

Personality and Individual Differences: the home for psychological generalists

William Revelle

Presidential Address to the International
Society for the Study of Individual
Differences, July, 2007

I am a personality psychologist:
I study Individual Differences

Personality and Differential Psychologists study The how and why of individual differences in

- A) Affect
- B) Behavior
- C) Cognition
- D) Desire

Personality and Differential Psychologists integrate

- A) social psychology
- B) cognitive psychology
- C) neuro-psychology
- D) behavior genetics
- E) methodology

Personality and Differential Psychology has applications in

I. Assessing leadership

II. Evaluating effectiveness

III. Testing Psychological Theory

Personality and Individual Differences

The study of personality and individual differences is the last refuge of the generalist in psychological theory and research.

Overview

I. Honorable history

II. Exciting Present

III. Promising future

Early Personality Research

I. Gideon

II. Plato

III. Theophrastus

IV. Hippocrates/Galen

V. Galton/Wundt/Heymans

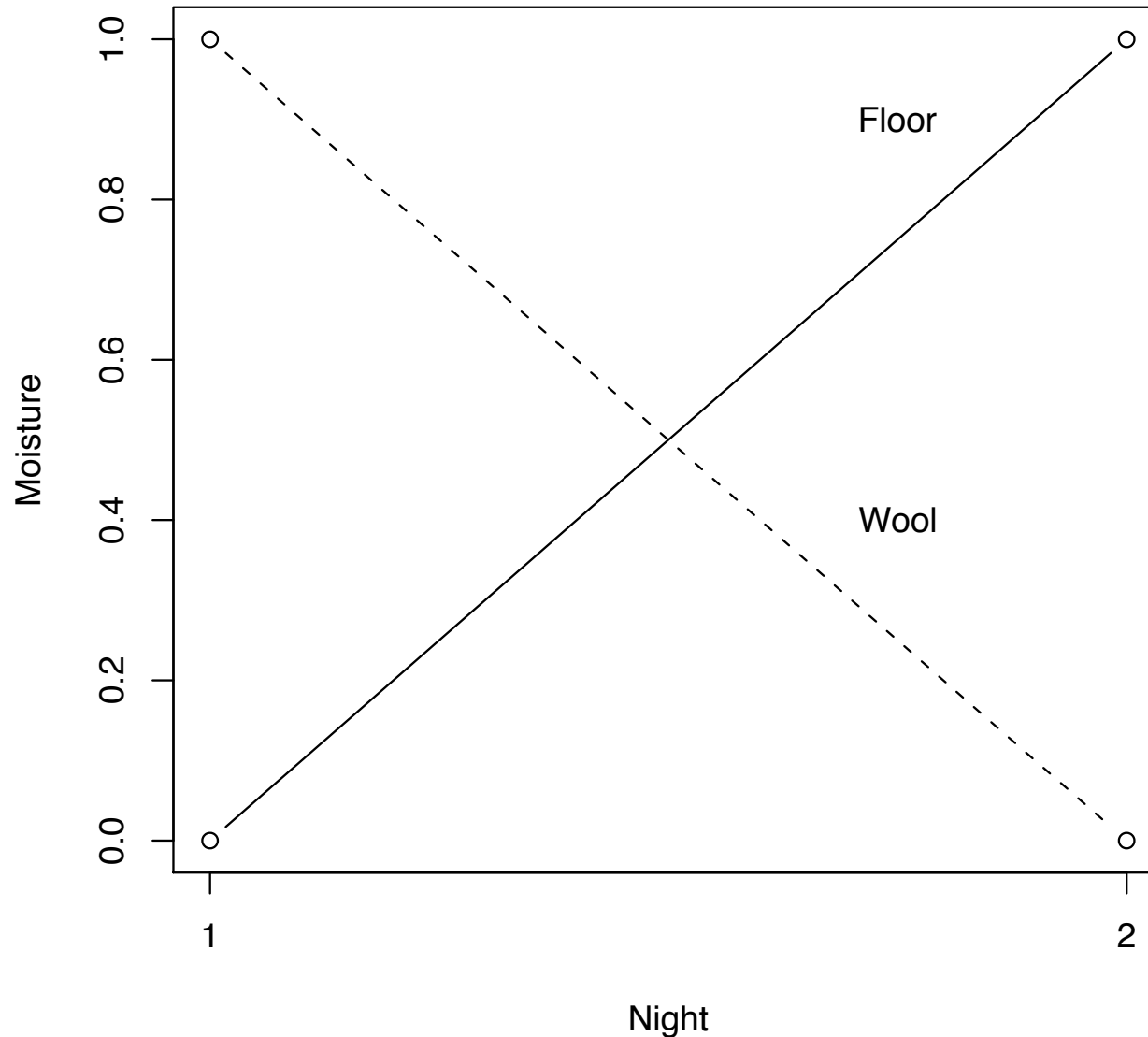
Gideon, master methodologist

I. introduced the within subjects design

II. recognized the power of cross over interactions

III. was not afraid of asking hard questions

Gideon's double dissociation test



Gideon's tests for God are an early example of a double dissociation and probably the first published example of a cross over interaction. On the first night, the wool was wet but the floor was dry. On the second night, the floor was wet but the wool was dry (Judges 6:36-40)

Gideon and assessment

I. The problem: 32,000 volunteers were too many for purpose

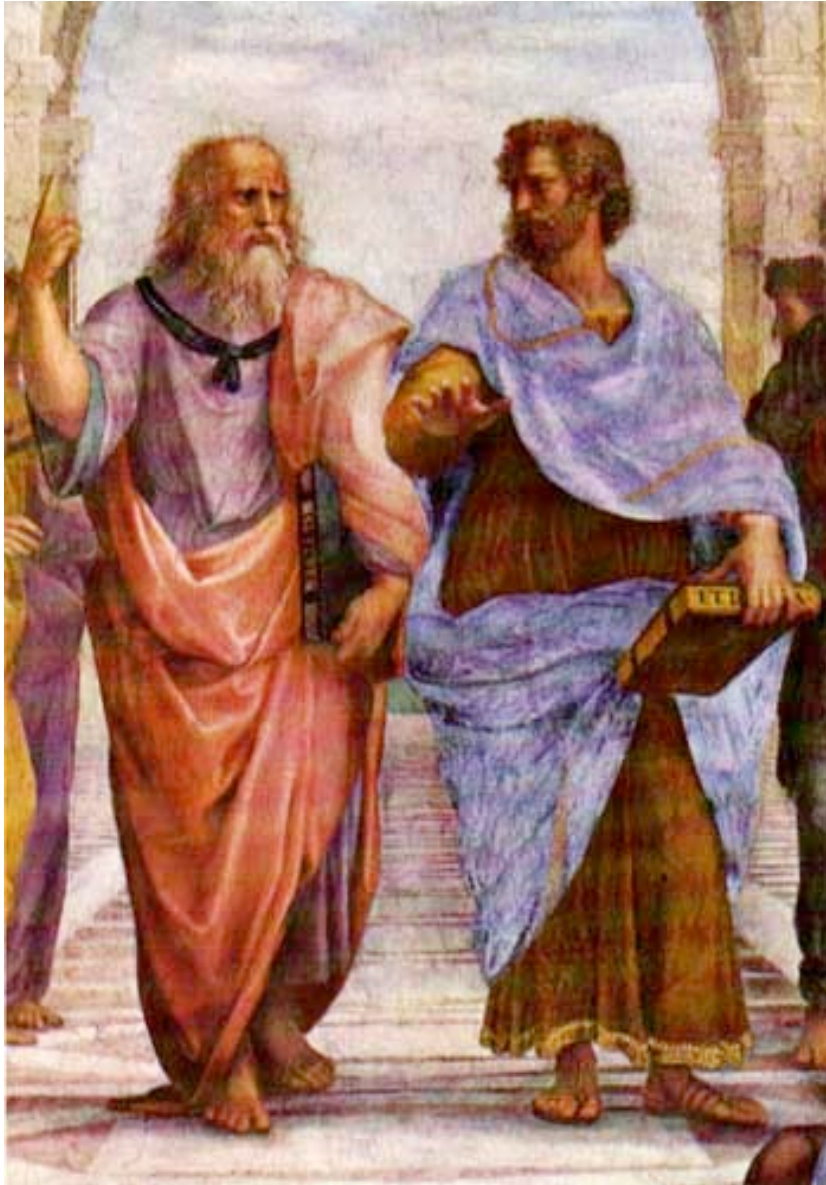
II. Solution: Sequential Affective and Cognitive Assessment

A) 10,000 passed the affective test (step back if you are afraid)

B) 300 passed the cognitive assessment (lapping water like a dog showing battlefield skill)

Gideon's assessment technique





Plato's contribution to psychometrics and personality assessment

Plato's contribution to psychometrics and assessment

I. True Score theory

II. The Allegory of the Cave and latent variable analysis

III. The Republic: leadership effectiveness: the role of intelligence, anxiety and impulsivity

Plato and latent variables: The allegory of the cave

Suppose that there is a group of human beings who have lived their entire lives trapped in a subterranean chamber lit by a large fire behind them. Chained in place, these cave-dwellers can see nothing but shadows (of their own bodies and of other things) projected on a flat wall in front of them. Some of these people will be content to do no more than notice the play of light and shadow, while the more clever among them will become highly skilled observers of the patterns that most regularly occur. In both cases, however, they cannot truly comprehend what they see, since they are prevented from grasping its true source and nature. (Republic 514a)

Plato and leadership

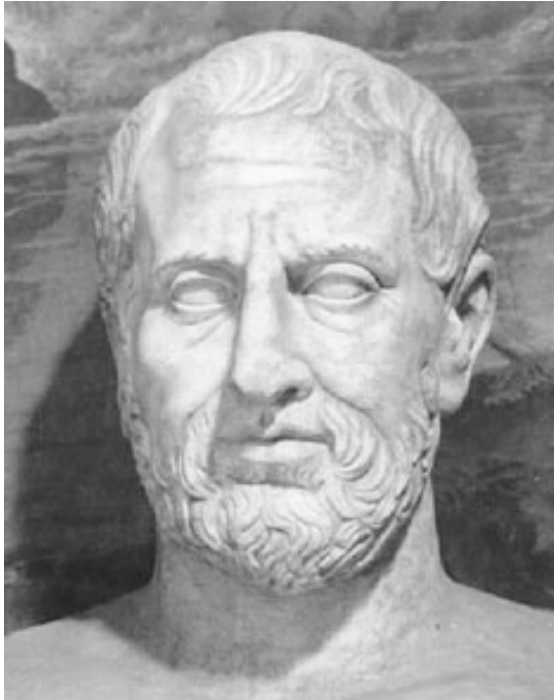
... quick **intelligence**, **memory**, sagacity, **cleverness**, and similar qualities, do not often grow together, and that persons who possess them and are at the same time high-spirited and magnanimous are not so constituted by nature as to live orderly and in a peaceful and settled manner; they are driven any way by their **impulses**, and all solid principle goes out of them.

