2010 International Society for Intelligence Research Conference

The following summaries of papers given at the ISIR conference (my 7th) are a continuation of my prior practice of going through my notes and typing some of them to share with a few interested parties. I do this largely for my own benefit, as it helps me in understanding and remembering what has been presented. In the past I have made a greater attempt to write in paragraph format, but I believe that it is more efficient to simply list the salient points from the papers. The job is large enough that I have omitted some papers. Those I have not included were omitted because of limited notes, confusion on my part, or personal preference, but some of the slides from those presentations are posted on Picasa (see link below). In most cases, I have listed the name of the presenter, although the papers that were presented frequently had multiple authors. Please mentally append an "et al." to the names.

My intent is writing this is to make it understandable to readers who are not familiar with the tools and abbreviations used in intelligence papers. For that reason there are a few instances where common abbreviations are defined and common references are explained.

One curiosity from the conference was that the projector was constantly causing problems. It is impossible to ignore the irony of this little electrical gadget causing so much confusion in a conference devoted to the subject of intelligence! But the projector eventually did its job and I took some screen shots. These photos are in a non-public Picasa folder that can be found with this link:
http://tinyurl.com/6bfwzlp

2010 International Society for Intelligence Research Conference

Alexandria, Virginia

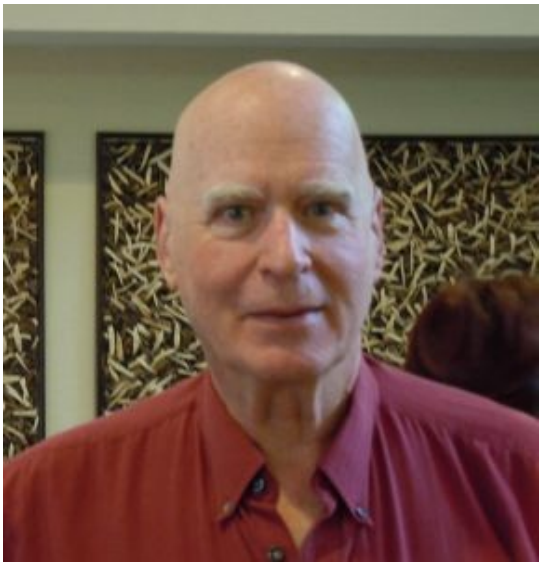
ISIR Lifetime Contribution Award: Tom Bouchard

The paper that started Bouchard's lengthy and important study of twins was this:
Sources of Human Psychological Differences: The Minnesota Study of Twins Reared Apart
Thomas J. Bouchard, Jr., David T. Lykken, Matthew McGue, Nancy L. Segal, Auke Tellegen
12 October 1990. *Science*, Volume 250.

This paper can be found on the Internet in PDF format. Among the significant findings reported in the paper are that "genetic factors exert a pronounced and pervasive influence on behavioral variability" and "the effect of being reared in the same home is negligible for many psychological traits."

Bouchard commented that in this paper, literally every sentence was changed in editing by Science. He is the recipient of the Kistler Prize: http://www.futurefoundation.org/awards/kpr_2005_bouchard.htm

In 2004, Bouchard was honored by the ISIR Distinguished Career Interview.


Tom Bouchard

Thomas Coyle

Predicting college GPA using test-specific variances (TSVs) from the SAT

Higher g-loading generally means better prediction of academic performance.
Non-g variance generally contributes little to the predictive validity of the tests.
The SAT correlation with g: r = .82, after correction for restriction of range and to freshman grades at about r=.35.
Verbal residuals correlate positively to verbal measures and negatively to math measures.
Math residuals correlate positively to math measures and negatively to verbal measures.
TSVs are predictive of SEM (Science, Engineering, & Math)* performance and are negatively correlated with humanities performance.
Math TSVs strongly predicts SEM GPA and negatively correlates with these measures in humanities.
Effect sizes are small relative to SAT(g) and are on the order of 0.30.
Interestingly, he said that he does not yet know what TSVs measure.

*SEM used here is sometimes written as STEM (Science, Technology, Engineering, & Math). This avoids confusion with the use of SEM to mean Structural Equation Modeling.

