consistent over time (median RMSEAs, SRMRs, CFIs, and NNFIs = 0.041, 0.010, 0.996, and 0.991, respectively). Both R^2 - and Omegabased analyses did not yield evidence for cross-temporal changes of the positive manifold strength. However, this finding was differentiated according to participant age, yielding a significant interaction between grade and year with younger participants showing cross-temporal *g*-decreases whilst older ones did not.

Discussion: Here, we show that there is no consistent evidence for meaningful time trends in scholastic achievement g of population-representative Italian student samples from 2010 to 2022. Significant administration grade by year interactions may be interpreted as tentative evidence for age-dependent achievement-g differentiation. These findings may be interpreted in terms of cross-temporal changes in g-related ability trajectories.
Building big teams to put theories of the positive manifold to strict tests

Dr. John Protzko



Central Connecticut State University, New Britain, CT, USA

Big Team Science can be used to put theories to strict experimental tests. Intelligence research is one of the oldest fields of research, and building off the positive manifold, has spawned numerous theories. The current study brings otgether teams of researchers from around the world, and through an adversarial collaboration, put one theory to a strict empirical test.

In the current study, we test whether acute cardiovascular exercise improves inhibitory control and, if so, whether improved inhibitory control is associated with cognitive ability differentiation. This pattern of results, differentiation arising from improvements to inhibitory control, is uniquely predicted by Process Overlap Theory, is a necessary consequence of the theory, and not predicted by any other major theory of the positive manifold.

We present the rationale for the study, outline the process of adversarial collaboration for strict theory testing, and explain the logic of putting POT to strict empirical testing. The empirical strategy is to have participants from numerous sites engage in an acute cardiovascular exercise program, testing their executive functioning before and after.

Then, we will administer non-EF tests of visual processing, fluid reasoning, and other skills to the participants. If we successfully replicate the effect of acute cardiovascular exercise on inhibitory control, or indeed on all EFs, we then engage in the strict theory testing of the positive correlation between cognitive constructs.

This talks lays out the basic framework, seeking to expand the process of adversarial collaboration, collaborative theory testing, and offer the possibility for interested labs to join data collection.

The Flynn Effect at the item level: Secular changes in PIAT-Math item patterns in the NLSY-Children data, 1986–2004

Dr. Joseph Lee Rodgers¹, Dr. Linda Wänström², Dr. Siewching Ang³

RT

¹Vanderbilt University, Nashville, TN, USA
²Linköping University, Linköping, Sweden
³Western Governors University, Online, USA

In past research, a positive Flynn effect has been identified in the PIAT-Math subscale in the National Longitudinal Survey of Youth children data (Rodgers & Wanstrom, 2007; Ang, Rodgers, and Wanstrom, 2010; O'Keefe & Rodgers, 2017). Thus, the NLSYC can be used as a "natural laboratory" to study the Flynn effect. The current study identifies Flynn effect patterns in the 84 PIAT-Math items.

By comparing PIAT-Math slopes across 1986, 1988, ... 2004 (10 surveys, 18 years), we show that for some items, likelihood of answering correctly was flat; for some items it increased; and for some it decreased. Increasing items dominated, resulting in earlier studies showing a positive Flynn effect. Our current study has two parts.

First, we measure item increases/decreases as slopes across time. We also describe the nature of items in relation to patterns. For example, a strong Flynn effect increase was shown for Item 42, where different children had various numbers and types of coins, respondents determining who had the most money. Item 56, with flat or negative slopes across years for older ages, tested whether respondents knew the definition of "radius."

Second, we used expert ratings of PIAT-Math items on eight quantitative domains defined by Webb's (1997) Depth of Knowledge taxonomy—matching, recall/memorization, computation, visual-spatial, reasoning, geometry, algebra, and counting. Raters were eight faculty members from quantitative psychology/mathematics education. Items were rated as having the characteristic or not (e.g., item 42 was rated as "computation" by 8/8; Item 56 was rated as "reasoning" by 0/8, as "geometric" by 6/8). We correlated item slopes with Expert Ratings to identify underlying Flynn effect domains. The strongest positive correlation was between "Reasoning" and the slopes. "Geometry" had a negative correlation with the slopes.

A number of Flynn effect interpretations emerge from these analyses.

Talent search 2.0: The landscape and coming future of new talent initiatives S

Mr. Jannik Schilling¹, Prof. Jonathan Wai²



¹Entrepreneur First, London, United Kingdom ²University of Arkansas, Arkansas, USA

Organizations rely on a handful of exceptionally talented individuals to create a disproportionate share of output and economic value (Lubinski & Benbow, 2006). We argue that school systems and universities have not kept up with workforce talent demands. Consequently, employers cannot rely on education systems for creating the talent they need. A wide variety of new talent searches have risen, funded by companies, foundations, and philanthropists (e.g., Schmidt Futures, Entrepreneur First, or Open Philanthropy). All of these programs are unique experiments in identification, selection, and development of talent and longitudinal follow-up studies could be available in a few years. This provides a unique opportunity to expand the research agenda around talent, investigating the relative importance of Intelligence and other capacities for various domains of success, different treatment effects of educational programming, and the future of talent allocation and development. As these initiatives are deliberately seeking talent from developing countries from impoverished backgrounds, these initiatives can provide unique information on how to help talented youth globally.

We argue that these programs will not only help understand talent, but will also increase diversity and inclusion of underprivileged and underrepresented talent around the world. Better talent sorting mechanisms may also increase a wider variety of innovations. In this presentation we chart what we call "Talent search 2.0," or the landscape and coming future of a rapidly expanding universe of new talent initiatives. Understanding this landscape, finding ways to bring these unique initiatives together for research purposes, and studying intellectual talent in these new settings can also improve our understanding of the consequences of human intelligence in society, and may even lead to an improved understanding of intelligence itself.

Impact of psychological well-being on job performance: An empirical study

Dr. Minal Uprety 1 , Dr. Pratibha Barik 2



¹Kirloskar Institute of Management, Pune, Maharashtra, India
²Shri Shankaracharya Professional University, Bhilai, Chhattisgarh, India

Purpose: To examine the impact of employee' psychological well-being on job performance.