On the other hand, those steadfast natures which can better be depended upon, which in a battle are **impregnable to fear** and immovable, are equally immovable when there is anything to be learned; they are always in a torpid state, and are apt to yawn and go to sleep over any intellectual toil.

And yet we were saying that both qualities were necessary in those to whom the higher education is to be imparted, and who are to share in any office or command.

And will they be a class which is rarely found?

Then the aspirant must not only be tested in those labours and dangers and pleasures which we mentioned before, but there is another kind of probation which we did not mention--he must be exercised also in many kinds of **knowledge**, to see whether the soul will be able to endure the highest of all, or will faint under them, as in any other studies and exercises.



Tyrtamus of
Lesbos
(Theophrastus)
biological
taxonomist and
taxonomist of
character

Theophrastus: behavior genetics and taxonomic theory

“Often before now have I applied my thoughts to the puzzling question -- one, probably, which will puzzle me for ever -- why it is that, while all Greece lies under the same sky and all the Greeks are educated alike, it has befallen us to have characters so variously constituted.”

Theophrastus, Chaucer and personality taxonomy

I. Theophrastus and the characters

II. Chaucer and the Canterbury Tales

Theophrastus meets Goldberg

Extraversion	Agreeableness	Conscientious	Neuroticism	Openness
Talkative	Sympathetic	Organized	Tense	Wide Interests
Assertive	Kind	Thorough	Anxious	Imaginative
Active	Appreciative	Planful	Nervous	Intelligent
Energetic	Affectionate	Efficient	Moody	Original
-Quiet	-Cold	-Careless	-Stable	-Commonplace
-Reserved	-Unfriendly	-Disorderly	-Calm	-Simple
Talker	Anxious to please	-Hostile	Coward	-Stupid
Chatty	Flatterer	-Shameless	Grumbler	-Superstitious
Boastful	-Unpleasant	-Distrustful	Mean	-Boor
Arrogant	-Outcast	-Avaricious	Unseasonable	-Gross

Goldberg, L. (1990); John, O. (1990); Theophrastus (372-287 BCE)

The biological basis of individual differences

I. Plato and the 3 domains of psychological research

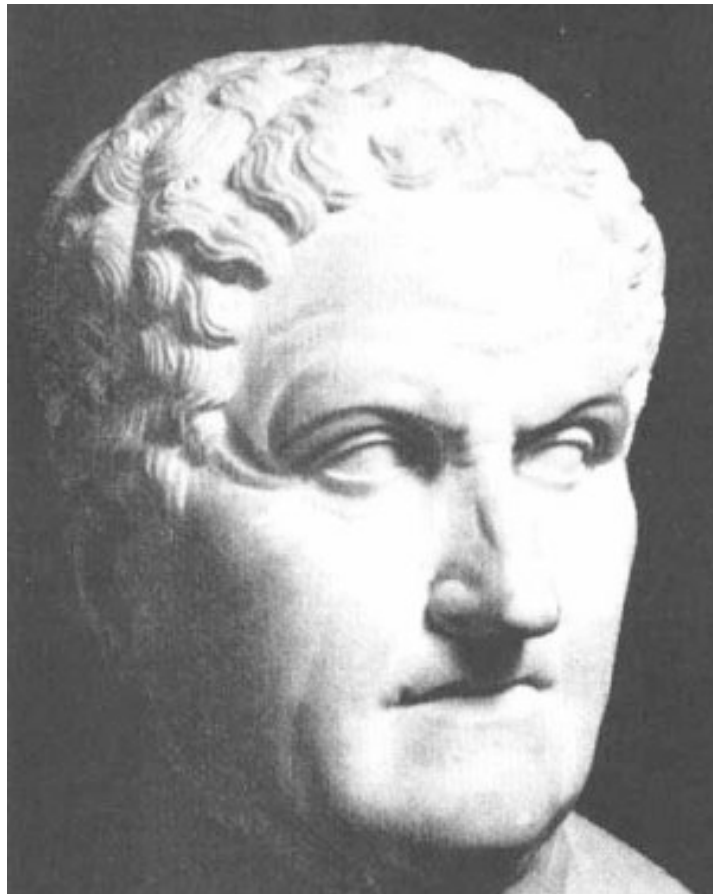
A) Reason and the brain

B) Emotion and the heart

C) Desire and the liver

II. Hippocrates/Galen and theories of temperament

Galen of Pergamum



4 temperaments of Galen/Kant

a recurring taxonomy

“element”	Physiological basis	Temperament
Fire	Yellow Bile	Choleric
Water	Phlegm	Phlegmatic
Air	Blood	Sanguine
Earth	Black Bile	Melancholic

