

Announcements (2/18/06)

- Electricity Test Today
 - Class resumes at 4 pm
- Information on Papers
- 3x5s
- Skin Conductance Applications

Applications

- Orienting (Bauer, 1984; Tranel and Damasio, 1985)
- Fear conditioning (Öhman)
- Individual Differences in Neuroticism
- Deficient anticipatory anxiety in psychopathy (Hare)
- Deception Detection (Myriad authors)

Neuroticism

- A trait-like tendency to experience negative affect and for increased reactivity to stress and aversive stimuli
- Would skin conductance reflect greater physiological reactivity to negative stimuli, and poorer physiological recovery?

Norris, Larsen, & Cacioppo (2007), *Psychophysiology*

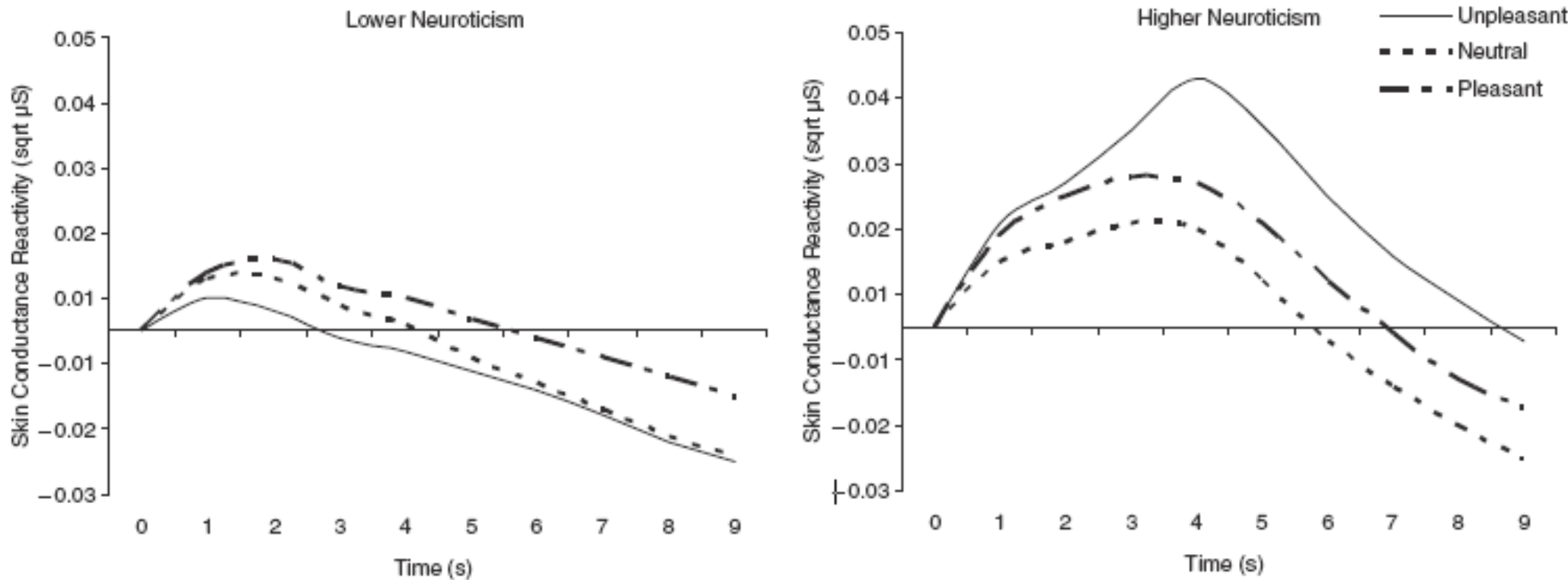
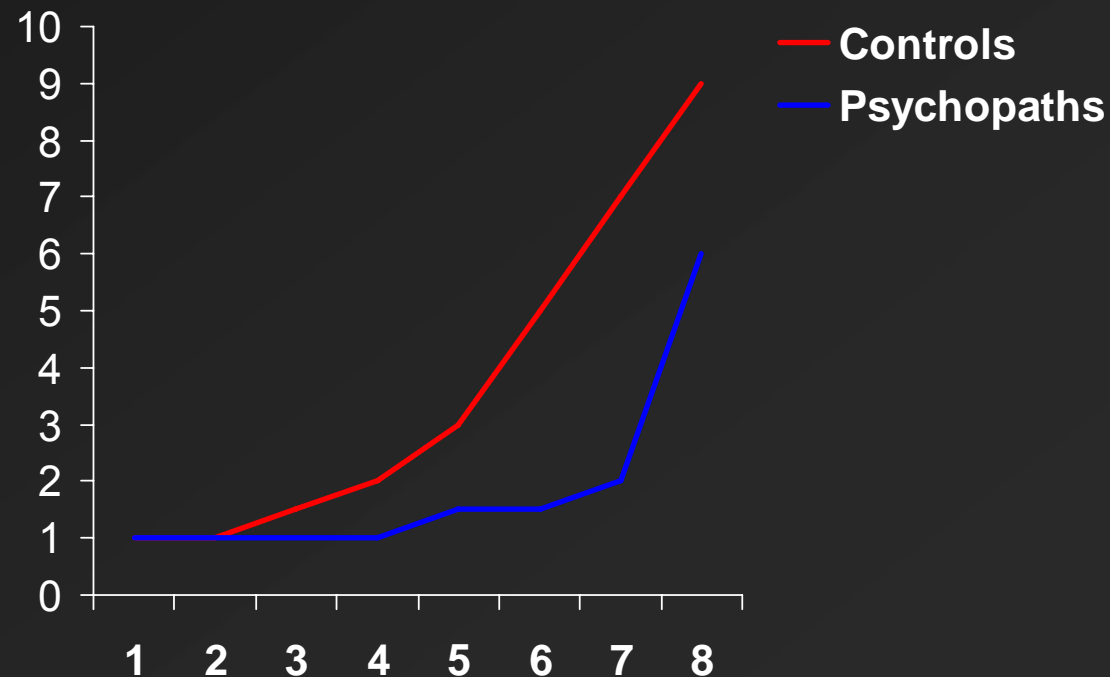