Jason Purcell

Predicting college GPA using non-g variances from the SAT and ASVAB

Data was collected from the SAT, Armed Services Vocational Aptitude Battery (ASVAB), and the National Longitudinal Study of Youth (NLSY).
A structural equation model (SEM) was used to estimate g, speed, school, and shop constructs.
g - based on the full ASVAB and SAT.
speed - numerical operations and coding speed (ASVAB)
school - arithmetic reasoning, general science, reading comprehension, word knowledge (ASVAB)
shop - automobile, electronics, and shop information, and mechanical comprehension
GPA was predicted by SAT, school, speed, and shop (school was best, shop weakest)
When g was factored out, only the SAT retained a predictive validity.

Anissa Snyder

Predicting first-year college GPA using the exit-level TAKS examination

TAKS : Texas Assessment of Knowledge and Skills (exit exam for public high schools)
WPT: Wonderlic Personnel Test
The best predictor was the TAKS(math) + WPT
Only TAKS(math) and WPT significantly predicted GPA [TAKS(math) to GPA, r = .36] [WPT to GPA, r = .14]
TAKS(math) predicts (male and female) after g is factored out.
WPT is not predictive of GPA after g is removed.

discussion...

Lubinski: The sex difference on spatial is about one standard deviation and is about the same on performance (career). More research is needed on Spearman's Law of Diminishing Returns; restriction of range at the high end is a problem. Project Talent (1000 high schools) achievement tests strongly related to student interests.

Ullen: The negative correlations should be examined against time spent on various subjects.

Gottfredson: Questioned GPA because of more grade inflation in humanities than in technical areas.

Hunt: There are huge differences in entrance requirements between schools (university level).

Comment from group: The non-g factors (relative to job, not school) are experience related and go away workers are all experienced; only g matters at that point. There is an initial contribution related to non-g skills, but this fades.

Christopher Beam

A genetically informed study of infant mental and motor predictors of kindergarten-aged achievement

Data from Early Childhood Longitudinal Study (750 pairs of twins).
Data at age 9 months was compared to later kindergarten achievement.
No shared environmental effect was found for reading.
Differences in motor ability predict twin math and reading outcomes.

Gottfredson comment: Some data show a strong correlation between motor ability and g.

Heiner Rindermann

Parents' education, less so their money, nurtures the intelligence of their children: results of 19 studies in 6 countries at different development levels

Program for International Student Assessment (PISA) data - no correlation or negative correlation with wealth; private school showed no positive effect.
Parental education and number of books in home show a strong correlation with intelligence.
[note: parental IQ was not shown as a variable; educational achievement is well established to strongly correlate with IQ and presumably the presence of books would reflect both education and intelligence]

Andrew Conway

The relationship between working memory and intelligence

introductory comments...
Individual differences in working memory (WM) are primarily due to variation in executive attention, goal maintenance, and updating.
Those who do better on WM tasks do better on cognitive control.
WM, cognitive control, and Gf (fluid intelligence) depend on the lateral prefrontal cortex.

The development of working memory capacity and fluid intelligence in children (Pascale et al. paper, presented by Conway)

WM is a memory construct for information that has recently been encoded.
Short term memory (STM) applies to storage only.

The data showed that WM, STM, and Gf are related, but separate constructs in young children. Structural equation modeling showed that the factor structures of the above factor constructs are invariant over time.

Thomas Redick

The role of executive attention in the link between working memory capacity and fluid intelligence

The best model shows that WM and attention each contribute directly to Gf and to each other.
In the relation between WM and Gf, attention is at best a mediator.
WM and attention are related, but not isomorphic.
WM wholly mediates reading comprehension.

Zachary Hambrick

Working memory capacity in the wild: Individual differences in geological field mapping

The study was designed to measure WMC for 67 participants, then compare their results in geological field mapping.
Students and experts (people experienced in field mapping) were tested.
Field mapping accuracy correlated r = 0.40 with g.
There was a large interaction between g and knowledge of geology.
Higher WM was helpful to novices, but not to experts.
Age to field map accuracy, r = 0.0

A. Freund

Modeling retest

Four hypotheses pertaining to retest:

1 - scores do not show measurable bias
2 - there is a significant retest effect
3 - there is a significant training effect
4 - the training effect is greater than the retest effect

Two groups were used; a control group that was not trained and a training group that received daily training on 10 items per day.
IRT (item response theory) analysis showed no difficulty invariance over time.
Gains on test items were not equal.
Results: hypothesis 1, no; hypotheses 2, 3, and 4, yes.