Multiple representations of the 4 temperaments



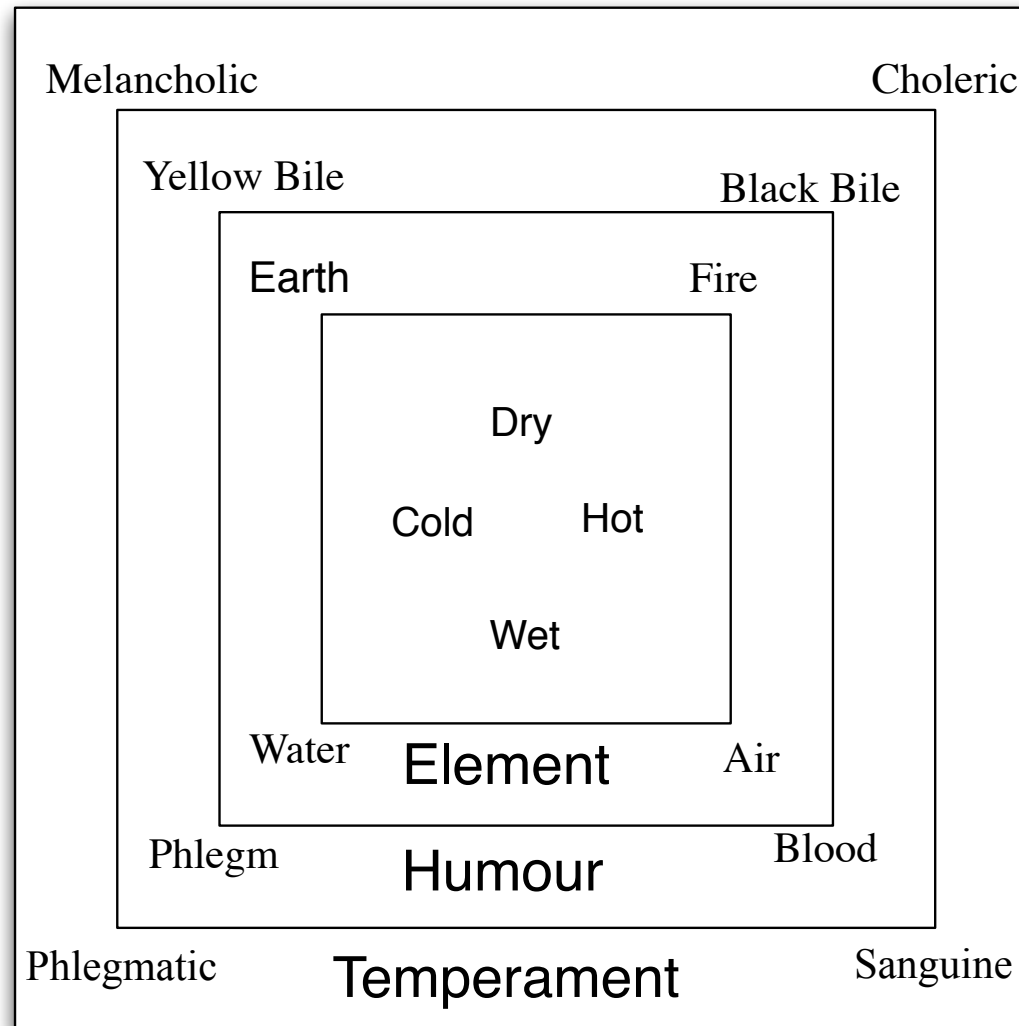




Astrology and the four temperaments

Autumn

Summer

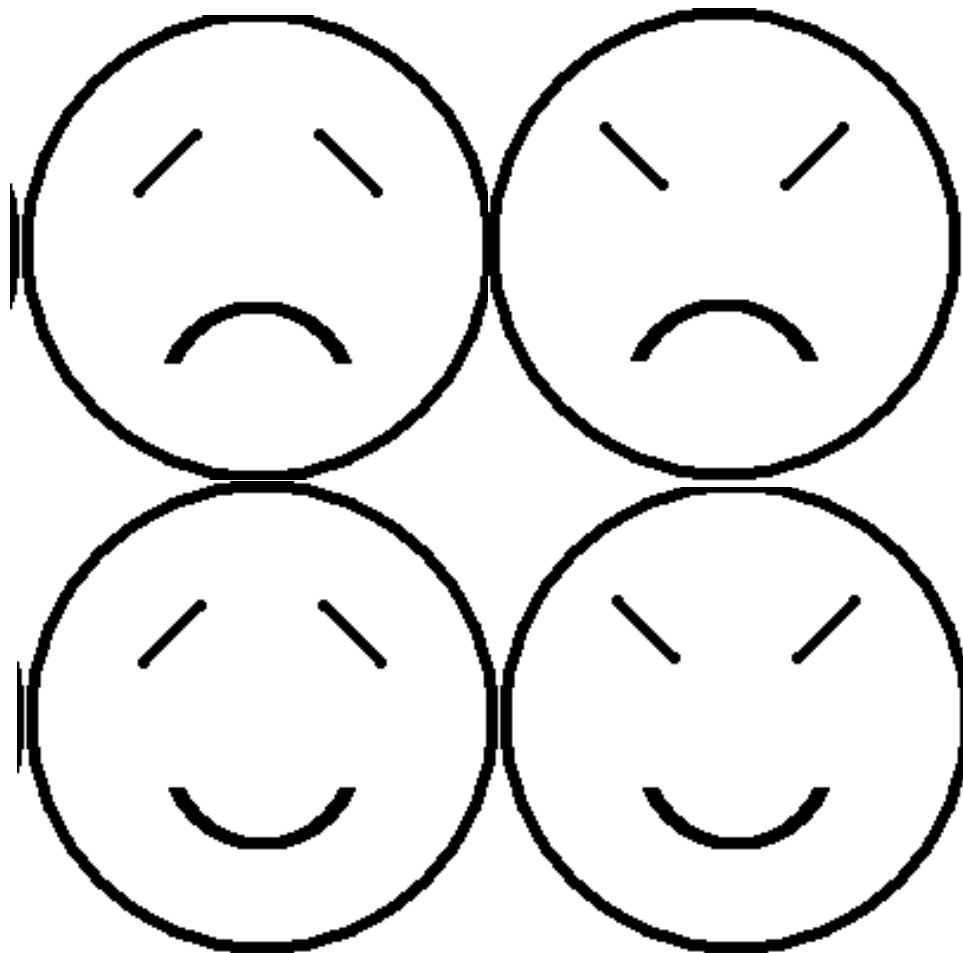


Winter

Spring

Season

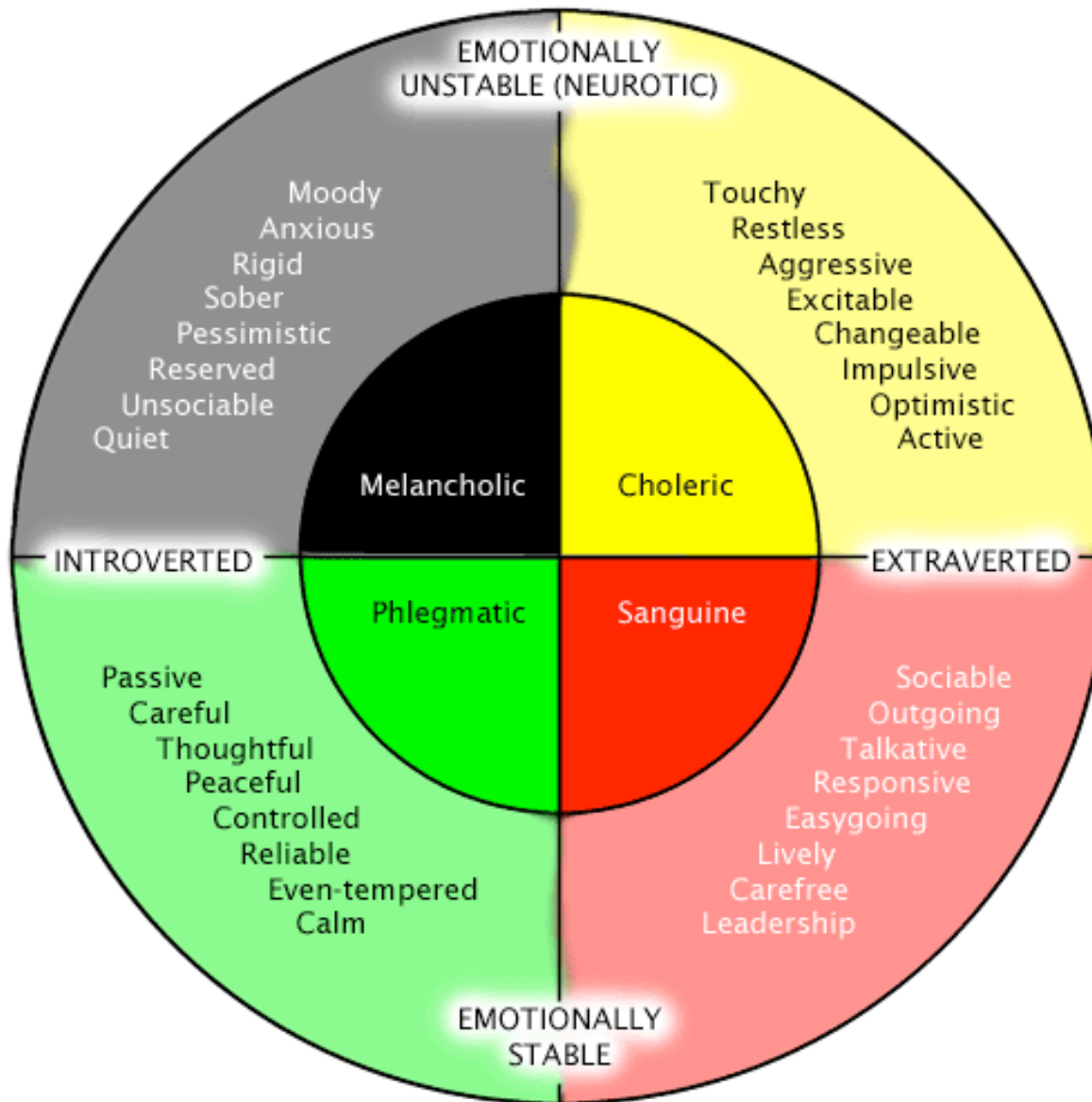
Interest in the 4 temperaments continues today (c.f. wiki)



Wundt's dimensional analysis

	Changeability	
Exciteability	Melancholic	Choleric
	Phlegmatic	Sanguine

Eysenck's dimensional organization

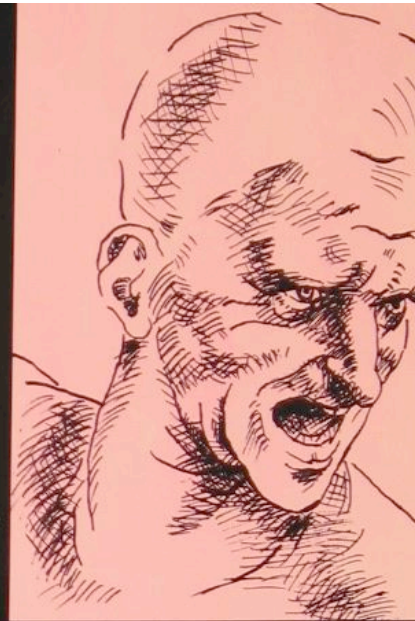


Eysenck, H.J and Eysenck, M.W. *Personality and Individual Differences*.