Design/methodology/approach: The data were gathered from the employees of various education institutes of higher education of India. 183 responses were received using a structured questionnaire which was developed based on previous literature. For measuring psychological well-being, four constructs were used namely; life satisfaction, interpersonal relationship, self-affirmation and physical and mental health and employee performance were also measured with four constructs; efficiency of work, Planning, creativity and innovation and efforts making. Correlation and regression analysis were used to analyze the collected data to evaluate the relationship between Psychological Well-Being and employee performance. For the analysis, IBM SPSS software was used.

Findings: It was examined that there were a strong and positive relationship between employee well-being on job performance. Self-affirmation has shown highest impact on job performance followed by life satisfaction, interpersonal relation and physical and mental health. But it was also observed that employees' strong physical and mental health reflect in strong creativity and innovation on their job performance.

Practical implications: The study results suggest that fostering employee psychological well-being may be advantageous for the organization's productivity. Universities can form their policies by considering the studied constructs to improve the job performance of employees. So that employees can also provide a good quality work and contribute more towards organization's goal.

Modeling effects of genes, environments, and their interaction on intelligence and other phenotypes

Prof. Keith F Widaman



University of California, Riverside, CA, USA

Statistical modeling of effects of genes, environments, and their interaction on intelligence and other phenotypes has undergone profound changes over the half century. Early studies (before 1970) concentrated on correlations between persons with different genetic makeup and environmental experiences (e.g., monozygotic twins reared together or reared apart, dizygotic twins reared together or reared apart) to yield heritabilities for various phenotypes, including intelligence.

Over two decades ago, with advent of methods to identify single nucleotide polymorphisms (SNPs) in the human genome, target gene studies appeared. In these studies, researchers typically concentrated on a single SNP to determine its main effects and interactive effects with the environment on important outcomes. These studies gave rise to competing theoretical accounts—diathesis-stress theory and differential susceptibility theory.

Due to failure to find replicable $G \times E$ effects across studies using single SNPs, during the past decade genome wide association studies (GWASs) have supplanted target gene studies. In a GWAS study, up to 1 million SNPs are differentially weighted (with weights based on prior research) and summed to derive a single GWAS predictor score of an outcome in a new sample.

Strengths and weaknesses of alternative modeling approaches will be presented, and two empirical examples will illustrate how modeling decisions can uncover or mask important $G \times E$ effects. One of these examples comes from the Maternal PKU Collaborative Study, a study of offspring born to mothers with PKU. This example demonstrates how the genome of one person (mother) interacts with her environment (diet) to have large effects on a different person (offspring). The second example derives from a longitudinal study of interaction style, with $G \times E$ effects uncovered only with confirmatory comparisons among alternative theoretical accounts. Both studies support the importance of both genes and interactive environmental effects on phenotypes, uncovering potential fatal flaws in GWAS approaches.

Testing for selective adoption placement with polygenic scores in the Minnesota Center for Twin and Family Research

Dr. Emily A Willoughby, Mr. Alexandros Giannelis, Mr. Tobias Edwards, Prof. Matt McGue,

Prof. James J. Lee

RT

University of Minnesota Twin Cities, Minneapolis, MN, USA

While adoption studies are powerful tools for investigating genetic and non-genetic influences, their utility relies on several important assumptions. One common critique is that parameter estimates derived from adoptive samples cannot be unbiased if offspring were selectively placed in their adoptive families based on some perceived similarity to the adopting parents. Although previous research has shown that moderate placement effects do not strongly influence parent-offspring correlations (Bouchard and McGue 1990), the presence of selective placement in adoption studies could nevertheless pose a threat to the validity of biometrical estimates derived from these samples. This is especially a concern regarding cognitive phenotypes such as IQ and educational attainment, which are thought to be likely substrates on which placement bias may operate.

We tested for the presence of selective placement with polygenic scores for 36 phenotypes in Minnesota's Sibling Interaction and Behavior Study, which includes 409 adoptive and 208 non-adoptive families consisting of two siblings and their rearing parents. Selective placement was assessed by comparing the correlations between midparent (mean of mother and father) and offspring polygenic scores to their theoretically predicted values, which—in the absence of placement effects—should not differ significantly from zero in adoptive families. We found no evidence of selective placement for 34 of 36 scores in adoptive families (mean r = -.03; mean p-value = .48), including educational attainment and IQ. In sum, this project represents the first empirical assessment of adoption placement effects across a wide range of polygenic scores, with encouraging implications for the validity of adoption studies writ large.

250 words written at age eleven predict intelligence and final educational attainment close to expert assessment **S**

Mr. Tobias Wolfram¹, Prof. Felix C Tropf²



¹Bielefeld University, Bielefeld, Germany ²CREST/ENSAE, Paris, France

In this presentation, we demonstrate the potential of predicting intelligence using textual data by integrating approaches from computational linguistics, natural language processing, and deep learning. Our predictive model, which, among other metrics, employs GPT-based word embeddings, significantly outperforms traditional metrics of textual complexity.

We focus on a sample from the 1958 birth cohort study, showing how textual data can be harnessed to predict intelligence and other non-cognitive traits. We find that using just 250 words written at age 11 can predict intelligence almost as accurately as teacher assessments and far more effectively than genetic data. This strong association with intelligence also allows us to predict final educational attainment from the text samples with high accuracy. In addition, our model is capable of predicting non-cognitive traits and personality, albeit with varying degrees of accuracy, sometimes up to decades later in life.

By combining teacher assessments, genomic data, and text samples, we develop a comprehensive prediction model of intelligence that approaches test-retest reliability. Our findings emphasize the potential of textual data and deep learning as a resource for intelligence research.