Frank Miele (gave paper for Arthur Jensen, who was unable to attend)
Ratio scale measurement of mental processes by means of mental chronometry

More intelligent people have less variation in reaction time (RT). [the standard deviation is smaller]
13 year old gifted children show RTs essentially identical to college students.
In intelligence measurement, there is a need for a true ratio scale. [IQ is an equal interval scale]
In order for chronometric measurement to be useful, the equipment variance must be low.
Jensen wants to extract chronometric g.
There was a general discussion of RT, Hicks Law, and chronometric methods. These are covered in detail in both The g Factor and Clocking the Mind.

Frank Schmidt -- Distinguished career interview

FS began his career in biology, then moved to psychology (Purdue).
The University of Minnesota people in differential psychology had a strong influence at Purdue.
Went to Washington, DC to work for the government, doing only research - developed statistical methods.
Found that g captures that which was to be predicted (focus on hiring).
Older professors were slow to accept g because they didn't want to have to revise their courses.
Younger professors then accepted the new model.
There is a linear correlation between g and job performance.
Non-linearity happens at 5% of the time at a 95% confidence level, so linearity is the rule.
More attention is needed to correct for measurement error. If done, some effects would go to zero.
"Job satisfaction" and "commitment to the organization" are often thought to be different, but they are almost identical.
The g factor accounts for everything of importance in job performance over a long time span.
Causality is from g down, not from the bottom up.
Psychometric g is a latent variable that can only be measured by its effects.
Criterion validity for g will increase as the test broadens.
When you partial g out of verbal, you only remove part; it is a partial-partial because of measurement error.

Meta-analysis (development and implementation credited to FM) has spread into many other fields.
Correlation between job performance and job satisfaction, r = 0.30 and not much variation from this value.
Consider a large city with a large black population. If you select (hiring police) for best qualifications, you end up with a poor representation of blacks in the police force. We need a way to measure the social benefits of a representative police force. You trade this for costs.
Mayor Marion Barry threw out all testing for police in DC. Subsequently, conviction rates for homicides went from near the best in the country to near the worst. Also, black officers were shooting themselves because they could not figure out how to operate the Beretta pistols they were issued.
Sampling error is often not properly accounted for. All data have both sampling and measurement errors--no exceptions.

discussion
Major contribution (FS) was the development of meta-analysis methods.
Gottfredson: When there was active hostility against meta-analysis and g, Frank stuck to it and prevailed.
Schmidt: ... starting point was the validity of personnel selection procedures.
Bouchard: Spearman did the first meta-analysis.
Schmidt: Information overload helped in the acceptance of meta-analysis because a new tool was needed.
Irwing: What is the role of personality in job performance?
Schmidt: There is low validity for self-report. There is not much range restriction on personality. Anxiety cannot be observed externally, so self-report is needed.

John Protzko
Can we become lastingly smarter?

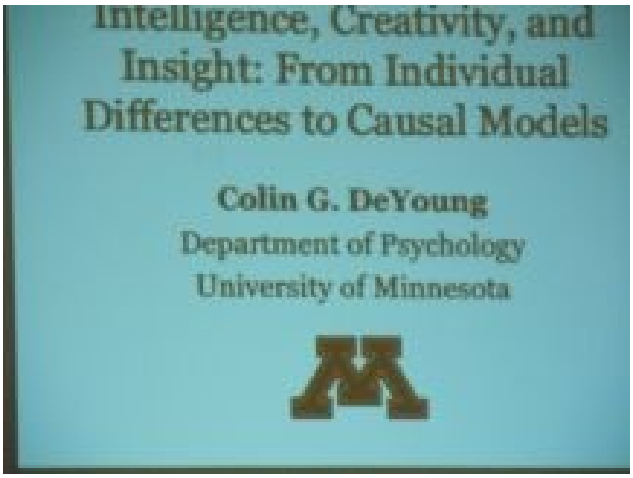
Cited various references that claimed connections between schooling and IQ.
After giving several claims (as above), noted that, in all cases, the effects fade out.
Intense early intervention programs, 3-5 years in duration have been tried. The gains fade.
Adoption is effectively an 18 year long intervention. Similar results.*
Can we create intellectual giftedness? No.