Melancholic



Choleric

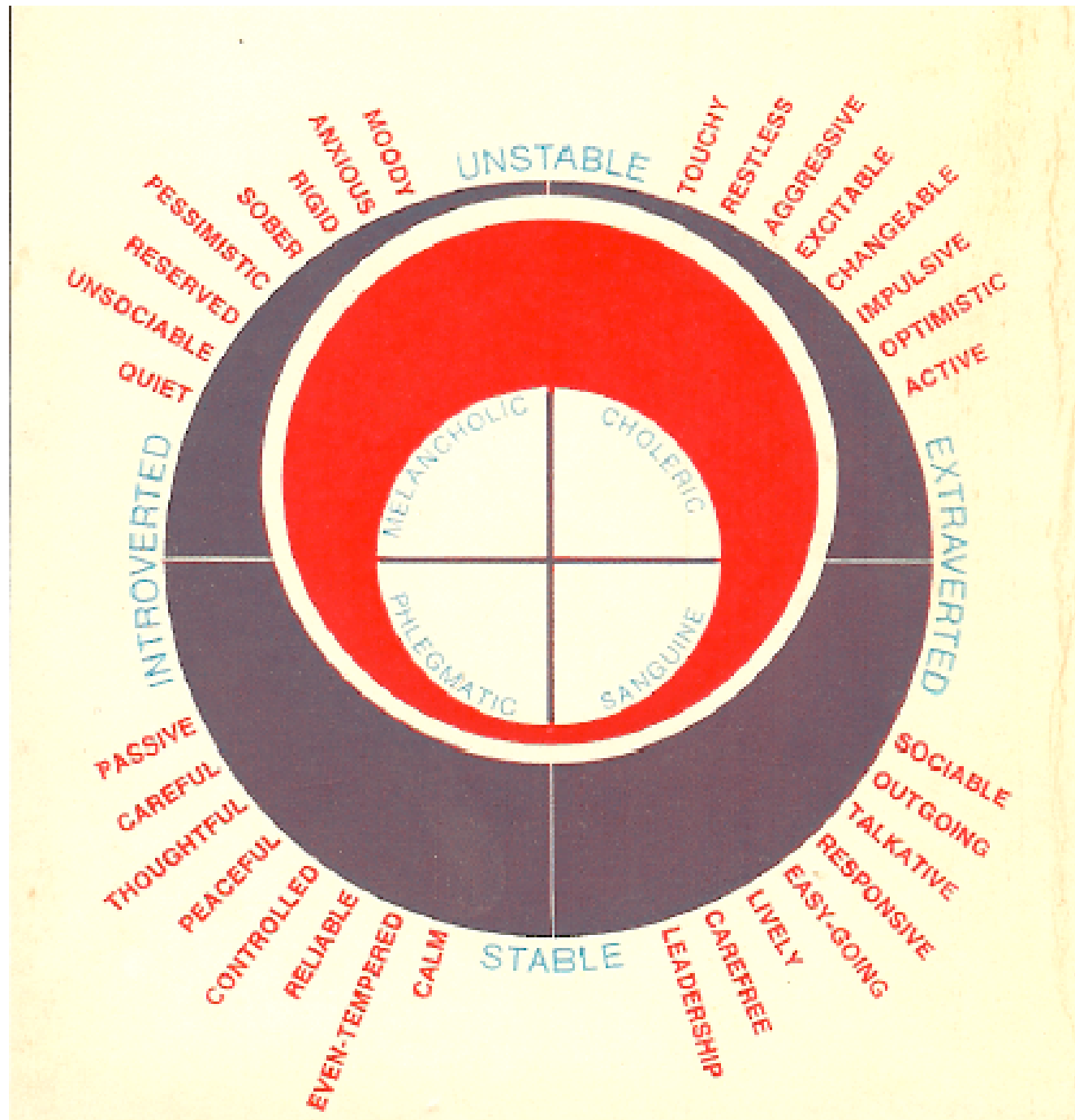


Phlegmatic



Sanguine



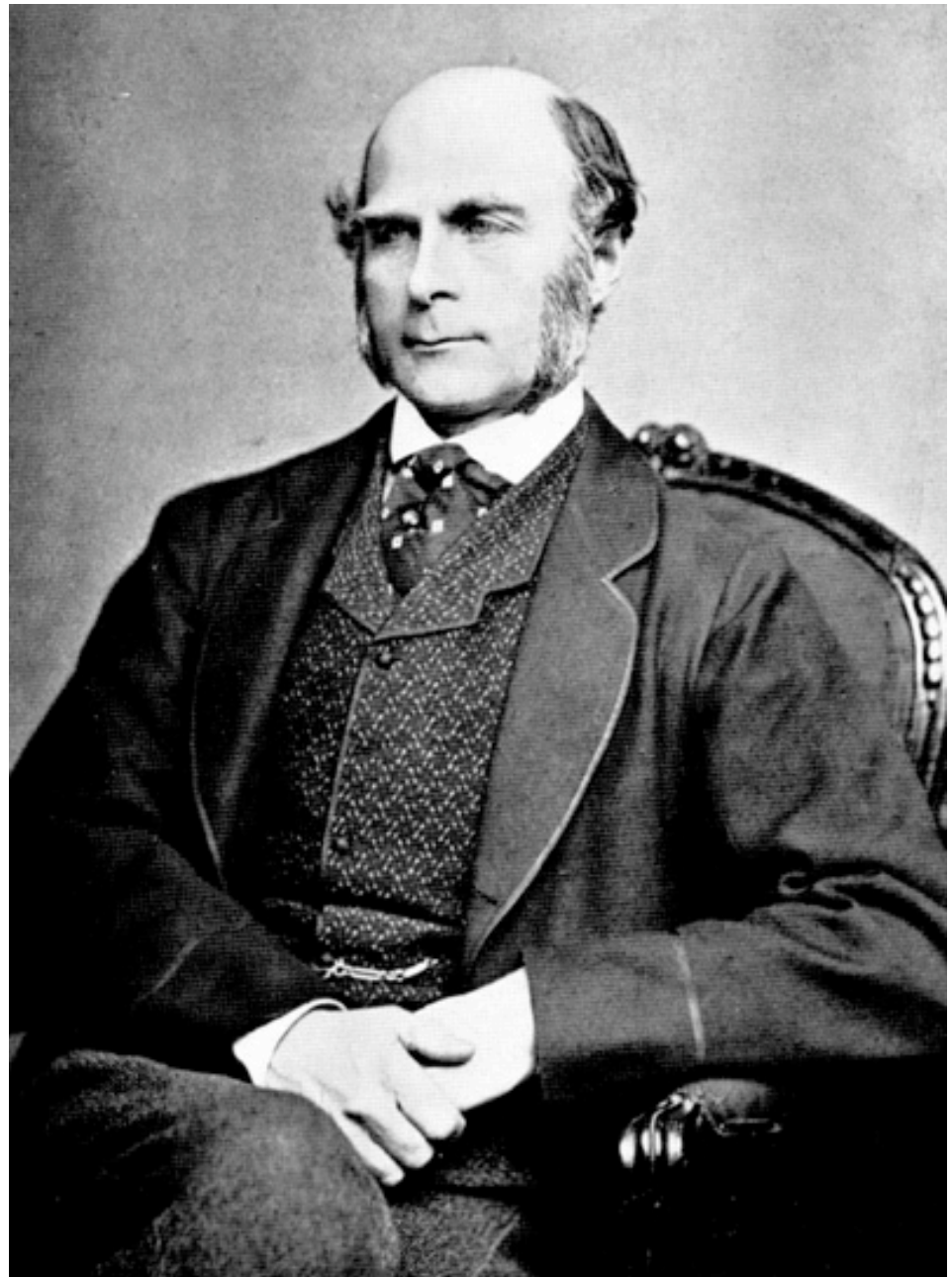


Individual differences come of age: Measurement and experiments

I. Francis Galton and regression

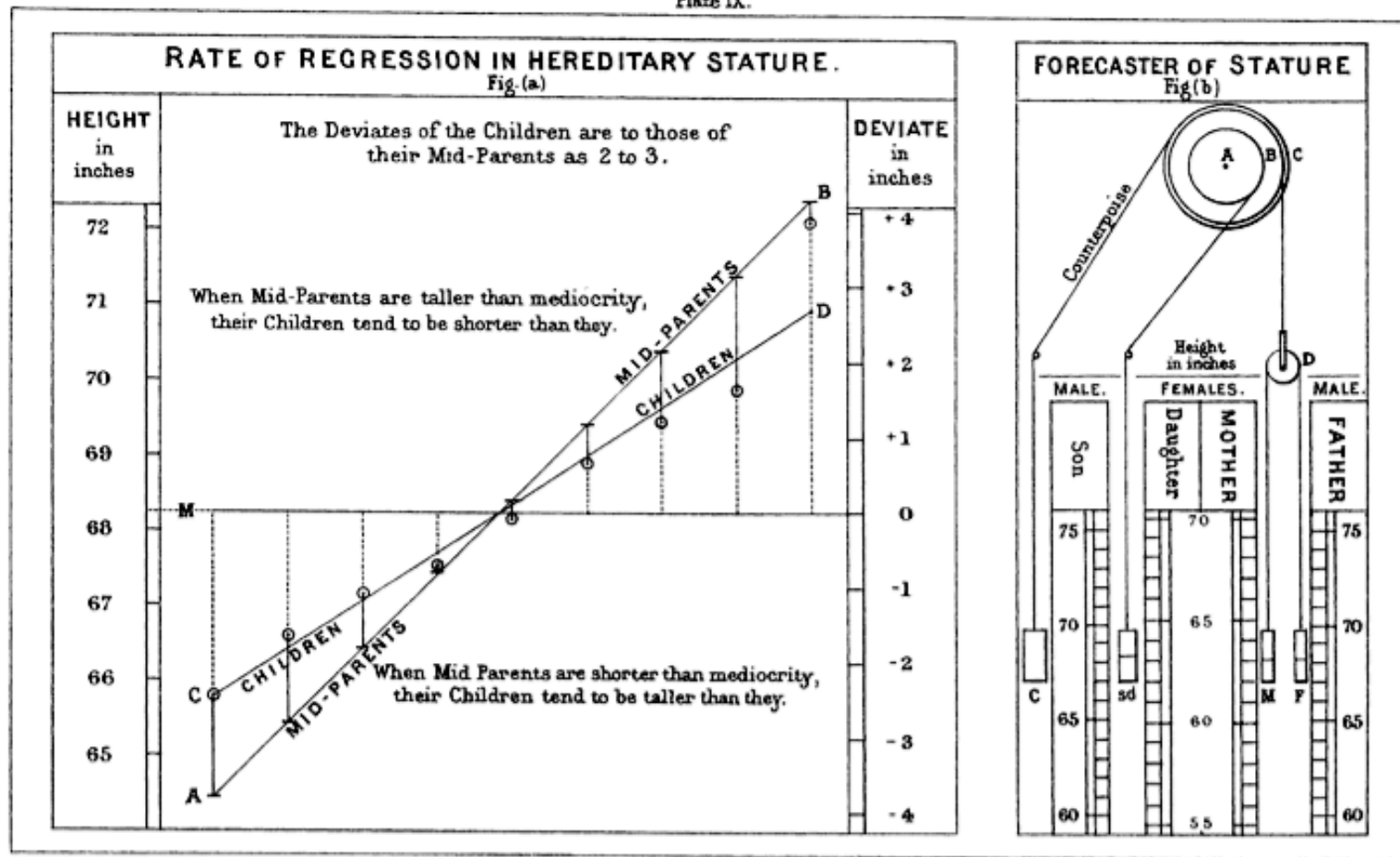
II. Wilhelm Wundt and experimental
methods

Francis Galton 1822-1911

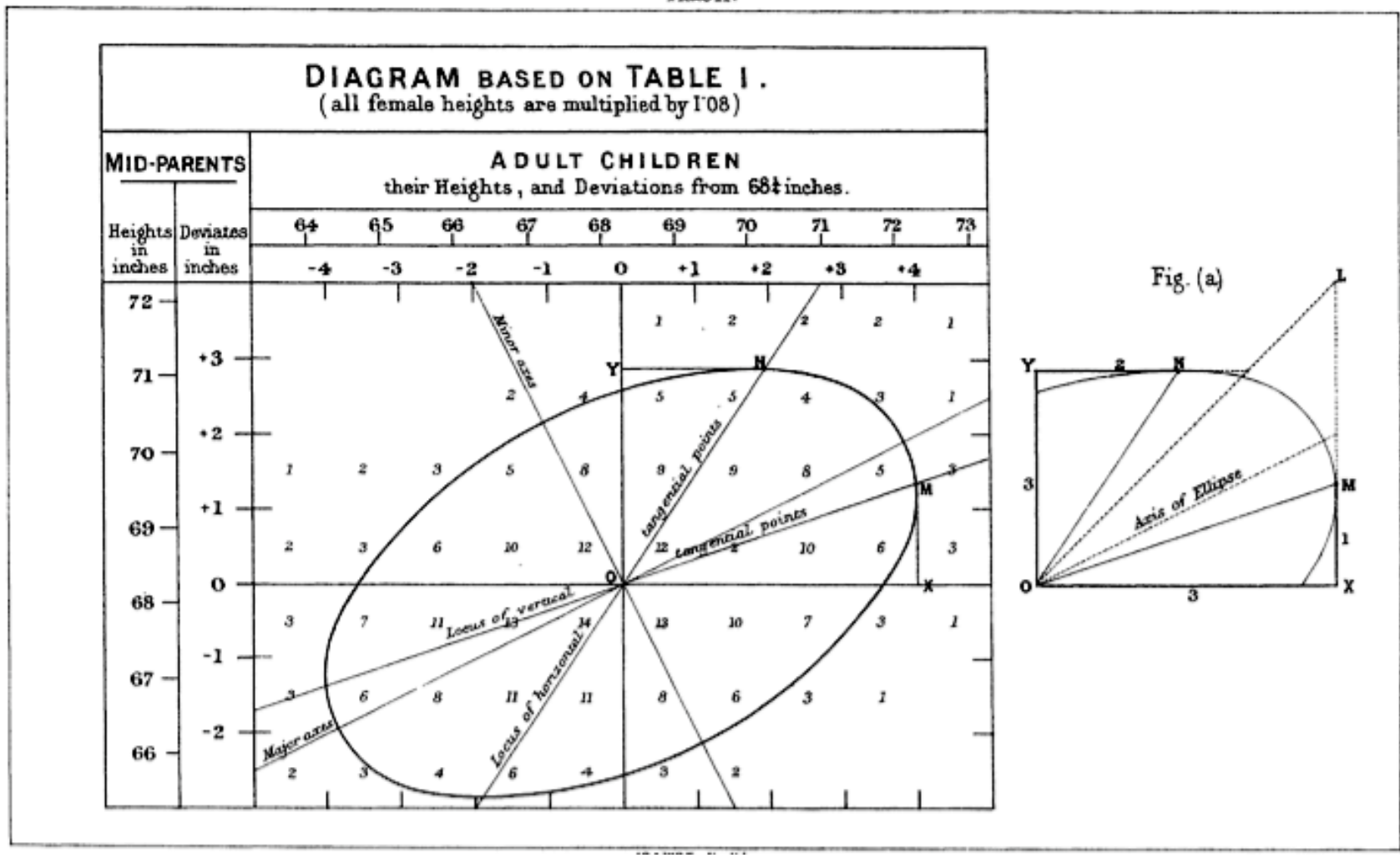


Galton and Regression

Plate IX.