General Cognitive Ability is the major source of ability covariance across mammals, birds, and fish: Traditional and phylogenetic meta-analyses of 82 studies on 36 taxa

Dr. Michael A. Woodley of Menie¹, Dr. Mateo Peñaherrera-Aguirre²

RT

¹Independent researcher, London, United Kingdom ²University of Arizona, Tucson, Arizona, USA

The historical focus of comparative psychology has been on narrow cognitive abilities, such as expressions of social cognition or physical-technical cognition. Despite this, an increasing body of comparative research based on individual differences models has identified the presence of General Cognitive Ability (GCA) emerging from correlation matrices among apparently distinct cognitive and behavioral cognitive phenotypes in diverse taxa. Here traditional and phylogenetic meta-analysis is used to determine the overall proportion of variance explained by the first latent dimension (i.e., Component or Factor, used as a direct measure of GCA) across a set of 81 studies (n = 3,993 individuals) corresponding to 35 (non-human) animal species. Across studies, it was found that GCA explained 42% of the variance after controlling for sample size. Moderation analysis found no effect of task number or factor estimation technique however study year (spanning 1920 to 2023) was a significant negative predictor of GCA variance. A phylogenetic meta-analysis was conducted at the species level which included GCA variance from humans sourced from a large meta-analytic database. The proportion of GCA variance was significantly larger in domesticated species than in wild taxa, suggesting that more strongly integrated abilities might be a key phenotypic locus for artificial selection, perhaps as a means of adapting domesticates to the demands of the human cognitive niche. A macroevolutionary model comparison evaluating the fit of various selection regimes indicated that GCA variance evolved under a model of Brownian motion, wherein the likelihood of phenotypic change is a function of branch length in the phylogenetic tree. The model also estimated a large phylogenetic signal for the proportion of GCA variance (after controlling for sample size and the number of studies per species [research effort]; Pagel's λ = .86), suggesting that the observed phenotypic differences in GCA variance are attributable to common ancestry.

Symposia

Symposium abstracts are listed in alphabetical order by panel chair's last name. Panel chair's name is <u>underlined</u>.

Can neuroscience/genetics research boost the Flynn Effect?

<u>Richard Haier¹</u>, Erhan Genç², Johanna Popp³, James J. Lee⁴, Joe Rodgers⁵

SY

¹University of California, Irvine ²Leibniz Research Centre for Working Environment and Human Factors ³University of Würzburg ⁴University of Minnesota ⁵Vanderbilt University

A recent Special Issue of Intelligence was devoted to the latest data on the Flynn Effect (edited by Joe Rodgers). Whatever the social/cultural/environmental factors partially responsible for the generational increase in IQ scores may be, they must work through biological mechanisms in the brain. What might research on the biological basis of intelligence reveal about these mechanisms? For the first third of the session, each member of the panel will briefly speak about how their research might address this question (5 minutes each) and the second two thirds will be open discussion with the audience. [This discussion follows up on the limited time allotted for discussion after Richard Haier's 2021 ISIR Life Time Achievement Award address which highlighted questions about boosting intelligence.]

Participants include Erhan Genç with a perspective from neurons, Johanna Popp with a perspective from brain network connectivity neuroimaging, James Lee with a perspective from DNA polygenic scores and molecular biology, and Joe Rodgers with a perspective from psychometrics.

The influence of intelligence research on test development and the interpretation of test scores

<u>Kristóf Kovács</u>¹, Andrew Conway², Scott Decker³, Dawn Flanagan⁴, Kevin McGrew⁵, Joel Schneider⁶

¹Eötvös Loránd University, Budapest
²New Mexico State University, NM
³University of South Carolina, SC
⁴St. John's University, NY
⁵Institute for Applied Psychometrics
⁶Temple University, PA

The gap between research on intelligence and the practice of measurement of cognitive abilities in clinical and educational settings was substantial for most of the last century. For a long time after Binet invented the modern intelligence test the primary interest of IQ-testers was measurement precision and predicting important outcomes, with little emphasis on scientific explanations of individual differences. Only recently did attention shift to providing a substantive scaffolding for cognitive assessment in general and for test score interpretation in particular.

Participants of this symposium will present the state of the art on theory-driven cognitive assessment from different perspectives. Andrew Conway will discuss what relevance process overlap theory, a recent theory of the positive manifold in intelligence, has for interpreting test scores. Scott Decker will analyze current practices in the measurement of intelligence from the perspective of cognitive neuroscience. Dawn Flanagan will discuss test score interpretation from a Cattell-Horn-Carroll (CHC) perspective, focusing on cross-battery assessment and neurocognitive connectivity research. Kevin McGrew will examine the main issue in which the eponyms of CHC theory disagreed about: whether the general factor of intelligence actually represents a general cognitive ability or is a mere statistical construct. Finally, Joel Schneider will explore the relationship between factors and abilities and the implications of this relationship for bridging the gap between theory and practice.

Modern investigations into the predictive power and fairness of cognitive measures

Nathan Kuncel, Isaac (Ike) Bazian, Saron Demeke, Reed Priest, Samuel Lee



University of Minnesota Twin Cities

In this research showcase, we will present a series of four papers that test old assumptions and new questions in the study of cognitive abilities. The first is a meta-analysis of the criterion related validity of cognitive abilities for predicting job performance focusing exclusively on modern samples from both the research literature and industry samples. Results indicate that cognitive ability remains a valid predictor but with a meaningful decline in overall predictive power. The second paper examines predictive bias by race and social class but considers the influence of omitted variables. We find that including variables such as high school SES meaningfully reduces the degree of overprediction for minority and low SES students. Our third paper, considers the indifference of the indicator and tests the conventional wisdom that administering a composite of g-loaded tests provides a robust estimate of g. However, in large datasets, gender and race/ethnicity score differences can vary substantially depending on the tests used to create the composite. Finally, our final paper examines stereotype lift effects where, lift is the elevation of a group's test performance due to not being part of a negative stereotype. We meta-analyzed the stereotype lift literature, finding it has a small influence on cognitive test performance (d = 0.09, SDres = 0.19) and that subgroup cognitive test performance differences are not solely due to stereotypes lifting and threatening performance.