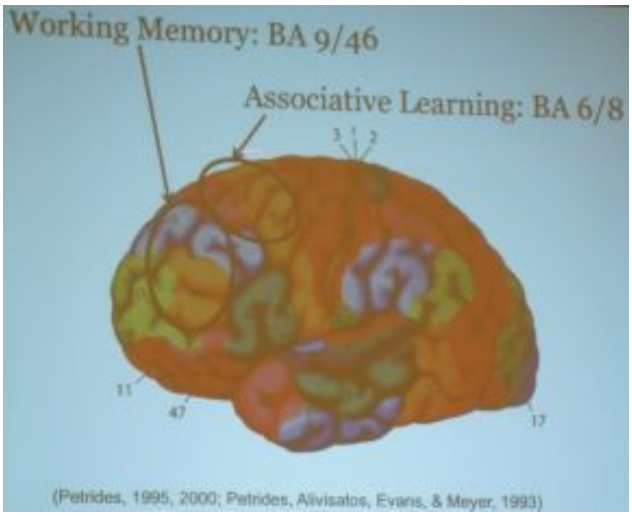
* Protzko failed to mention the Scarr and Weinberg adoption work. Schmidt pointed out that they found fade and increasing heritability with age.

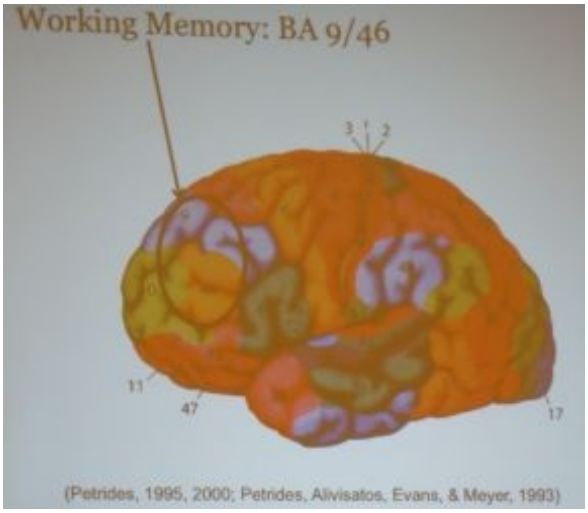
Colin DeYoung

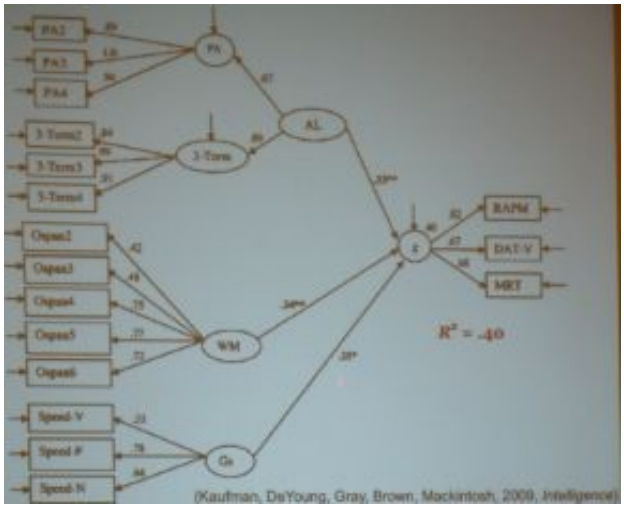
Intelligence, creativity, and insight: From individual differences to causal models

In this case, the slides convey more information than my notes.