Galton and Regression



Wilhelm Wundt

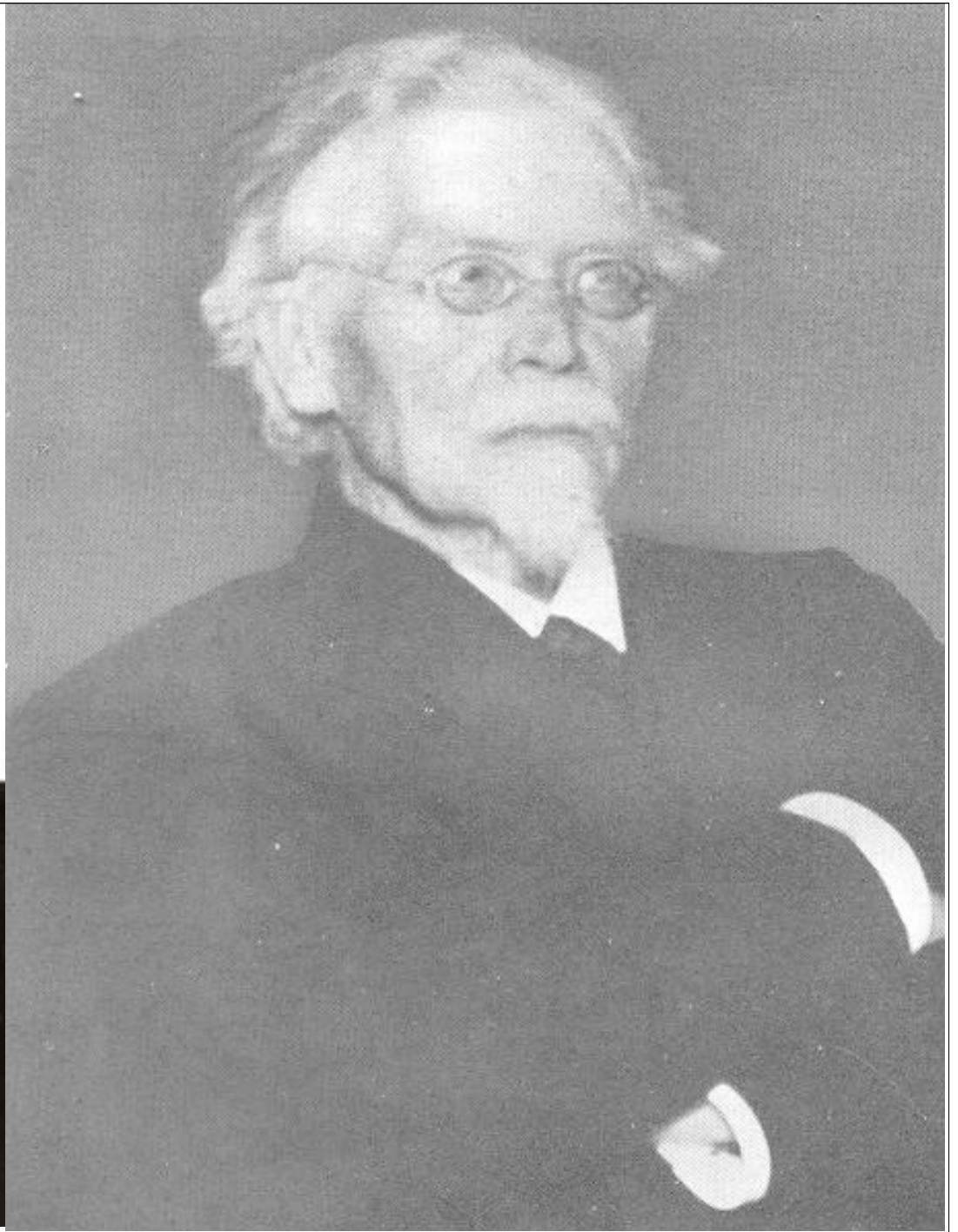
1832-1920

- Basic Experimental Paradigm
- 3 factor theory of emotion
- Hedonic theory



Gerard Heymans (1857-1930)

- Empirically based research
- 3 dimensions of personality



Gerard Heymans (1857-1930)

- Empirically based research
 - 3000 (Dutch) doctors were asked to rate all members of a family on a large number of traits
 - ≈ 400 responded with ratings on 2,523 subjects
- Three dimensions
 - Emotionality or Emotional Instability
 - Activity or general drive
 - Dominance of primary or secondary functioning

Heymans taxonomy

(from Eysenck, 1992)

	Emotionality	Activity	P/S	Jung
Apathetic	-	-	S	Sensitive I
Amorphous	-	-	P	Intuitive I
Phlegmatic	-	+	S	Intuitive E
Sanguine	-	+	P	Sensitive E
Passionate	+	+	S	Thinking E
Choleric	+	+	P	Feeling E
Sentimental	+	-	S	Feeling I
Nervous	+	-	P	Thinking I

Mid - late 20th Century Measurement and theory testing

I. John Atkinson

II. Donald Broadbent

III. Raymond Cattell

IV. Hans Eysenck

V. Jeffrey Gray

John Atkinson

1924-2003

I. Theory of Achievement Motivation

- A) Individual differences and general laws
- B) Theory testing through experimentation

II. Theory of the Dynamics of Action

- A) Inertial properties of motivations and desires
- B) Introduced the concept of personality traits as rates of change in psychological states

Donald E. Broadbent

1926-1993

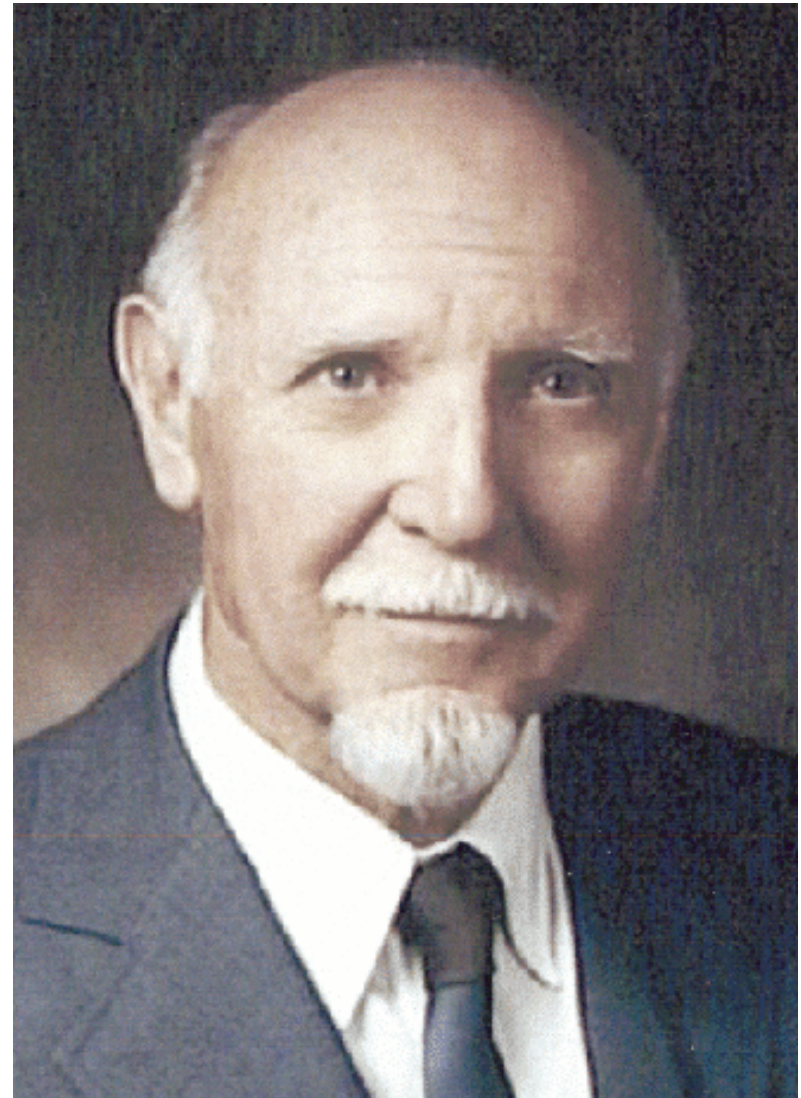
- I. Cognitive experiments showed individual differences interacting with situational determinants of attention and performance
- II. Experimental work on arousal theory inspired work by Eysenck and others

Raymond Cattell

1905- 1998

Founding President:
Society for Multivariate
Experimental Psychology

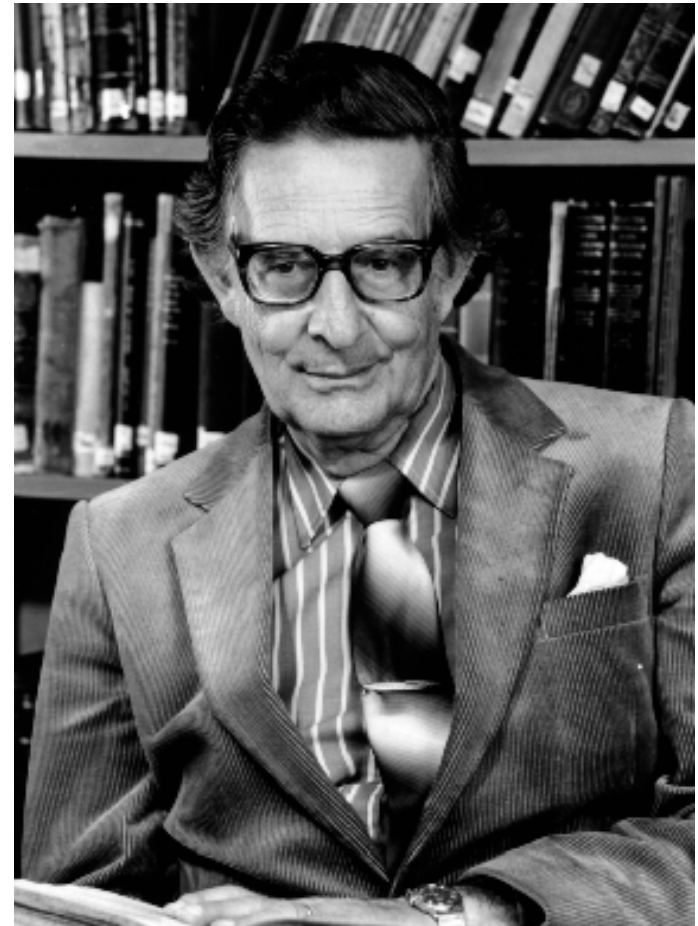
- Primarily
multivariate, little
“experimental”



Hans J. Eysenck

1916-1997

Founding President: International Society for the Study of
Individual Differences



Cronbach, Eysenck and the two disciplines of scientific psychology

I. Cronbach (1957, 1975) and Eysenck (1966, 1983, 1997) argued for the unification of the two disciplines of experimental and correlational approaches

II. Is it possible?

III. Are we doing it?

Is it possible to do Experimental Personality?