Figure 1. Skin conductance reactivity as a function of picture valence, time, and neuroticism. Pictures were presented from 1–6 s. Estimated means for participants lower (1 *SD* below the mean) and higher (1 *SD* above the mean) in neuroticism are plotted separately.

Anticipatory Arousal in Psychopathy

- Hare Countdown Task (1965)
- #'s appear from 1..8
- At "8" punishment is given (shock):



*Lie Detection: The Problematic
Polygraph Test and Some
Alternatives*





People Sometimes Lie



An Armchair Taxonomy Of Lies

- Little Harmless Lies
 - The Social Graces
- All Other Lies
 - Accusations
 - about parental habits
 - about fidelity
 - about abuse: physical, sexual
 - Inaccuracies
 - income
 - assets
- Denials
 - about parental habits
 - about fidelity
 - about abuse
- about income
- about assets

The Difficulty in Detecting Lying

<u>Observer Group</u>	<u>Accuracy</u>
Secret Service	64.1
Federal Polygraphers	55.7
Robbery Investigators	55.8
Judges	56.7
Psychiatrists	57.6
Special Interest	55.4
College Students	52.8

^achance = 50%

from Eckman & O'Sullivan, 1991

The Polygraph and the American Psyche

Lady 1: [My coworker]'s husband is being sent to polygraph school in Atlanta for three weeks so he can give the polygraph test.

Lady 2: Cool! That's like the test that can read your mind, right?

Conversation overheard in W. Lafayette, Indiana, December, 1990

What we, the American people, are witnessing is the beginning of the end of mankind's search for an honest witness. For the first time in the history of civilization, mankind has the opportunity to prove beyond a reasonable doubt the veracity of his testimony through a generally accepted and scientific (sic) valid examination of his own psyche. God gave us the polygraph.

Michael B. Lynch, in *Polygraph*, The Journal of the American Polygraph Association, 1975

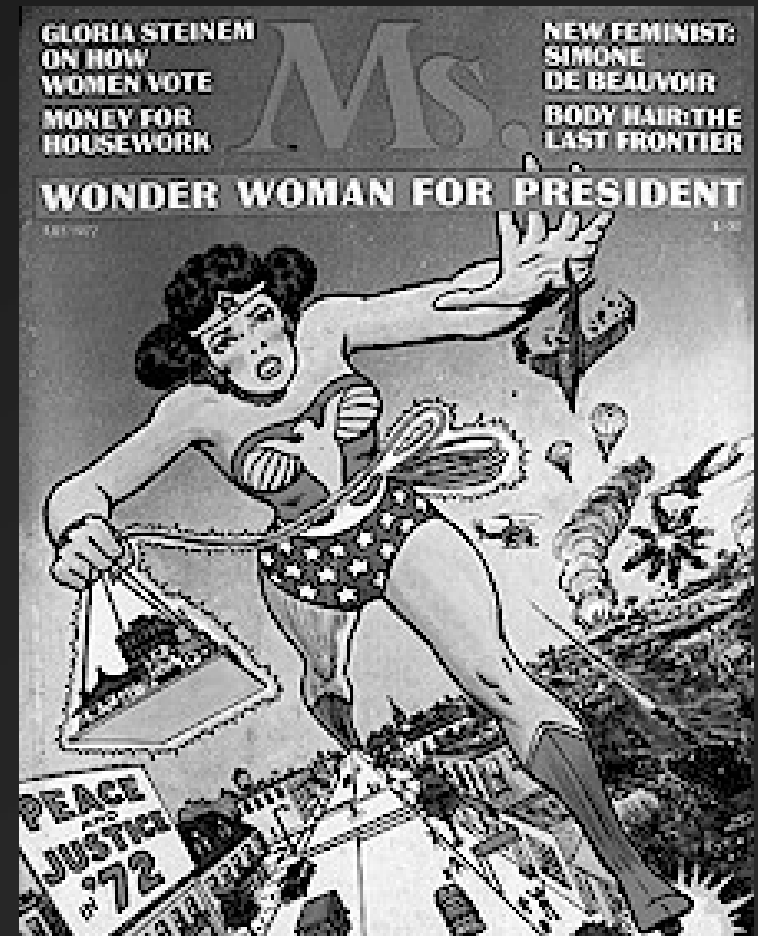
Media Portrayals:

[Political Ad](#)

[Entertainment](#)



- Polygraph invented in 1915 by Harvard-trained Ph.D., LL.B. William Moulton Marston
- Claimed it could detect lies by measuring blood pressure
- Not his main claim to fame



The Polygraph Test

➤ Fundamental assumption is that physiological responding:

➤ differs when one is truthful versus being deceptive,

or

➤ demonstrates a specific physiological “lie response.”

Uses (and abuses) of Polygraph Tests

➤ **Specific Incident Investigations**

- Criminal Investigations: Defendants, Complainants, Witnesses
- Insurance Claims Investigations
- Investigating Prison Inmates Accused of Violating Rules
- Substantiation of Claims Made in Civil Suits
- Paternity Suits

➤ **Screening Situations**

- Pre-employment Screening
- Screening of Current Employees
- Child Custody Cases
- Convicted Sex Offenders

➤ **Employee Polygraph Protection Act (EPPA; 1988)**

- Prohibits Screening Tests for employment in private sector
- Allows tests for those reasonably suspected of involvement in a workplace incident
- “Friendly” Tests to the currently employed and to criminal defendants still permitted
- Federal, State, and Local Government Employers, Federal Contractors, and Police can still use for screening!

➤ **Expansion of Testing?**

- *National Defense Authorization Act* of 2000 requires scientists at nuclear weapons laboratories to submit to polygraph tests to maintain their security clearance

Instrumentation and Measures

- Polygraph examinations involve multi-channel recorders in a flightcase.
- Typically recorded:
 - Respiration
 - Cardiovascular activity (BP, HR)
 - Skin resistance
- These measures:
 - provide an indication of changes in autonomic activity
 - do *not* index the "lie response"

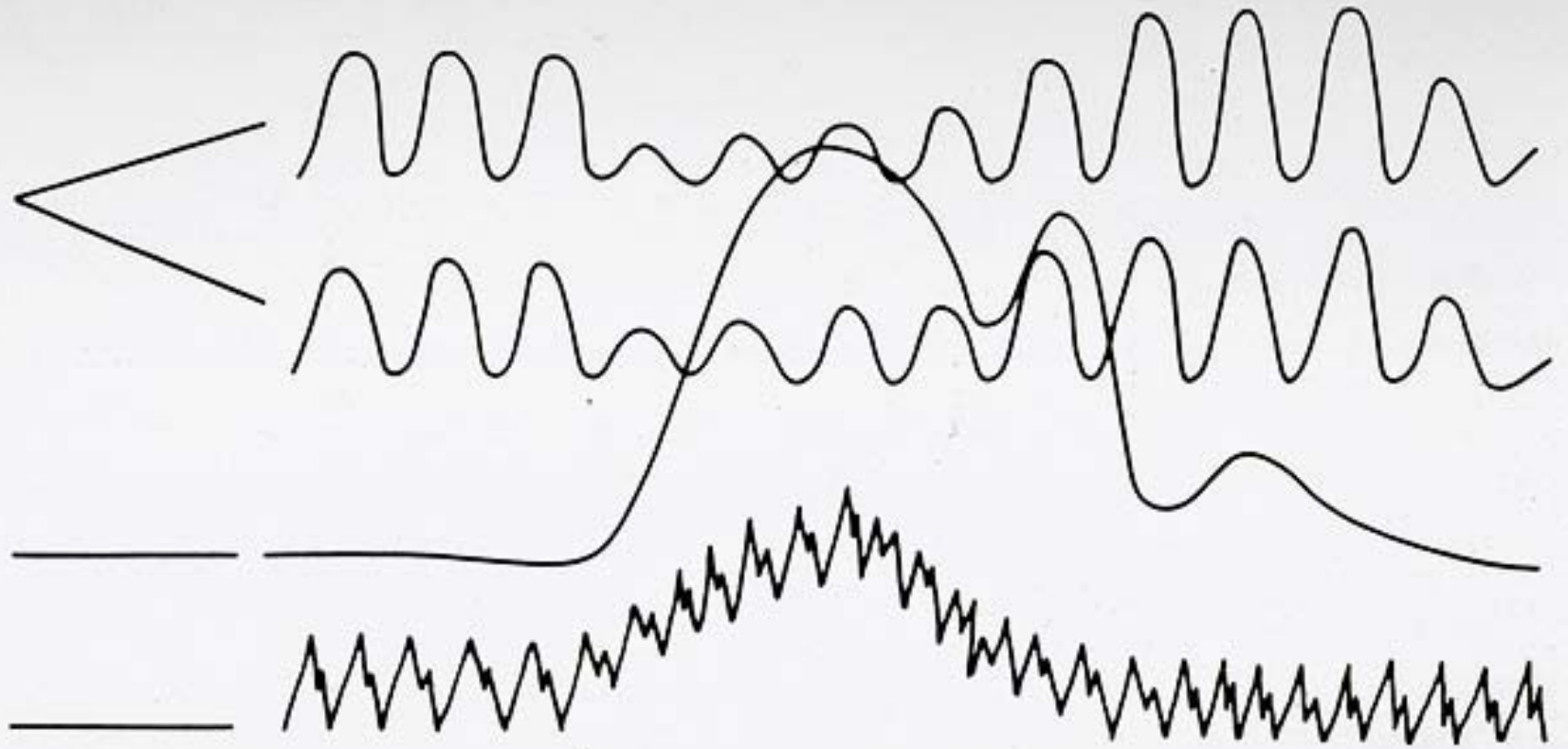
EXHIBIT "B"