Prospects of gifted education and challenges in the current political climate

Avery Wang¹, Jim Milgram², Mike Mhlolo³, Harrison Kell⁴, Frank Worrell⁵



¹Apple Research Scientist

- 2
- ³ Central University of Technology
- ⁴ Educational Testing Service
- ⁵ University of California Berkeley

Historical, global, multidisciplinary, current, and future perspectives on giftedness and talent

Jonathan Wai¹, Camilla P. Benbow², Michael K. Mhlolo³, Andy Parra-Martinez¹, Jannik Schilling⁴, Frank C. Worrell⁵

¹University of Arkansas
²Vanderbilt University
³Central University of Technology
⁴Entrepreneur First and Minerva Institute
⁵University of California, Berkeley

This panel explores historical, global, multidisciplinary, current, and future perspectives on giftedness and talent. Jonathan Wai introduces the panel, connects it to the prior panel on giftedness, and discusses the importance of a diversity of perspectives and evidence for gifted education and intelligence research to advance. Camilla Benbow takes us back in history, exploring the ongoing tensions of inequity in equity, providing an empirical update to what we know about helping talented students. Michael K. Mhlolo also takes a historical lens, bringing us to South Africa, and discusses the climate for gifted education there, especially in the context of a failed curriculum change in the mathematical sciences. Andy Parra-Martinez provides a multidisciplinary and global exploration of talent identification, arguing for the importance of bridge building across disciplines. Jannik Schilling explores the future of talent identification as now led by corporations and philanthropists, providing a roadmap for some possible new research directions. Frank C. Worrell discusses.

Posters

Poster abstracts are listed in alphabetical order by presenting author's last name. Presenting author's name is <u>underlined</u>.

An explanation for human differences across postindustrial time, geography and disciplines

Mr. Abel M Dean

PP

South Padre Island, TX, USA

Not just intelligence, but many human traits vary across both postindustrial time and geography. Other such traits include height, low-birthweight prevalence, body-mass index, child mortality, birth rate, income per capita, developmental speed, adult longevity, and age at menopause.

A notable pattern, suggesting a single overarching explanation, is that the directions of trends for all such traits across postindustrial time match the directions of geographic covariance from less-advantaged to more-advantaged countries.

Settling on neither superficial nor unfitting explanations such as "wealth" or "fast-slow," I explored the data of the United Nations, of the NCD Risk Factor Collaboration, and of Lynn & Vanhanen, and I found that a surprisingly-simple variable—mortality weighted by reproductive value (v-Loss) per age-structured life-history theory—acts as the cue along an offspring quantity-quality trade-off spectrum. Put simply, because a greater share of youth survive, our genomes strategize to reproduce fewer but individually-fitter children.

This explanation is reinforced, among cross-sectional subsets of country-level traits, by both a confirmatory factor analysis (CFA), showing a unitary loading of v-Loss ($\lambda = -0.983$) on the single QuantityQuality factor, and a structural equation model (SEM), each cross-validated and having near-perfect local and global fit statistics (CFA: RMSEA = 0.000, CFI = 1.000, SRMR = 0.005; SEM: RMSEA = 0.014, CFI = 1.000, SRMR = 0.018).

Included in the SEM is an indirect feedback loop from lesser v-Loss to greater intelligence to greater GDP per capita then returning to lesser v-Loss, which I suggest is the biological engine for industrial revolutions.

This novel unified theory of human variation, if broadly recognized, may constitute a framework for the social sciences, may underscore the necessity of intelligence research, and may furnish a further global incentive to protect the lives of our descendants, thereby decreasing their number but enhancing their intelligence, height, and longevity.

Searching for robust associations between general intelligence and graph measures of functional connectivity

Mrs. Dorothea Metzen¹, Mrs. Christina Stammen², <u>Dr. Christoph Fraenz²</u>, Mrs. Caroline Schlüter¹, Prof. Wendy Johnson³, Prof. Onur Güntürkün¹, Prof. Colin DeYoung⁴, Dr. Erhan Genç²

¹Ruhr University Bochum, Bochum, Germany
²Leibniz Research Centre for Working Environment and Human Factors (IfADo), Dortmund, Germany
³University of Edinburgh, Edinburgh, United Kingdom
⁴University of Minnesota, Minneapolis, Minnesota, USA

The relationship between general intelligence and the graph theoretical properties of the brain's intrinsic functional network has produced conflicting results in previous research. To address this issue, we conducted a multi-center analysis that utilized data from four independent data sets (with a total of more than 2000 participants). The aim of our study was to identify robust associations across samples between *g* factor scores and both global and node-specific graph measures.

On the global level, we found *g* to be significantly and positively associated with global clustering coefficient in almost all samples, and with global efficiency in one sample. With regard to small-world propensity, we did not observe any significant associations. On the node-specific level, elastic-net regressions for nodal efficiency and local clustering revealed no brain areas that consistently showed positive or negative effects across data sets. Graph measures exhibited moderate to good test-retest reliability. However, when we compared the regression outcomes between or within imaging sessions of the same sample, we found the overlap of results to be merely 36.8%.

In conclusion, our use of resting-state imaging and conventional graph measures did not lead to replicable results regarding the association between general intelligence and functional connectivity.

A century of behavioral genetics at the University of Minnesota (S)

Dr. Emily A. Willoughby, <u>Mr. Alexandros Giannelis</u>, Prof. William. G. Iacono, Prof. Matt McGue, Prof. Scott I. Vrieze PP

University of Minnesota, Minneapolis, MN, USA

The University of Minnesota has played an important role in the resurgence and eventual mainstreaming of human behavioral genetics in psychology and psychiatry. We describe this history in the context of three major movements in behavioral genetics: (1) radical eugenics in the early 20th century, (2) resurgence of human behavioral genetics in the 1960s, largely using twin and adoption designs to obtain more precise estimates of genetic and environmental influences on individual differences in behavior; and (3) use of measured genotypes to understand behavior. University of Minnesota scientists made significant contributions especially in (2) and (3) in the domains of cognitive ability, drug abuse and mental health, and endophenotypes. These contributions are illustrated through a historical perspective of major figures and events in behavioral genetics.