- I. Individuals can not be assigned to personality conditions
- II. Experimental designs test person x condition interactions
- III. Can combine general laws with theories of individual differences

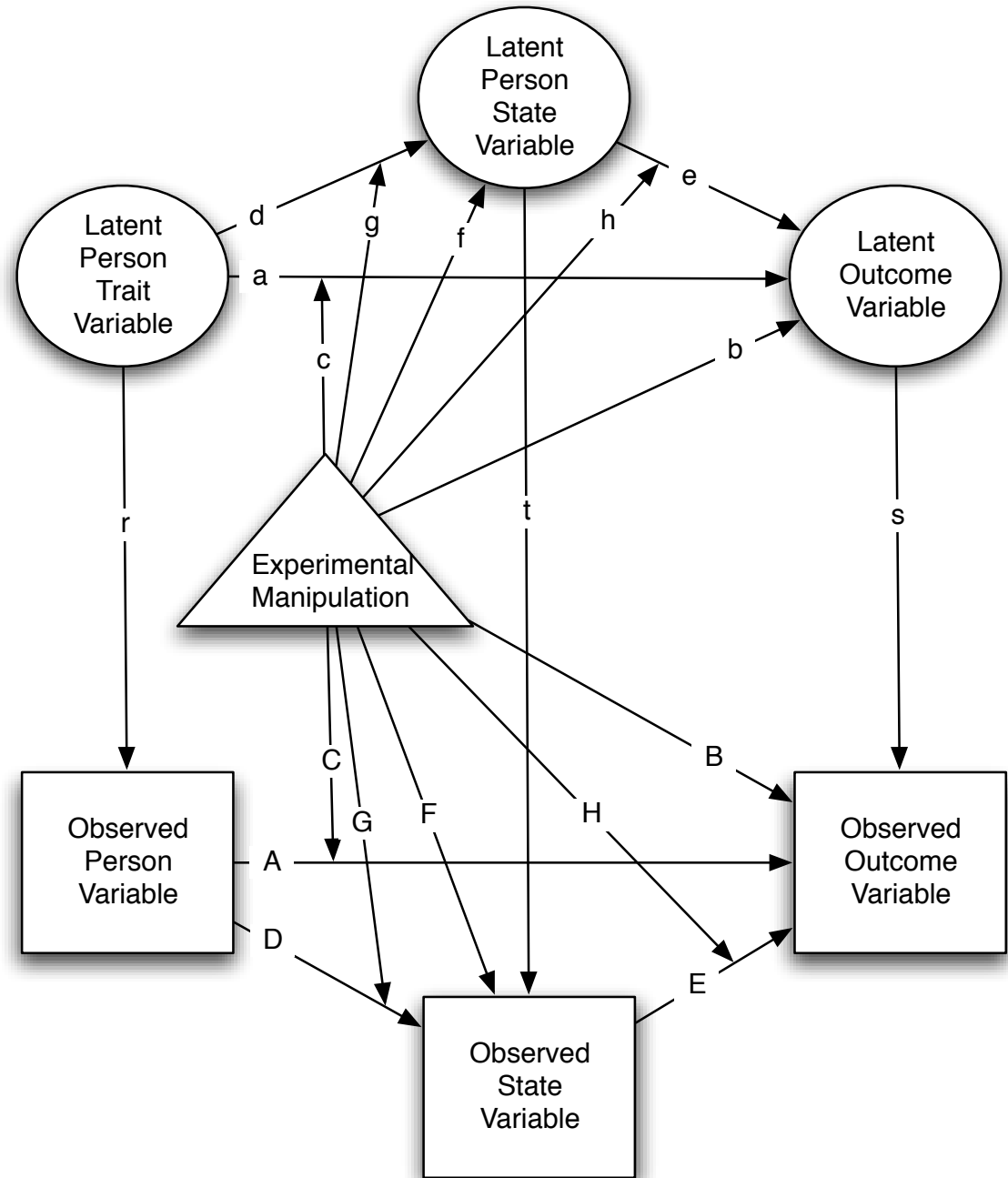
Few studies use experimental techniques or study IQ reported in our journals

Journal	Total	Exper.	IQ	Exp%	IQ%
EJP	68	0	2	0	3
JoP	125	7	1	6	1
JPSP	280	26	3	9	1
JPSP-PID	92	26	3	28	3
JRP	102	16	1	16	1
PaID	586	73	47	12	8

Revelle, W. and Oehlberg, K. (in press) Integrating experimental and observational personality research: the contribution of Hans Eysenck , Journal of Personality.

The basic logic of a personality experiment

Observed paths (A-H) are estimates of latent paths (a-h) and are affected by reliability (r, s, t)



Testing Personality Theory with experimental methods

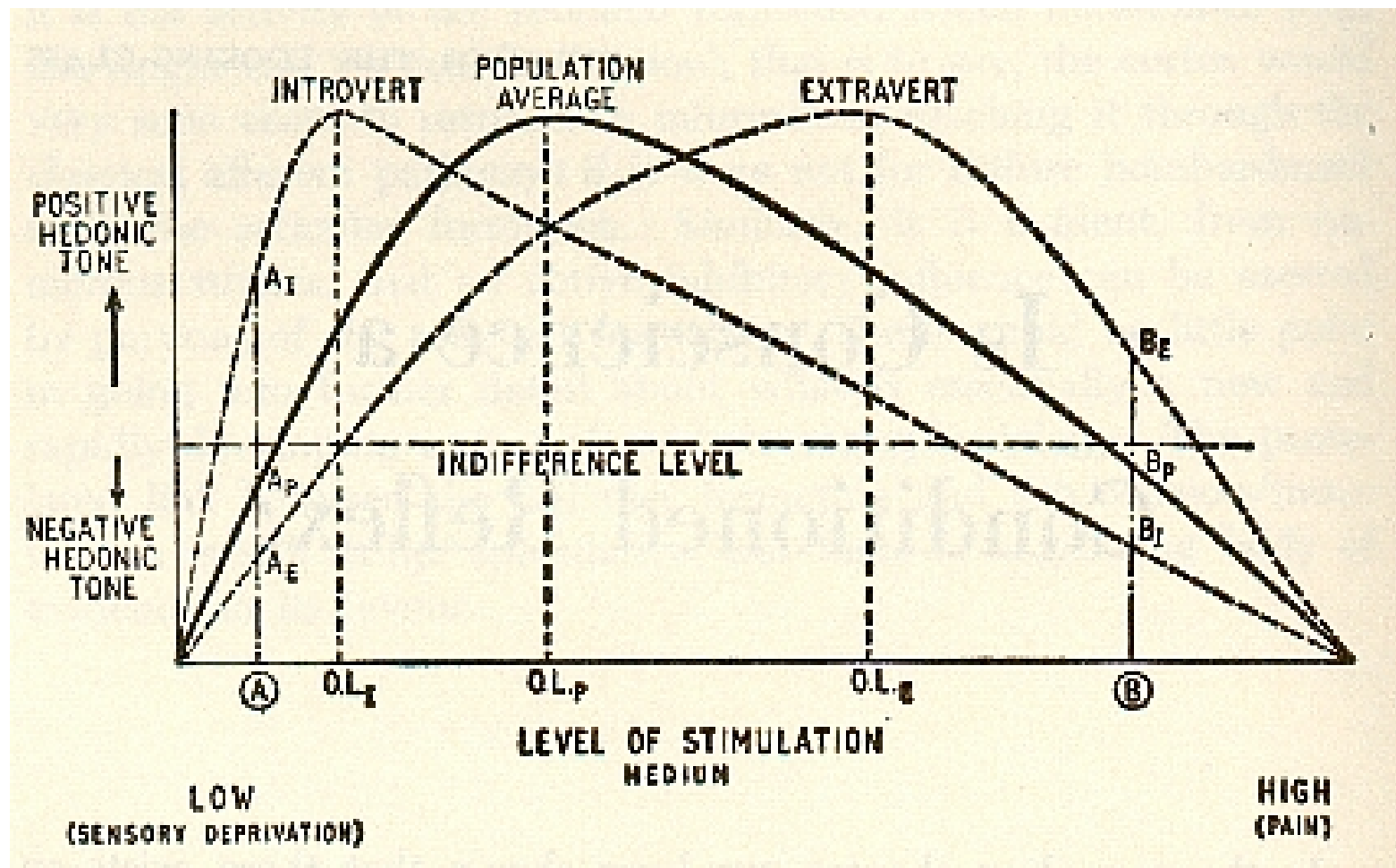
I. Eysenck's theory of extraversion and arousal