A CLASSIC "LYING" REACTION

PNEUMO
TRACINGS

GSR
TRACINGS

CARDIO
TRACINGS



↑
THE POINT AT WHICH THE SUBJECT
ANSWERED A RELEVANT QUESTION.

Approaches to Detecting Deception

Emotion/Arousal	Memory/Recognition	Other Cognitive Correlates
<ul style="list-style-type: none">➤ “The” Polygraph➤ Facial Expression➤ Voice Stress➤ Facial Blood Flow➤ Thermography➤ Demeanor	<ul style="list-style-type: none">➤ Guilty Knowledge Test<ul style="list-style-type: none">➤ Autonomic (SCR)➤ Central (ERP, fMRI?)	<ul style="list-style-type: none">➤ Response Conflict➤ Attention and Memory Load➤ Both ERP and fMRI➤ Linguistic Analysis

Note that none detect lying *per se*

The Polygraph Examiner

- Requisite skills
 - Knowledge of test construction
 - Knowledge of the basic psychometric properties of tests: reliability and validity
 - Clinical interviewing skills
 - Knowledge of physiology of the autonomic nervous system
 - Knowledge of autonomic psychophysiological recording, scoring, and interpretation
 - Knowledge of the ethics of administering and reporting the results from psychological tests; limits of interpretation, limits of confidentiality
 - ???
- Training
 - Graduated from professional polygraph training school, which are administered and staffed primarily by professional polygraphers (31 schools accredited by the American Polygraph Association (APA) in the U.S. and Canada)
 - Curriculum spans a minimum of 7 weeks

Control Question Test (CQT; John Reid, 1947) (for Specific Incidents Investigations)

- Approximately 10 questions
- Relevant Questions
 - address the subject matter under investigation
- Control Questions
 - questions developed by the examiner after a pretest interview with the subject
 - address generally questionable behavior
- At least 3 separate *charts* (i.e. 3 separate presentations of the set of questions) are administered
- The pretest interview stresses 2 ways to fail test, and that test is infallible

CQT “Theory” (Raskin, 1982)

- Innocent subjects should react with stronger emotion to the *Control* questions since their content are of greater direct concern
- Guilty subjects should respond with stronger emotion to the *Relevant* questions
- Comparing the magnitude of the responses (usually skin-resistance) to the control and relevant questions yield a verdict of Guilty, Innocent, or Indeterminate

“CONTROL” TEST QUESTIONS

- **Did you slap Tommy?**
- **Have you hit anyone?**
- **Did you threaten Tommy?**
- **Have you ever told a lie to stay out of trouble?**
- **Have you ever threatened anyone?**
- **Did you punch Tommy?**