Determining the culture-fairness of Wiener Matrizen Test II among Nepalese and Austrian participants (5)

Ms. Aayushma KC

PP

Vienna University, Vienna, Austria

One of the biggest challenges with IQ measurement has been the idea of having reliable unbiased tests that fairly measure an individual's IQ regardless of their cultural background. The once accepted notion of non-verbal IQ tests being able to measure IQ without disadvantaging those with differing cultures has been challenged on multiple occasions. Hence this makes it essential for IQ tests to be as widely tested in as many different cultures as possible, such as the Wiener Matrizen Test II (WMT-2). A culturally distant country (as compared to the classic W.E.I.R.D. areas) that has had little participation in psychometric testing is Nepal. As such, the present study aims to compare data of the WMT-2 among Nepalese and Austrian participants and seek culture fair results. Around 100 participants from each country will be tested and the data will be analyzed using item response theory's Rasch model analysis. Results from both countries are expected to remain Rasch homogeneous and thus continue to provide support for the test to be used as a valid and reliable culture fair test in one additional country. Not only will this study add on to the growing literature of culture fair tests in IQ and the method of item response theory within psychometric research, but it will bring forth research from a little explored area, Nepal, and may pave a route for future and continuous investigations there.

Students with indicatives of academic giftedness and intellectual deficit: Comparative analysis in belonging, achievement, bullying, indiscipline and school violence

Dr. Tatiana de Cássia Nakano

PP

Pontifical Catholic University of Campinas, Campinas, São Paulo, Brazil

Within a global perspective of seeking equality and respect for diversity, the inclusion of people with special needs has gained significant ground. This study proposes to utilize students' results in a standardized Brazilian state test as a basis for a rapid screening of academic gifted and cognitive deficit students. A database containing the results of 100,181 Brazilian students from the 5th and 9th of elementary school and 3rd year of high school. The test consisting of multiple-choice questions related to the subjects of Portuguese and mathematics, along with other measures regarding school quality. The students' school grades in both subjects were added together to give them an overall grade. From this, the mean and standard deviation of the total sample were calculated. In accordance with the predominant criteria described in the literature, two groups were selected: students with +2SDs identified as gifted (n = 2,149; 2.3%) and students with -2SDs identified as cognitively deficit (n = 2,287; 2.2%). A Student's t test and an analysis of variance were used to compare the educational outcomes of the two groups. In terms of school attendance (F = 117.591; p < 0.001) and school performance (15754.823; p = 0.001), the gifted group displayed significantly higher means. The group with cognitive deficit indicators displayed the highest means of general violence (F = 477.606; p < 0.001), school violence (F = 141.616; p < 0.001), and home violence (F = 364.177; p < 0.001), bullying as perpetrators (F = 207.676; p < 0.001), bullying as victims (F = 441.351; p < 0.001), and indiscipline (F = 148.353; p < 0.001). The understanding of the differences between the different groups is crucial for guiding the development of preventive measures that minimize school dropouts and give students the opportunity to feel like they belong and engaged in the school.

Granting: Foundation for Research Support of São Paulo and Ayrton Senna Institute.

Intelligence and self-control as determinants of the examination grades among college students

Prof. Edward Nęcka

PP

SWPS University, Kraków, Poland

Intelligence and self-control are two dimensions of individual differences with firmly established relevance for variety of real-life outcomes. Income, healths, and academic achievements are determined by both intelligence and self-control. However, there is a long dispute concerning the relative importance of these factors. In order to address this question, we investigated 350 college students of the technical and agricultural departments. The participants filled in a battery of personality questionnaires, including the NEO-FFI and self-control scales. Additionally, they were asked to complete Raven's Advanced Matrices as a measure of general fluid intelligence. Dependent variables were examination grades from all academic subjects the students were supposed to take during one year of studying. We found that the psychological predictors were rather weak in comparison with demographic variables, such as age, gender, and the place of birth. Better grades were obtained by older students, women, and people living in cities and bigger towns. Younger students, men, and people descending form rural areas obtained relatively worse results. As to psychological factors, intelligence was more important as the predictor of success in STEM subjects, whereas self-control better predicted grades in the areas of social sciences and humanities. Limitations of this study are connected with the self-report character of personality measures.

Evolution of intelligence research: First decade of the Journal of Intelligence

Dr. Fabio Andres Parra-Martinez, Dr. Jonathan Wai

PP

University of Arkansas, Fayetteville, AR, USA

How has the field of intelligence evolved in the last decade?

Updating and expanding the work of Wicherts (2009) and Pesta and colleagues (2018), we performed parallel bibliometric analysis on the two premier journals in the field to identify performance metrics and research themes: Intelligence and the Journal of Intelligence (JOI) between 2013 and 2022. This analysis adds to prior bibliometric articles reporting the evolution of the journal Intelligence from 1977 up to 2018. It includes JOI from its inception, along with Intelligence to the present.

What are the current trends in intelligence research and publications?

Although the journal Intelligence's growth has declined over time, it remains a stronghold for traditional influential research (average publications per year = 71.2, average citations per article = 17.07, average citations per year = 2.68). JOI shows a steady growth pattern in the number of publications and citations (average publications per year = 33.2, average citations per article = 6.48, total average citations per year = 1.48) since its inception in 2013.

What are the research themes in this decade?

Common areas of study across both journals include cognitive ability, fluid intelligence, psychometrics-statistics, g-factor, and working memory. Intelligence includes core themes like the Flynn effect, individual differences, and geographic IQ variability. JOI addresses themes such as creativity, personality, and emotional intelligence.

What's next?

We discuss research trends, co-citation networks, thematic maps, and their implications for the future of the two journals. This work calls for a multiple-perspective discussion of the role of traditional and current research trends in intelligence research. Finally, we open a conversation on topics of relevance such as the role of impact and representation of researchers in the field whose work will continue shaping the evolution and future of intelligence.

Religiosity and science-related beliefs in highly intelligent individuals (S)

<u>Ms. Paulina Plinke¹, Mr. Tobias Wolfram², Mr. Florian Dürlinger³, Dr. Michael Schmidt-Salomon⁴, Prof. Tanja Gabriele Baudson⁵ PP</u>

¹Johann Wolfgang Goethe University, Frankfurt/Main, Germany
²University of Bielefeld, Bielefeld, Germany
³University of Vienna, Vienna, Austria
⁴Giordano Bruno Foundation, Oberwesel, Germany
⁵Vinzenz Pallotti University, Vallendar, Germany

The link between intelligence and religiosity has been examined for almost a century, with most studies showing a negative relationship. This was confirmed in a recent meta-analysis (Dürlinger & Pietschnig, 2022). Yet the upper extreme of the intelligence distribution has hardly been examined in this regard. Hence, the goal of the present exploratory study is to fill this gap.