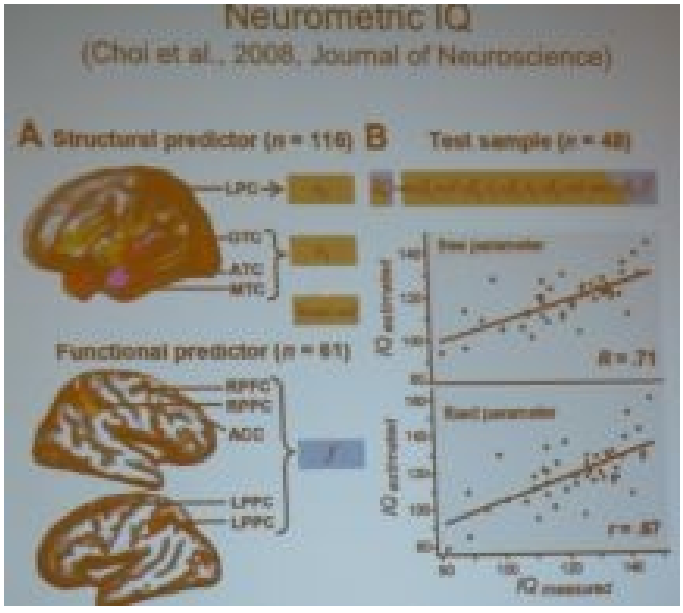






First steps: Individual Differences

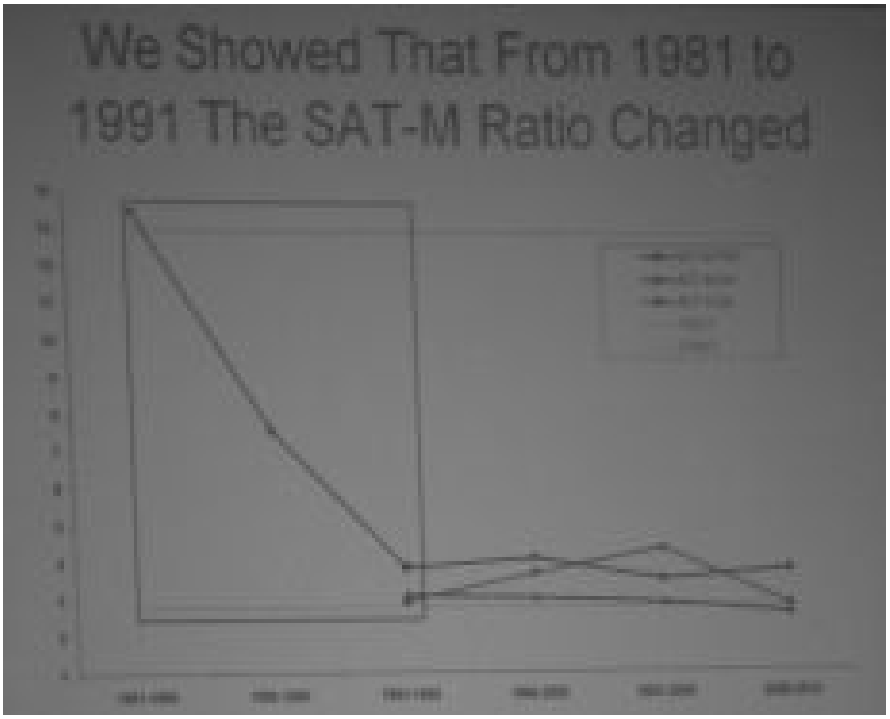
- If process X is involved in ability Y, then individual differences in X are likely to predict individual differences in Y.
- Using causal knowledge to make correlational predictions.
- Using correlation results to suggest possible causal mechanisms.



Jon Wai

An examination of sex differences in the top 5% of cognitive abilities 1981-2010.

In 1983, Benbow and Stanley reported (for 7th grade students) a 13:1 male-female ratio for scores above 700 on the SAT.
By 2005 the ratio dropped to 2.8:1 and has remained essentially unchanged at that level.
ACT scores have followed a similar path.
Recent ACT perfect scores were 18 males and 1 female.



discussion

Gottfredson: Asked Julian Stanley why there was a decline in the ratio. His answer was that there were more Asian girls in the talent search. The decline may be a demographic effect.
Bouchard: Have other changes been reported that are consistent with this finding? (no answer from the group)
R. Gordon: Were newer tests less difficult than earlier rests? (no answer from the group)
From group: It is possible that item level data would show intentional selection to reduce the ratio. [This has previously been admitted by Educational Testing Service.]

Gregory Park

Time-saving from acceleration and the effect on STEM productivity

The paper is based on data taken from the SMPY (study of mathematically precocious youth) longitudinal study that has tracked students from testing at age 13 through more than 25 years.
The mean age for a person earning a PhD in Europe is 24, while in the US it is 32.
The SMPY data shows that students who were accelerated did better on measures (age when attaining milestones).
Those who were accelerated (grades skipped) maintained about a 2 year advantage in achieving milestones.