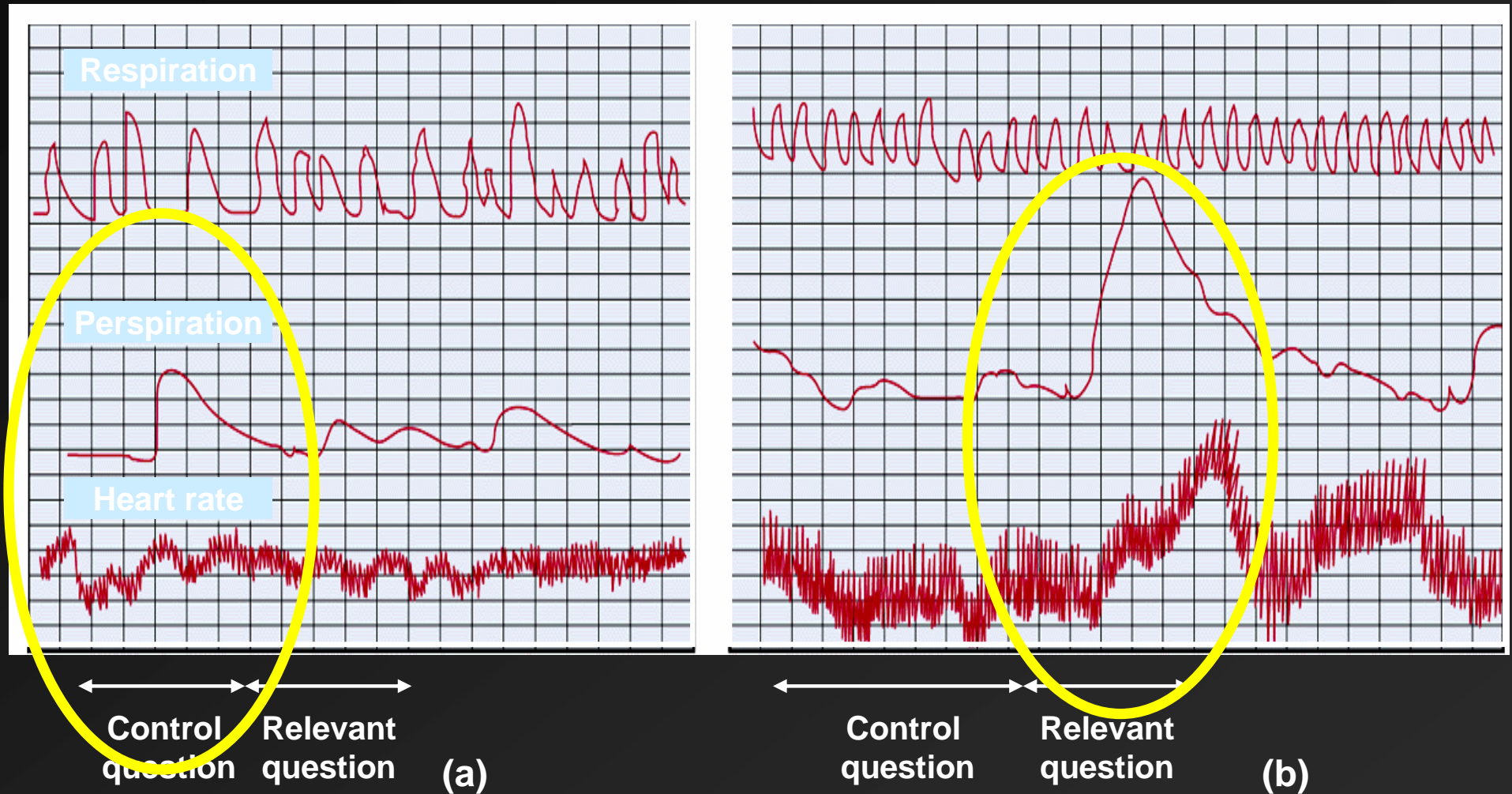
Relevant

“Control”

Hypothetically...

Innocent

Guilty



Typical Scoring -- Semiobjective Method

- Each relevant question paired with a "control" item adjacent in the sequence of questioning
 - A score of -1 to -3 is assigned if response to relevant item is (a little, somewhat, clearly) larger than response to control item
 - A score of +1 to +3 is assigned if response to relevant item is (a little, somewhat, clearly) smaller than response to control item
- Separate scores derived for each channel, and scores are summed over charts, channels, and question pairs
 - Total score < -6 : DECEPTIVE
 - Total score $> +6$: TRUTHFUL
 - $-5 < \text{Total score} > +5$: INCONCLUSIVE

Typical Scoring (less than objective method)

- **Polygrapher uses a global impressionistic decision-making strategy that incorporates:**
 - **Case facts**
 - **Examinee behaviors**
 - **Polygraph Chart data**
 - **Examiner's "professional" hunches and impressions**

The Importance of Blind Scoring

- Expectancy Effects (the "60 Minutes study")
 - Three polygraph firms each examined four employees accused of theft of a camera (none actually stolen)
 - Without the knowledge of the employees, each polygrapher was told that a different employee was suspected by management
 - In each instance, the suspected employee was deemed guilty (probability by chance = 1.5%)

Validity and Ethical Concerns: Examine the Assumptions

- Assumptions that must be met in order for the CQT to produce valid results:
 - Examiner formulates relevant questions that guilty subjects will answer deceptively (*reasonable*)
 - Examiner constructs control questions that subjects will answer untruthfully or with some doubt as to their veracity (*plausible, but difficult*)
 - An innocent person will be more disturbed by the control questions than by the relevant questions (*implausible*)
 - A guilty person must be more disturbed more by the relevant questions (*reasonable*)

The CQT Box Score

	% Correctly Classified	
	Guilty	Innocent
Professional Polygrapher's Research		
Horvath & Reid (1971)	85	91
Hunter & Ash (1973)	88	86
Slowick & Buckley (1975)	85	93
Wicklender & Junter (1975)	92	95
Davidson (1979)	90	100
Yankee, Powell, & Newland (1976)	100	98
Weighted Total	91	94
Social Scientist's Research		
Barlanda & Raskin ^a (1976)	98	45
Horvatha (1977)	77	51
Kleinmuntz & Szucko (1984)	75	63
Iacono & Patrick (1988)	98	55
Weighted Total	88	57

^a is also a trained polygrapher

after Iacono & Patrick, 1997

Assessing deception: Polygraph techniques.