Data will be gathered in the course of the presenting author's internship with Mensa in Germany among the society's ca. 16,000 members. Membership is limited to individuals scoring at the top 2% (IQ 130+) in a standardised IQ test. We will conduct the survey using the Centrality of Religiosity Scale (CRS; Huber & Huber, 2012), Swami et al.'s (2012) brief scale of science-related beliefs as well as a self-constructed scale for validation purposes. Educational status will be included as a control variable. In addition to previous studies, we will attempt to distinguish between different religions.

Structural-functional brain network coupling during task performance reveals intelligence-relevant communication mechanisms **s**

<u>Ms. Johanna L Popp¹, Mr. Jonas A Thiele², Dr. Joshua Faskowitz², Dr. Caio Seguin², Prof. Olaf Sporns², Prof. Kirsten Hilger¹ PP</u>

¹University of Würzburg, Würzburg, Bavaria, Germany ²Indiana University Bloomington, Bloomington, Indiana, USA

Individual differences in general intelligence have a biological basis within the structure and function of the human brain. Network neuroscience investigations revealed neural correlates in various properties of structural and functional brain networks. Specifically, it was demonstrated that the agreement between structural and functional connections during resting state, the intrinsic structural-functional brain network coupling (SC-FC coupling), is associated with individual differences in intelligence. However, whether the SC-FC coupling during active cognitive processing relates to general intelligence remains an open question.

In this preregistered study, we used open data from 764 adults of the Human Connectome Project, derived structural connectivity from diffusion weighted imaging, functional connectivity from fMRI assessed during resting state and seven tasks (eight conditions), and estimated general intelligence with a latent g-factor derived from 12 cognitive tests. One similarity measure and three communication measures were used to model functional interactions arising from structural brain networks. SC-FC coupling was estimated as degree to which these measures align with functional connectivity, providing insights into different neural communication strategies.

At the whole brain level, significant associations between intelligence and SC-FC coupling operationalized with different communication measures were observed during emotion processing, relational processing, and social cognition. Features created from region-specific SC-FC coupling allowed to significantly predict individual intelligence scores during all conditions (p < .05 by permutation test), while prediction performance was best during cognitively demanding tasks. All analyses will be replicated in a lockbox data sample.

In sum, our study reveals insights into the neural underpinnings of efficient information processing associated with general intelligence. Especially the implementation of optimal region-specific network communication strategies during the performance of cognitively demanding tasks serves promising new explanations about the neural basis of individual differences in general intelligence.

Rational development and validation of figural matrices for the assessment of very high reasoning ability (S)

Prof. Franzis Preckel, Mr. Julian Preuß

PP

Trier University, Trier, Rhineland-Palatinate, Germany

For the assessment of very high cognitive abilities, many assessments exhibit shortcomings such as ceiling effects, which prevent assessing individual differences in this ability range; high measurement error, which reduces the reliability of the assessment; or multiple solution pathways to solve the tasks, which threatens construct validity. Reasoning abilities, central to cognitive abilities, are typically assessed using figural matrices. This study presents the development of a figural-matrices-test for high ability individuals using rule-based item construction and the evaluation of the underlying construction approach. A rule taxonomy, synthesized from the literature, guided the development of 190 figural matrices. Pilot studies with N = 100 participants and four 20-item-tests led to the development of a final test version comprising 26 matrices. This test was administered to 633 participants aged 13–58 years (M = 20.15, SD = 8.28) recruited from schools or clubs for intellectually gifted in both paper-and-pencil and online formats. Items were analyzed following Classical Test Theory and Item Response Theory. Items were difficult for the sample (M = .63). A single-factor model fit the data well, also indicating sufficient scale-reliability (ω = .85). The rule-based construction approach was supported using multiple-regressions, error analyses, and the linear logistic test model which revealed that 83% of variability in item difficulty could be explained by the construction rules. Findings could be replicated in the online adaptation of the test. Test-criterion correlations with other intelligence measures (e.g., Raven) and school grades were of medium size. The fit of a 1PL-IRT-model could be established for 20 items which were invariant over gender, IQ, or age. In conclusion, the study critically appraises existing theories of rule-based item construction in a gifted population and highlights principles for constructing difficult matrix tasks. The present findings may aid the future development of reasoning tests tailored to high ability individuals.

Deep learning-based assessment of creative metaphor production in divergent thinking tasks

<u>Dr. Ricardo Primi^{1,2}, Dr. Tatiana de Cássia Nakano³</u>

PP

¹Universidade São Francisco, Campinas, São Paulo, Brazil ²Ayrton Senna Institute, EduLab21, São Paulo, Brazil ³Pontifícia Universidade Católica de Campinas, Campinas, São Paulo, Brazil

The vital role of creativity as a 21st-century skill has been widely recognized due to its significant impact on professional and social progress. However, assessing creativity, particularly in the context of divergent thinking tasks, poses substantial challenges. One of these challenges is the need for a large pool of trained raters to evaluate and score individual responses, a process that can be time-consuming, subjective, and inconsistent. These constraints become even more pronounced in large-scale assessments, creating a bottleneck that impedes the wider utilization of creativity assessments. To address these issues, there is a pressing need to establish a reliable, scalable, and automated scoring system for creativity assessments. This study explores the application of deep learning methodologies for this purpose, focusing on evaluating student responses to a "fill in the blank" divergent metaphor task (e.g., "The camel is the _____ of the desert"). The use of deep learning, particularly transformer-based models like BERT (Bidirectional Encoder Representations from Transformers) and GPT (Generative Pretrained Transformer) (Radford et al., 2018), has revolutionized various fields by achieving remarkable performance in tasks that require understanding and generating human-like text. In our study, we test the feasibility of these models to score students' divergent metaphor productions. We used a sample of 14.174 human scored responses for supervised fine-tuning of the models. We aimed to build a system that could understand the creative context of a given response (using BERT) and generate a score that aligns with human rater evaluations. By providing reliable, automated scoring, our work may facilitate greater insights into the development and promotion of creativity skills, ultimately enhancing the capacity of educators and policymakers to foster creativity in the 21st century.