At this point Linda Gottfredson presented a symposium:

In memoriam of Constance Holden.

Holden died in 2010 and was a science writer for Science magazine. To honor her, there was a symposium titled "Challenges in reporting mainstream science on human variation in socially important traits."

A guest speaker was apparently supposed to present material on this subject, but changed it to another (interesting) subject, which did not set well with one of the program committee members. Since I failed to record the name of the speaker and did not find it in the program, I will report mostly on some of the discussion that followed the presentation.

The presentation discussed genetic evolution, some of the mechanisms involved, and some consequences. It ended with the comment that Afghanistan cannot become a Denmark.
Miele: Can Denmark become an Afghanistan? A: yes
Nyborg: It is difficult to establish democracies in nations where the mean IQ is less than 90.
Discussion: Inbreeding is the most important factor preventing democracies.
Discussion: Japanese and Chinese populations are more homogeneous than most. There are, as a guess, probably lower SDs in IQs in those countries. These populations grew rapidly after the Ice Age.
Discussion: Non-sub-Saharan people have 1-4% Neanderthal genes. These genes may have facilitated the adaptation to colder climates.
Discussion: The transition in the West, over the past 50 years, was huge but presumably not genetic.
Discussion: Birth control is dysgenic.
Speaker: Religion has played a big role -- it has been preoccupied with the details of reproduction.
Discussion: Allowing immigrants to maintain their cultures (religions) leads to factions and conflict. PC pressure has been greater in Europe than in the US.

M. Burgaleta

Matter integrity and general cognitive performance: A tract-based spatial statistics approach

TBSS: tract-based spatial statistics
Diffusion Tensor Imaging (DTI) detects how freely water moves and in which directions and can identify white matter (WM) tracts and individual differences in WM integrity.
FA (fractional anisotropy) (indicating WM integrity) is related to verbal more than to performance abilities.
TBSS is more sensitive than VBM (voxel based morphometry) and does not require smoothing.
Gc was significantly correlated with FA in females, but not in males.
Gf was correlated with FA in males, but not in females.
WM integrity is related to Gf in males and to Gc in females.
Conclusion: there are sex differences in brain structure and the relevance of WM integrity for cognitive performance.

[There are color images used in this presentation posted on the Picasa link. See page 1.]

Roberto Colom

Hippocampal structure and human cognition

104 subjects (mean age 19.9 years) received MRI scans and tests for 7 psychometric factors.
Volumes for the left, right, and total were greater for males than females.
For males, the Raven's Advanced Progressive Matrices test and the 2 back task were correlated with structural differences in the left hippocampus.
For females 12 factors showed significant correlations; most of these are relative to the left hippocampus.
Processing speed and attention are not related to differences in hippocampal structures.
There are different structures for males and females with respect to g.

David Schroeder

A comparison of the gray matter correlates of vocational interest and cognitive ability scales

40 young adults were given tests of cognitive ability and vocational interests.
[The Holland Self-Directed Search (SDS) was used to measure vocational interests. It is described here: http://www.self-directed-search.com/johnholland.aspx]
Structural MRI was used with VBM to measure regional gray matter volume.
The Realistic scale (pertains to outdoor, blue-collar, and some engineering fields) of the SDS showed significant positive correlations with several large brain areas.

David Geary - Featured Speaker

Evolution of sex differences in brain and cognition

Cited r-K selection, noting that reproductive rate is a determinant of parental investment.
Role reversals are found in some species, for example: pipefish and seahorses. In these cases females compete for males and are larger and more colorful.
Species with large males (relative to females) display physical male-male competition.
Division of labor is related to mate choice.
Hypothesis: female foraging resulted in an evolved advantage in object location (memory and focus on landmarks in navigation). This is seen in girls and women after age 13 (there is a small location memory task advantage).
Female incidental memory with recall is a larger advantage.
Girls and women use landmarks and name them (verbal).
Females have a preference for colors in the reddish range.
8% of males have some degree of color blindness. This is an advantage in detecting concealed objects, especially in dappled light.
Physical sex differences are consistent with the use of projectile weapons. There is a 70% difference in lean muscle mass in the upper body.
Maturation rates differ between the sexes.
Bone morphology differs.
Throwing competence (distance, velocity, and accuracy) differs.
Men have an advantage in "where" action; women have an advantage in "what" action.
In one study, at age 37 hours, females looked longer at faces, while males looked longer at mobiles.
Male advantages:

- visual and auditory tracking
- blocking objects thrown at them
- hitting moving objects with a thrown object (gay males are as accurate as heterosexual females)

Males display a more distributed processing of motion information. The associated area in the brain is larger than in females. Damage to this area degrades the ability to catch.
Females can be very aggressive in verbal attacks; competition for males begins at puberty.
Physical competition results in men being larger than females.
Several language centers in the brain are larger in females.
The female brain language center remains large, independently from total brain size (imaging).
Females are better at reading other females (face, etc.) than they are in reading males.

Andrew Scholey

Effects of individual differences in glucoregulation on mental performance with and without nutritional interventions

When an individual is emotionally laden, glucose level goes up, indirectly increasing memory formation.
Old people consume more glucose and the level falls off more slowly. This is associated with cognitive processing.
Counting by serial 7's improves with a drink containing glucose.
The fall in blood glucose is large when a person is performing the serial 7's task. The effect is large.
When the Stroop test is done for 45 minutes, blood glucose decreases by depletion.
Reaction time is improved by glucose addition.
High insulin helps because it is a facilitator of glucose uptake.
Psychomotor performance was improved by a glucose drink, but memory was not improved. Thirst was a factor. If thirsty, the glucose drink was an impairment, not a boost.
For a given glucose dose, there was a greater effect on subjective alertness and word recognition reaction time when the body mass index was above 25 than when it was below 25. [There are several screen photos of this lecture. See the preface for the link.]

Bouchard: Starvation affects the brain less than any other part of the body because it gets priority. In WW2 concentration camps, people were still functioning cognitively up to death by starvation.

[There are a large number of slides from this paper on Picasa. See page 1.]

Matthew Pase

Arterial stiffness: an important predictor of cognitive performance in mid-life

Arterial stiffness (AS) increases with age and is associated with dementia.
A mechanism for damage: The brain experiences pressure pulses from the heart and may suffer damage to small structures from these pulses.
Studied 92 healthy adults.
RT increased with increasing pulse pressure.
AS predicts memory specific functions and processing speeds.
Some prescription medications and omega-3 fatty acids reduce AS.
Men from fishing villages have lower AS than men from farming villages.

AS is a risk factor, even in healthy people.

Discussion: Pulse wave velocity is the best measurement of AS.
Lubinski: The reliability of blood pressure is about 0.60, so data may underestimate correlations.

Jason Major

The dependability of the general factor of intelligence: Why g is not a first principal component

Data used: Subtests from the Minnesota Study of Twins Reared Apart.
The Johnson-Bouchard VPR (verbal, perceptual, image rotation) model fits better than most other models.
The g factors from small batteries differed substantially from the "true g" obtained from large batteries.
Principal components analysis is not suited for determining whether g is identical with another factor.

Tim Keith

Are we really overfactoring modern cognitive tests? Test of a hypothesis via plausible simulated data

The following paper noted that there has been an increase over time in the number of factors being measured by IQ tests and that the number has become excessive:

> Historical increase in the number of factors measured by commercial tests of cognitive ability: Are we overfactoring?
> Thomas W. Frazier, Eric A. Youngstrom
> *Intelligence*, Volume 35, Issue 2, March-April 2007, Pages 169-182

The study (Keith) being presented is similar to the Woodcock-Johnson (presumably in its CHC structure)
The full number of factors was examined and compared to the same factors after the first two (largest) were combined.
In every comparison, confirmatory factor analysis (CFA) suggested many factors (5 to 8), while parallel analysis suggested only 2.
CFA seems to be giving the correct number of factors.

Bouchard: No model is "real world." There is a fundamental problem with selecting a model.

Paul Irwing

Are g and the general factor of personality (GFP) correlated?

Data was taken from the Vietnam Experience Study.
The Minnesota Multiphasic Personality Inventory was used for the personality analysis.
15 cognitive ability tests were used for the cognitive analysis.
A hierarchical confirmatory factor analysis produced a single GFP from a set of three first-order factors.
The cognitive measures produced a general factor from four first-order factors.
The correlation of GFP with g was r = -.23.
The weak correlation is consistent with the weak relationship between job performance and personality.

Bob Williams