In R. Rogers, Ed., *Clinical Assessment of Malingering and Deception*

New York: Guilford.

Types of Validity Studies

➤ **Laboratory:** Mock Crime

➤ **Field:** Real Life Cases

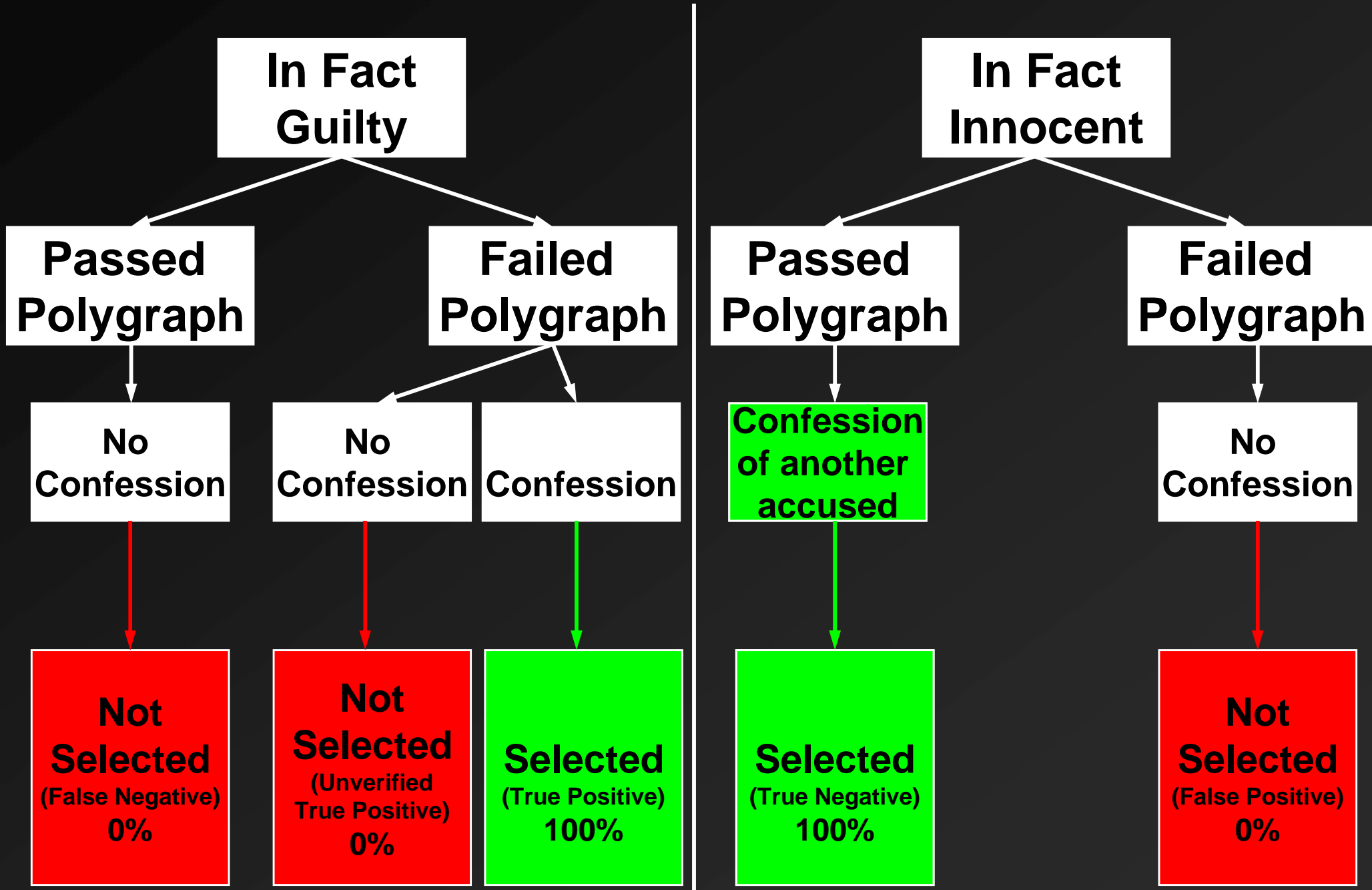
Effects of Enhancing Realism in Laboratory Studies

Study	Group	N	% Accuracy	
			Guilty	Innocent
Raskin & Hare (1978)	Psychopath	23	100	~92
	Nonpsychopath	20	100	~90
Patrick & Iacono (1989)	Psychopath	20	83	63
	Nonpsychopath	21	91	50

Problems with Field Studies

- How is ground truth established in real-life cases?
 - Judicial verdicts inadequate
 - plea bargains and false convictions
 - evidence may not be beyond a reasonable doubt
 - judicial verdict may be influenced by outcome of polygraph!
 - Therefore confessions are used to identify the culpable and to clear the innocent.
- Confessions are gathered only after the subject has failed the test, which leads to an unfortunate selection bias