The International Cognitive Ability Resource (ICAR) in the mobile toolbox: A valuable tool for intelligence researchers

<u>Dr. William Revelle</u>, Dr. Stephanie Ruth Young, Dr. Elizabeth McManus Dworak, Dr. Richard Gershon

Northwestern University, Evanston, IL, USA

Rationale: The ICAR offers well-validated, public domain measures of cognitive abilities that facilitate open-science practices in intelligence research and has been used in over 100 studies to date. To further promote the use of the ICAR, we describe the adaptation of the ICAR for self-administration via the Mobile Toolbox (MTB) smartphone app.

Method: We will provide an overview of the MTB and discuss how selected ICAR item types were redesigned to optimize usability on a mobile app while preserving validity. We will also discuss the construction of computer adaptive tests (CATs) for two item types.

Results: We will briefly demonstrate the ICAR subtests within the MTB app, including three fixed-form tests (Verbal Reasoning, Letter-Number Series, and ICAR16) and two CATs (3D Rotation and Progressive Matrices). We will also discuss the forthcoming recalibration ($n \sim 300$) and validation ($n \sim 100$) studies and present preliminary data as available.

Implications: The MTB allows participants to self-administer the ICAR and other cognitive tests alongside custom surveys on their own smartphones, which is particularly useful for ecological momentary assessment of cognitive abilities. As such, the MTB is a valuable resource for researchers interested in remotely assessing cognitive ability in diverse study designs.

Mean IQ differences between Brazil and USA: Its impact on diagnosis related to the extreme of intelligence (S)

Mrs. Karen Rosangela Silva de Souza Saviotti, Dr. Cramen Flores-Mendoza

PP

UFMG, Belo Horizonte, Minas Gerais, Brazil

The Greenwich IQ (mean differences between nations) is based preferentially on raw scores differences of the Raven Progressives Matrices. The IQ estimate made for Brazil was not different, which vary between 85 to 87. This time we present another type of estimate based on the Wechsler Intelligence for Children-Fourth Edition (WISC-IV), and the Wechsler Intelligence for Adult-Third Edition (WAIS-III), the worldwide intelligence scales most used. The Brazilian norms for both versions were published in 2014 and 2002 respectively. Items of 10 subtests of WISC-IV and 5 subtests of WAIS-III did not differ from the American version. Additionally, for Brazil and USA, the psychometric structure of the scales was similar. Thus, we could compare Brazilian and American norms. Method: A total of 12 WISC-IV age-norms and 2 WAIS-III age-norms were analyzed for Brazil and USA. Specifically, we analyzed the raw scores required by the standardized scale (1-19) of each subtest of each age. Results: We find positive differences in all subtests of the WISC-IV and WAIS-III, which means that a higher raw score was requested to Americans than Brazilians for reaching the same scaled score. The average of standardized difference for the WISC-IV (Total IQ) and the WAIS-III (IQ performance) was 9.3 and 12 IQ points respectively, very close to 11 points of difference initially estimated between Brazil and USA by Lynn and Vahannen (2012). Moreover, based on clinical protocols were the Weschler scales were applied, we assert that these differences had impact on the diagnosis related to the two extremes of the intelligence spectrum (giftedness and intellectual disability). Conclusion: An open academic discussion regarding the impact of cognitive differences nations on cognitive diagnoses is necessary, which is especially important for educational settings.

Investigating the co-variability between face processing, intelligence, and autistic-like nonverbal communication S

Ms. Dana L. Walker, Prof. Romina Palermo, Dr. Gilles E. Gignac

PP

The University of Western Australia, Perth, Western Australia, Australia

The degree of co-variability between face processing abilities (detection, perception, and recognition) and general intelligence remains contentious. Furthermore, it is unclear whether deficits in face processing abilities are a result of reduced social interest, associated with higher levels of trait-autism, as suggested by the social motivation theory of autism. Specifically, the non-verbal communication dimension of trait-autism has not been estimated in association to multiple dimensions of face processing and intelligence. Consequently, we administered four face processing ability tests (detection, perception, memory, and expression recognition), four cognitive ability tests (crystallised intelligence, visuospatial ability, memory span, and processing speed), and the Autism Quotient to a sample of 253 general community adults. Using latent variable modelling, a global face processing ability factor (f) was established, and it was positively associated with general intelligence (g; λ = .49). Furthermore, autistic-like nonverbal communication was a significant, negative predictor (β = -.47) of f. g was neither a mediator nor suppressor of the effect. Therefore, given the meaningful, positive association between f and g, we conclude that face processing abilities may be considered a candidate ability within the Cattel-Horn-Carroll model of intelligence. Furthermore, developmental prosopagnosia, an inability to recognise faces, could be conceptualised and diagnosed as a learning disability. Finally, we found support for the social motivation theory of autism, whereby higher levels of autistic-like nonverbal communication difficulties were associated with poorer face processing abilities, irrespective of intelligence.

Demonstrating the Utility of Admission Tests for Student Selection

Dr. Paul A. Westrick

PP

College Board, New York, NY, USA

For decades, colleges and universities in the United States have used admission tests to facilitate the selection of students. Despite both internal and external researchers demonstrating the utility of admission tests, numerous colleges and universities have adopted test-optional or test-blind admission policies. While the overt rejection of using tests makes direct research impossible, research on test-optional policies continues as does research on differential validity by academic major and on grade inflation in particular academic domains in higher education. However, more recent trends—some due to COVID disruptions—remain unknown to many researchers and consumers of validity research. These include institutions replacing course grades scored on a four-point scale with pass/fail (dichotomous) grades, excluding from analyses data for students who withdrew from courses, and replacing the first grade earned in a course as the grade of record with a higher grade earned in the same course in a later term. Though higher education institutions that alter the criterion often do so out of an interest to keep students enrolled, these policies force validity researchers to develop new approaches to demonstrate that admission tests still provide utility.

The speaker draws upon more than a decade of experience conducting validity research for the SAT and the ACT, both used for undergraduate admission decisions, and the MCAT, which medical schools use for admission decisions. The speaker has examined data from hundreds of institutions, both for institutional validity reports and for meta-analyses, and will share more information on the impact of these different grading policies on how validity research is conducted and ultimately consumed by different stakeholders.