A) Preferences

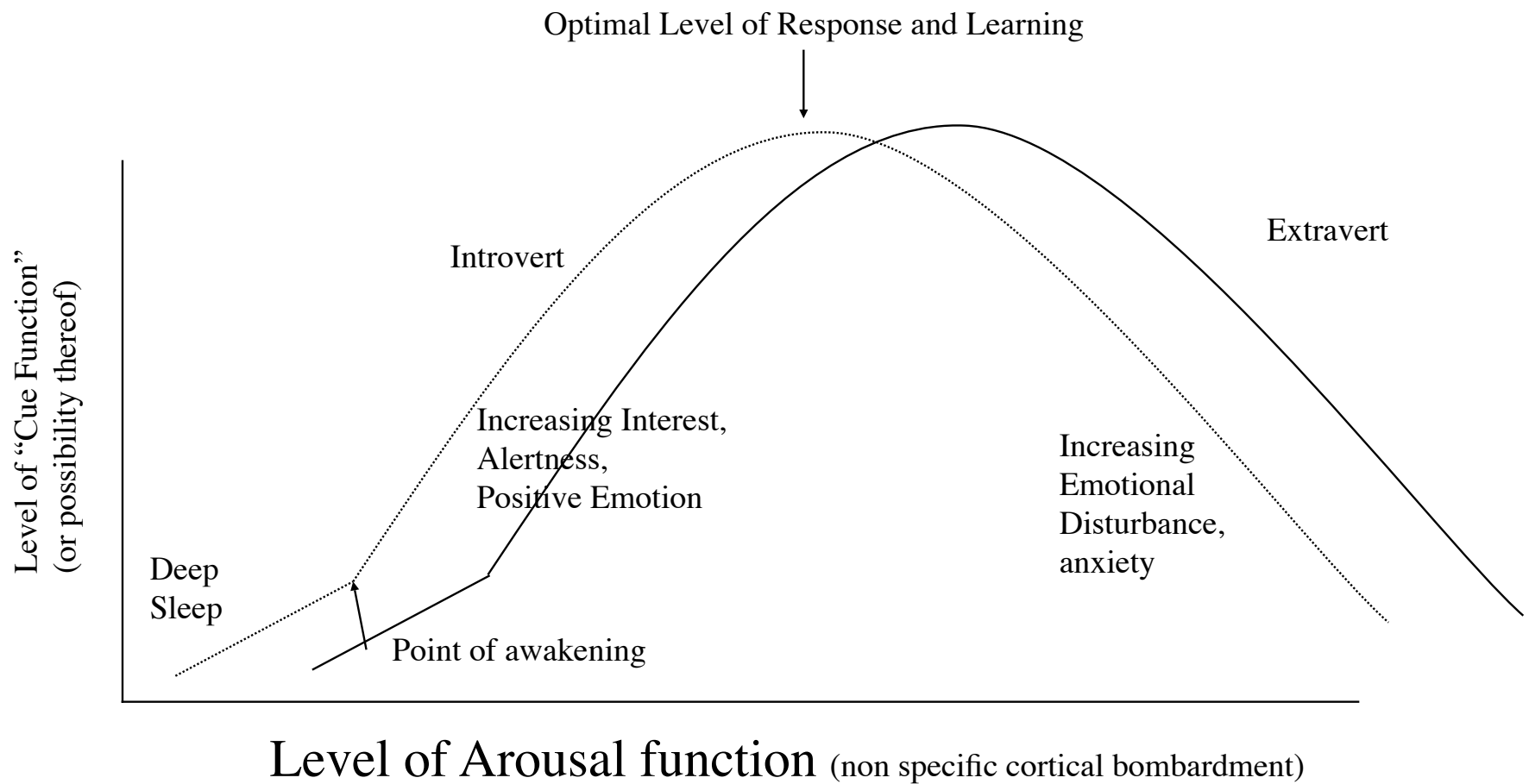
B) Performance

II. Gray's theory of sensitivity to reward and punishment cues

Eysenck and Wundt curve



Eysenck + Hebb (1967)



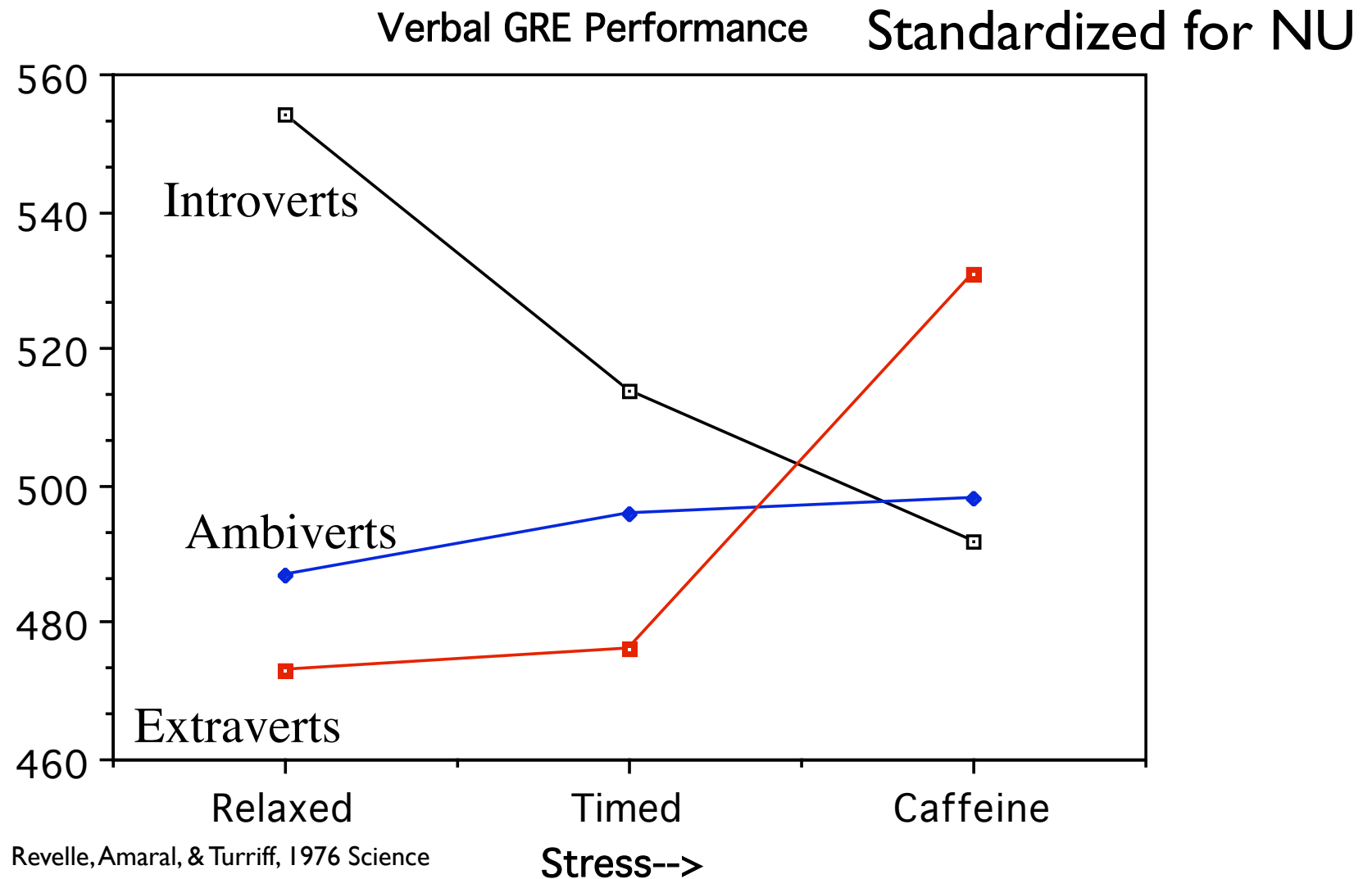
Experiments test limits of generality

- I. If a personality dimension interacts with a manipulation, then we are able to define the limits of the individual difference
- II. Interactions allow us to exclude alternative hypotheses

Introversion and cognitive performance

- I. Introverts do better on exams in relaxed conditions than extraverts.
- II. Is this because they are smarter?
- III. No, because experimentally we can show this effect reverses under time stress and caffeine

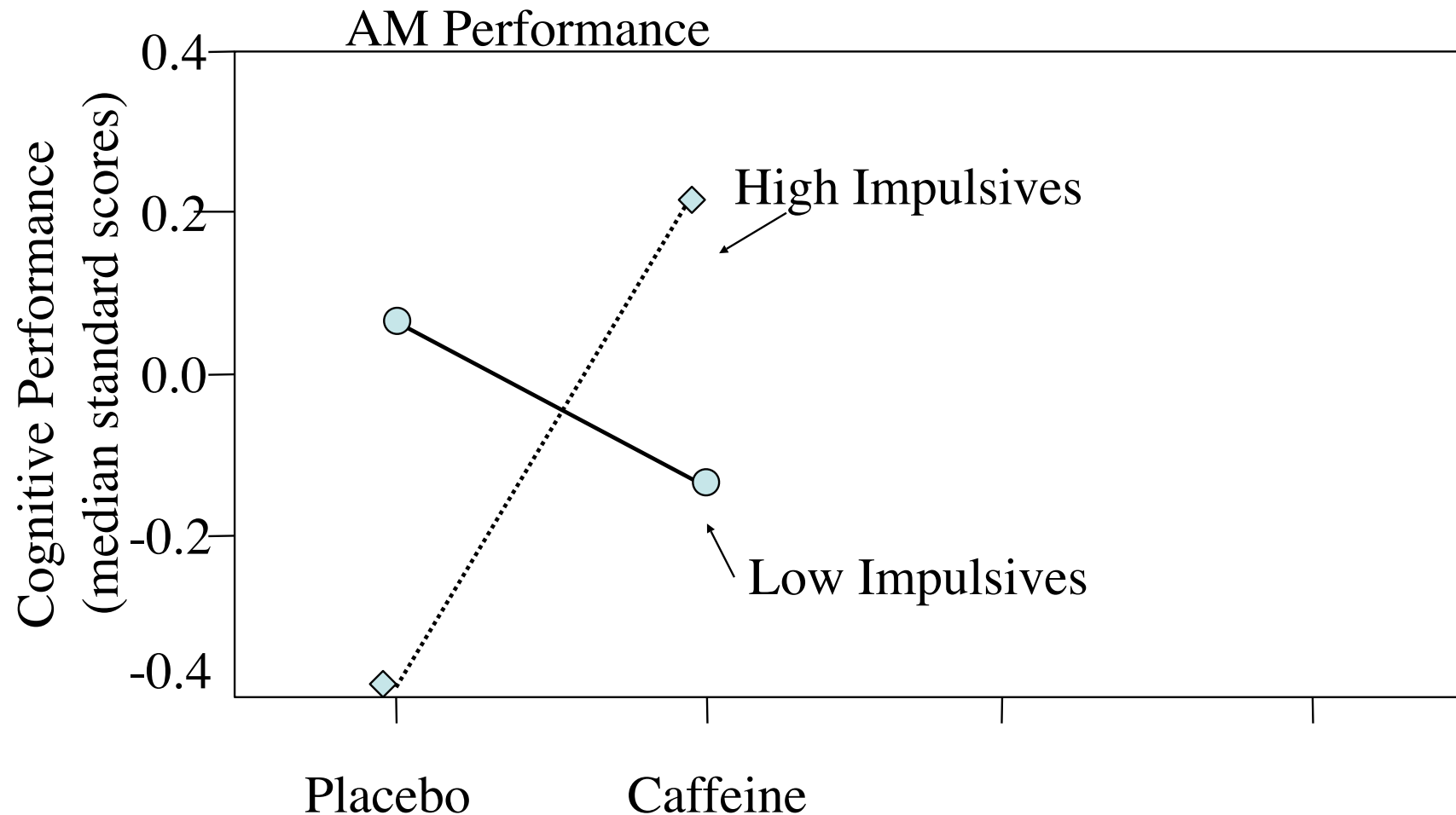
Introversion, time pressure, and caffeine: effect on verbal performance