Why Using Confessions Overestimates Accuracy



Screening Tests

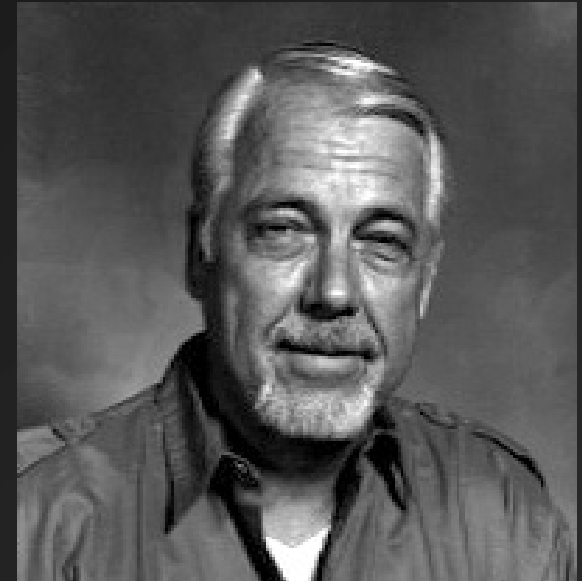
- Because these tests have much higher false negative rates than false positive rates, they should not be used in instances where most folks are innocent

	Test Verdict		
Actual	Guilty	Not Guilty	
Guilty	9	1	10
Not Guilty	45	45	90
			100

- Total correct verdicts = 54%

The GKT as an alternative to Traditional Polygraph Procedures

- **Guilty Knowledge Test (GKT)**
 - **Devised by Lykken(1959)**
 - **Sometimes termed Concealed Information Test (CIT)**
 - **Can utilize Skin Conductance or other measures (e.g. Event-Related Brain Potentials)**



Guilty Knowledge Test (GKT)

- The GKT does not assess lying as indexed by fear of being detected, but probes for guilt as indexed by recognition
- A series of questions is devised, each having several alternatives, only one of which is true about the crime in question
- Chances of an innocent person looking guilty on a 10-item GKT are $1/5^{10}$.

Assessing Recognition: For Specific Incidents Investigations

- Used when information about a crime or event is available that only a real culprit would know
- Series of questions constructed, only one of which has correct critical detail

Regarding the abduction location, do you know for sure it was...

1. ... at a Toy Store?
2. ... at a Shopping Mall?
3. ... at a City Park?
4. ... at a Friend's House?
5. ... at School?
6. ... at a Restaurant?

Other questions about

- Time abductee taken
- Clothing worn
- etc. for 6-10 questions

- Subject instructed to answer "no" to each item, so that if guilty, subject would be lying to the critical item.
- Critical item never positioned at beginning.
- A consistent peak of physiological response on one critical alternative suggests guilt.

GKT Accuracy: Lab Studies

Study (1 st Author, Yr)	N	Percent Correct	
		Guilty	Innocent
Lykken '59	98	88	100
Davidson '68	48	92	100
Podlesney '78	18	90	100
Balloun '79	34	61	88
Giesen '80	40	92	100
Bradley '81	192	59	89
Bradley '84	16	100	100
Iacono '84	55	91	100
Steller '87	87	85	100
Iacono '92	71	87	71
O'Toole '94	45	77	94
Study Median	48	88	100

GKT – Box Score, and Concerns

- Superior to CQT, especially in protecting the innocent
- Resistance to use among those in the polygraph community
 - Concern about applicability, especially in high profile cases
 - The GKT for OJ
- Despite limitations of CQT, may have utility for eliciting confessions

Countermeasures?

➤ Drugs

➤ Waid, Orne, Cook, & Orne (1981), Meprobamate (a tranquilizing agent) and the GKT

	Actual			Actual		
Verdict	Innocent	Guilty		Verdict/Drug	Innocent	Guilty
Innocent	11	2		Guilty-Placebo	3	8
Guilty	0	9		Guilty-Mepro	8	3

Questionable validity because study lacked realism and proper incentives

Countermeasures?

- Iacono et al. (1984, 1987) increased incentives and found no effects (relative to placebo) for:
 - Diazepam (widely prescribed tranquilizer)
 - Methylphenidate (stimulant)
 - Meprobamate (tranquilizer)
 - Propranolol (widely prescribed cardiac med. β -blocker that inhibits SNS activity)
- Overall hit-rate for the guilty was $>90\%$

Countermeasures?

- Street drugs and ETOH
 - Bradley and Ainsworth (1984) -- mild ETOH intoxication during mock crime decreased detectability during subsequent polygraph examination
 - Studies needed to determine effects of higher doses and of more potent drugs
 - To the extent that the drug interferes with memory or sense of responsibility at the time of the crime, it may serve as a potential countermeasure

Physical Countermeasures?