Assortative mating and offspring achievement

Dr. Nicholas Zill

PP

Westat, Inc., Rockville, MD, USA. Institute for Family Research, Charlottesville, VA, USA

What role does assortative mating by education play in contributing to group differences in children's academic achievement? To answer this question, I analyzed data from a large-scale, nationally representative study of U.S. kindergartners who were followed from school entry to the 8th Grade. The study included information about the educational attainment of each student's birth mother and biological father, whether or not the parent was living with the child. Coding their attainments into five categories ranging from less than high school to graduate or professional degree, I found that almost nine out of 10 of the students had mothers and fathers who shared the same education level (47 percent) or were only one level apart (41 percent). The results showed that the marriage of equals contributes to inequality in the educational achievement of the next generation. Students whose parents both had graduate degrees scored significantly higher on a composite measure of eighth-grade knowledge and skills than students with only one parent with a graduate degree. At the bottom of the parent-education ladder, students with two parents who never completed high school scored significantly worse than students with one high school dropout parent and one who finished high school or more. This was true even after making adjustments for differences in family income, poverty status, and racial and ethnic background. In discussing the implications of the results for public policy, I note that while the marriage of equals may exacerbate educational inequality, it also contributes to educational excellence. In addition, the negative consequences of assortative mating in perpetuating inequality are tempered by regression to the mean due to random recombination of parental genes.

List of Participants

Bazian, Isaac	University of Minnesota Twin Cities
Benbow, Camilla	Vanderbilt University
Bleske-Rechek, April	University of Wisconsin-Eau Claire
Breit, Moritz	University of Trier
Clark, Gregory	University of California
Conway, Andrew	New Mexico State University
Coyle, Tom	University of Texas at San Antonio
Dean, Abel	South Padre Island
Decker, Scott	University of South Carolina
Demeke, Saron	University of Minnesota Twin Cities
DeYoung, Colin	University of Minnesota Twin Cities
Edwards, Tobias	University of Minnesota Twin Cities
Flanagan, Dawn	St. John's University
Franenz, Christoph	Leibniz Research Centre
Fries, Jonathan	University of Vienna
Garner, Kayla	Northwestern University
Genç, Erhan	Leibniz Research Centre
Grinschgl, Sandra	University of Graz
Giannelis, Alexandros	University of Minnesota Twin Cities
Haier, Richard	University of California Irvine
Hao, Han	New Mexico State University
Hermo, Santiago	Brown University
Hilger, Kirsten	Würzburg University
Jansen, Leah	Michigan State University
KC, Aayushma	Vienna University
Kell, Harrison	Educational Testing Service
Kim, Alice	University of Souther California
Kovács, Kristóf	ELTE Eötvös Loránd University
Kuncel, Nathan	University of Minnesota Twin Cities
Lasker, Jordan	Texas Tech
Lee, James	University of Minnesota Twin Cities
Lee, Samuel	University of Minnesota Twin Cities
Libedinsky, Ilan	Vrije Universiteit
Madison, Guy	Umeå University
McGrew, Kevin	Institute for Applied Psychometrics
Metzen, Dorothea	Ruhr University
Milgram, Jim	
Mhlolo, Mike	Central University of Technology
Morris, Damien	King's College London
Nakano, Tatiana	Pontifical Catholic University of Campinas

Nęcka, Edward	SWPS University
Noreen, Gabriella	Vanderbilt University
Oberleiter, Sandra	University of Vienna
Pafford, Alexandra	University of Amsterdam
Parra-Martinez, Andy	University of Arkansas
Pietschnig, Jakob	University of Vienna
Pinker, Steven	Harvard University
Plinke, Paulina	Johann Wolfgang Goethe University
Popp, Johanna	University of Würzburg
Preuß, Julian	Trier University
Priest, Reed	University of Minnesota Twin Cities
Primi, Ricardo	Universidade São Francisco
Protzko, John	Central Connecticut State University
Revelle, William	Northwestern University
Rodgers, Joseph	Vanderbilt University
Saviotti, Karen	UFMG University
Schilling, Jannik	Entrepreneur First
Schneider, Joel	Temple University
Uprety, Minal	Kirloskar Institute of Management
Wai, Jonathan	University of Arkansas
Walker, Dana	The University of Western Australia
Wang, Avery	Apple Research Scientist
Westrick, Paul	College Board
Widaman, Keith	University of California Riverside
Willoughby, Emily	University of Minnesota Twin Cities
Wolfram, Tobias	Bielefeld University
Woodley of Menie, Michael	Independent
Worrell, Frank	University of California Berkeley
Zill, Nicholas	Westat, Inc.

Useful Information

Navigating Berkeley

Getting around: The nearest international airports to Berkeley are the **Oakland International Airport** (OAK; 13.4 miles) and the **San Francisco International Airport** (SFO; 23.4 miles). Berkeley and the surrounding area are very well-connected with public transportation. The hotel is right next door to a bus station that connects to the North Berkeley train station. From here, there are multiple options (see Google Maps) that connect to the Oakland Airport and to SFO. See this page: https://www.hotelshattuckplaza.com/aboutus/getting-here for more information about travel to and from the hotel. The Bay Area uses the BART (Bay Area Rapid Transit) train system. See below for a map of BART routes, and visit this page for more details: https://www.bart.gov/system-map.

Social event: Our main social event will be a banquet held on Friday, July 28, from 6:00 to 8:00 pm in [TBD].

Things to do: Berkeley is home to a wide variety of interesting things to do and see. You can read more about what to do, see, eat, drink and shop in Berkeley here: https: //www.visitberkeley.com/things-to-do/.





Acknowledgements

- Our thanks to The Institute for Mental Chronometry for supporting ISIR 2023
- Our thanks to all the Reviewers who read submissions for this conference
- Our thanks to all members who have given of their time most generously on numerous committees to enable the conference to run smoothly

Future meetings

We usually have the conference in Europe and in the USA alternate years. **Our 2024 meeting will take place in Zürich, Switzerland, with local host Elsbeth Stern**. We are seeking a host for 2025 in the USA. Please email admin@isironling.org if you'd like to discuss hosting the meeting.



_