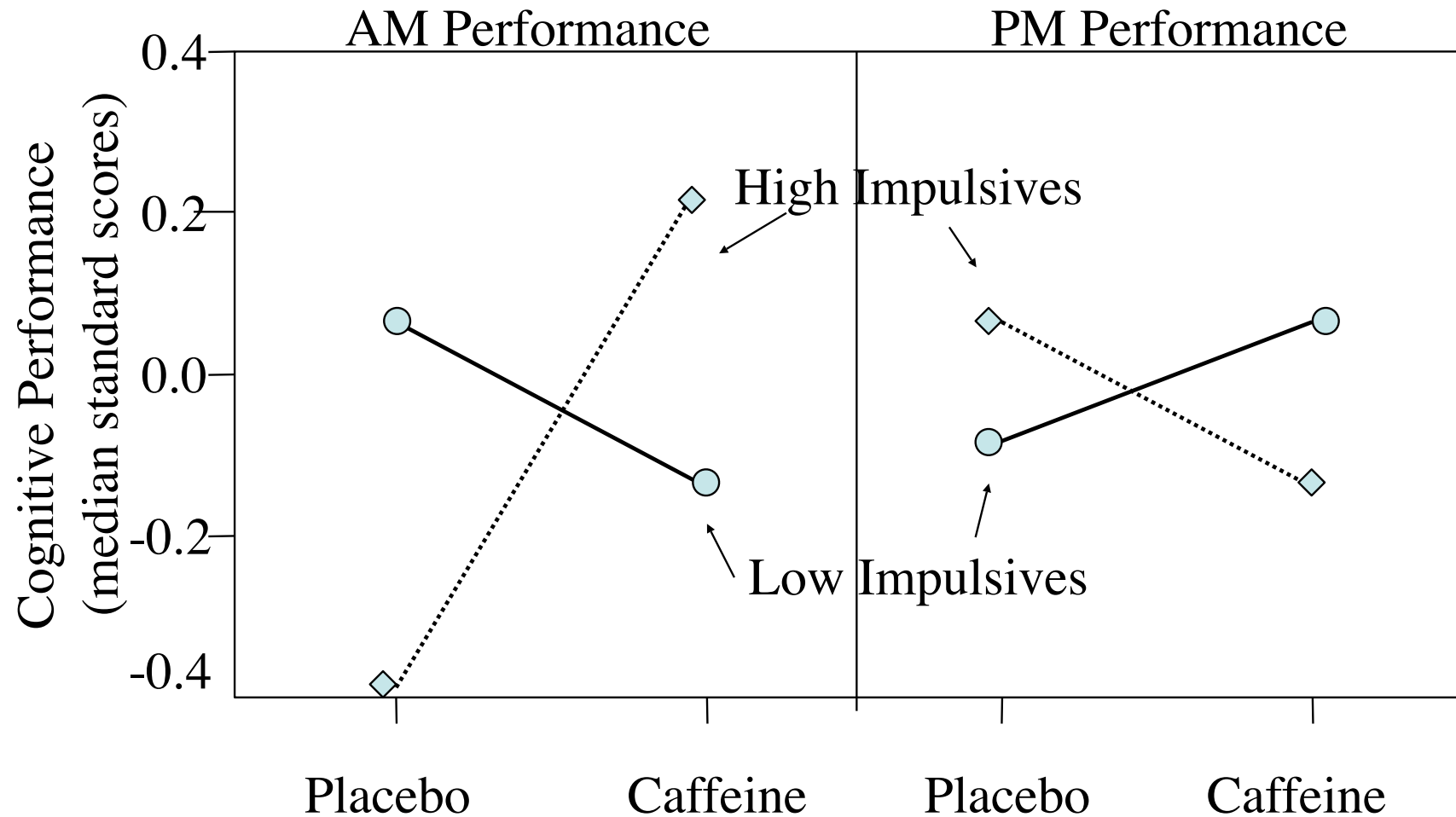
Does this support Eysenck's hypothesis?

- I. Yes, but further studies limit this effect and show an interaction with time of day
- II. This interaction tests and finds the limit of the overall trait effect

Impulsivity, Caffeine, and Time of Day: the effect on complex cognitive performance



Impulsivity, Caffeine, and Time of Day: the effect on complex cognitive performance



Extraversion vs. Impulsivity

- Caffeine effects were systematic, but not for extraversion, but rather for impulsivity
- Systematic interaction with time of day
- Implications
 - Performance does vary as function of personality and arousal, but depends upon time of day
 - Personality dimension of relevance was impulsivity
- Experimental studies allowed us to limit the generalization of the personality trait

The field of personality and individual differences is strong

I. After a long dry period, personality is becoming an active endeavor again in the US.

II. Europeans (and others) continued the tradition of theory and research in individual differences

Differential Psychology is more than “personality”

I. Intelligence

II. Sex

III. Age

IV. Ethnicity

V. Culture

Intelligence and mortality

I. Ian Deary: IQ, SES and mortality

II. Linda Gottfredson: Life as an IQ test

III. Is “Health Literacy” more than IQ?

Genetics of Individual Differences

- I. Major Behavior Genetic studies (e.g. GOSAT) are being conducted
- II. Specific target gene analyses are being replicated across labs.
- III. Gene x Gene and Gene x Environment interactions are being replicated and becoming more common

Individual differences in Cognitive-Neuro functioning

I. Richard Haier and PET scanning

II. Aljoscha Neubauer and MRI/EEG
imaging of cognitive functioning
-- individual differences in brain
activation

III. Neuro-endocrinology

New technologies lead to new methodologies: The example of the Web

I. Public domain materials: IPIP

II. Web based assessment: SAPA

III. Public domain software: R

International Personality Item Pool: a collaboratory

- I. Lew Goldberg's <http://ipip.ori.org>
provides > 2000 items used in
personality inventories organized by
scale
- II. Item statistics and correlations with
various criteria available from Lew
Goldberg

Synthetic Aperture Personality Assessment (SAPA)

- I. Takes advantage of web for subject recruitment (currently $> 70,000$)
- II. Gives each participant a small subsample (50+) of IPIP + ? items
- III. Builds up item statistics across (>300) items for $> 70,000$ subjects

SAPA uses open source code

- I. Written in HTML/PHP and uses MySQL for data storage
- II. Analyzed using the open source statistics package R.

SAPA allows detailed analysis of multiple domains

I. Structure of personality items and relationship to new constructs

II. IQ estimates

III. Sex differences

IV. Ethnic differences

SAPA measures

I. Demographics: age, sex, education, country

II. Base measures: “Big 5” CANOE

III. IQ items, validated with (self reported) SAT/ACT

A) “homegrown” IQ items

B) self reported SAT/ACT/SATv/SATq

IV. Other constructs

Synthetic Aperture Personality Assessment: other constructs examined

I. Music preferences

II. Trust/Trustworthiness

III. Right Wing Authoritarianism

IV. Promotion and Prevention Focus

V. Verbal versus quantitative reasoning

Items with largest correlation with gender

0.28	(Like) Broadway Musicals (e.g. Rent, Cats, Phantom of the
0.27	Get overwhelmed by emotions.
0.26	Get stressed out easily.
0.25	(Like) Broadway, Movie and TV Soundtrack Music in General
0.24	Am concerned about others.
0.23	Sympathize with others' feelings.
0.22	(Like) Top 40/Pop Vocal Music (e.g. Kelly Clarkson, Madonna,
0.22	Panic easily.
0.22	Worry about things.
0.2	Feel others' emotions.
0.2	Inquire about others' well-being.
-0.2	Believe that I am better than others.
-0.17	Am not easily bothered by things.
-0.17	Feel little concern for others.

Non-IQ items predict g

0.26	(Like) Opera (e.g. Verdi, Wagner, Puccini)
0.26	Am quick to understand things.
0.25	Have a rich vocabulary.
-0.25	Have difficulty understanding abstract ideas.
0.24	(Like) Big Band/Swing (e.g. Glenn Miller, Duke Ellington)
-0.24	Am not interested in theoretical discussions.
0.24	Believe that I am better than others.
0.23	Love to read challenging material.
0.23	Believe in the importance of art.
0.22	Can handle a lot of information.
0.22	(Dislike) Gospel Style Country (e.g. Del Way, Carroll Roberson,
-0.22	Avoid philosophical discussions.
-0.22	Try to avoid complex people.
0.22	(Like) Modern Electronic Music (e.g. Jean-Michel Jarre,
0.21	Use difficult words.
0.2	Tend to vote for liberal political candidates.

Relating cognitive and non-cognitive personality

	C	A	N	O	E	ACT	SAT	SAT	g
Consc	<i>0.92</i>	0.27	-0.17	0.11	0.15	-0.02	-0.08	-0.02	0.01
Agree	0.25	<i>0.90</i>	-0.20	0.22	0.44	-0.07	-0.07	-0.12	0.02
Neurot	-0.16	-0.18	<i>0.93</i>	-0.16	-0.31	-0.03	-0.02	-0.09	-0.11
Open	0.1	0.20	-0.14	<i>0.87</i>	0.33	0.35	0.39	0.25	0.33
Extrav	0.14	0.40	-0.28	0.30	<i>0.93</i>	-0.03	-0.06	-0.07	-0.08
ACT	-0.02	-0.07	-0.03	0.32	-0.03	<i>1.00</i>	0.56	0.59	0.50
SATV	-0.08	-0.07	-0.02	0.37	-0.06	0.56	<i>1.00</i>	0.59	0.33
SATQ	-0.01	-0.11	-0.09	0.24	-0.07	0.59	0.59	<i>1.00</i>	0.43
g	0.01	0.01	-0.09	0.28	-0.07	0.45	0.30	0.39	<i>0.81</i>

alpha reliabilities on diagonal, disattenuated correlations above diagonal₄

Predicting Aptitude Tests

Openness and Verbal

	SAT	ACT	SATV	SATQ
β Open	0.19	0.21	0.31	0.14
β g	0.33	0.39	0.21	0.35
R	0.42	0.49	0.42	0.41
R ²	0.18	0.24	0.18	0.17

Open Source and Public Domain Software

I. Open source software allows us to share statistical algorithms across the web. An example is R.

II. R has been developed over the past 12 years by statisticians around the world and has become a standard for statistical computing.

R: Statistics for all of us

I. R packages are available for free
for all computer platforms

A) Factor analysis, cluster analysis, IRT,
Multilevel modeling, structural equations,
Multidimensional Scaling, etc.

B) What is not yet available can be created
easily

Differential Psychology in the future

I. New technologies for measurement

- A) ambulatory assessment of psychophysiology
- B) time intensive data collection

II. New statistical procedures

- A) multilevel analysis
- B) dynamic modeling

III. Revised theories

An example of theory revision: Reinforcement Sensitivity Theory

I. J. A. Gray (1972, 2002)

II. Philip Corr, Alan Pickering, Luke
Smilie

Promising Developments

- I. Handbook of Personality Research
(Robbins, Fraley & Krueger, 2007)
- II. Roadmap for new methodologies in
behavioral science (NIH)