- Honts et al. (1983, 1984) found that 78% of highly motivated subjects could be trained to "beat" the CQT by biting their tongues or pressing their toes to the floor during control questions
 - Although it took training, motivated suspects could easily obtain it or it could be provided, especially when stakes are high (e.g., foreign agents being screened for national security positions)
- The polygraphers were unable to detect these subtle maneuvers
- "Counter-countermeasures" worked to detect those using countermeasures: 80% of those using countermeasures could be detected by a blind analysis of EMG recordings
 - Such counter-countermeasures rarely used in field polygraphy
- The rectangularity score of the GKT should -- in theory -- be much less susceptible to these techniques
 - GKT and rectangularity scores rarely used in field polygraphy
 - Yet Honts et al (1996) found that both Physical (pressing toes to floor) and mental (counting backwards by sevens) countermeasures reduced the validity of the GKT (Overall accuracy dropped from 85% to 25%)

Interim Synopsis

- People Lie
- There is no unequivocal lie response
- Traditional Polygraphy, which focuses on emotional reactions, suffers from an unacceptably high false positive rate
- Polygraphers overestimate the accuracy of the procedure due to how cases are selected for inclusion in studies
- Assessing recognition may prove more accurate, but potentially less widely applicable
- Polygraphs are useful for eliciting admissions and confessions

Science and Pseudo-Science, Debate and Diatribe, Validity versus Vitriol

If proponents wish to convince the scientific community of the merits of polygraph lie detection, I submit that they will have to develop a more convincing case than the one currently on offer. Their case must be founded on studies which include the necessary controls for nonpolygraphic sources of information, that is, studies which compare the accuracy of assessments derived from case-file material and the subject's demeanor during questioning with that based on these sources plus the polygraphic record. I strongly suggest that such studies would confirm what the available data suggest: that polygraph lie detection adds nothing positive to conventional approaches to interrogation and assessment.

Carrol, 1988

Science and Pseudo-Science, Debate and Diatribe, Validity versus Vitriol

If I announce to my scientific colleagues that I have invented a new test that can identify schizophrenia with 90% or 95% accuracy, my colleagues will be interested -- but skeptical. I would be expected to support my assertion with experimental evidence and that evidence would be very critically examined. Even if my proofs withstood such scrutiny, many would reserve judgment until an independent investigator had confirmed my findings. All this skepticism about a claim that I can distinguish "crazy people" from normal ones! The tools of the psychologist are not precision instruments; really high accuracy is seldom achieved. Skepticism is appropriate. Nevertheless, when the polygrapher announces that his psychological test can separate liars from the truthful with a validity of 90%, or 95%, or even 99%, the typical reaction is a kind of marveling acceptance. The critic who questions these claims is greeted with surprise and skepticism. Nearly every American has heard of the lie detector; without really knowing what is involved, many assume that it is nearly infallible. So deeply ingrained is this mystique that, gradually over the last 50 years, the burden of proof has somehow shifted to the critic.

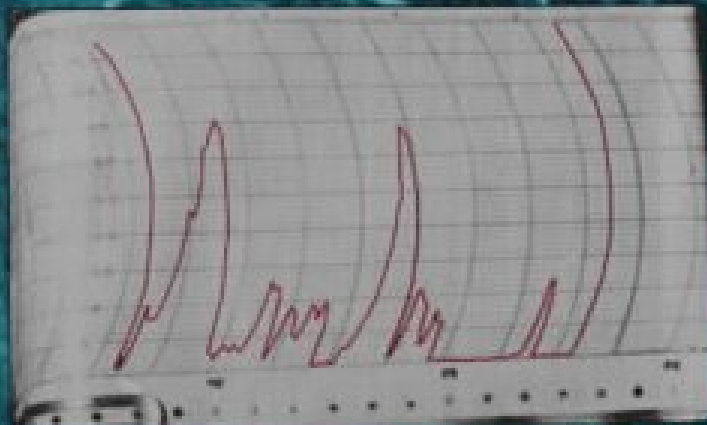
Lykken, in *A Tremor in the Blood*, 1981

Science and Pseudo-Science, Debate and Diatribe, Validity versus Vitriol

Unfortunately, the minute a small handful of psychologists -- one or two pseudo-knowledgeable and one or two completely ignorant of what they were even trying to do -- got into the picture, two expressions, "false positive" and "false negative", came to light. It appears that some people turn out to be weird ducks. Sadly, when that type of inquirer doesn't understand something, he is usually prone to attach strange names to it under the guise of professionalism or scientific exploration on both sides of the same coin. By confusing other people more so than himself he feels he can still call himself an "expert." Those two phrases appeared in a tumor in the brain [sic]. Before then, they had never existed in polygraph language. In all sincerity, however, foul ball psychologists are few and far between.

Ferguson, in *Preemployment Polygraphy*, 1984

A
TREMOR
IN THE
BLOOD



USES AND ABUSES OF THE
LIE DETECTOR

DAVID T. LYKKEN

THE
POLYGRAPH
AND LIE DETECTION

COMMITTEE TO REVIEW THE SCIENTIFIC
EVIDENCE ON THE POLYGRAPH

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