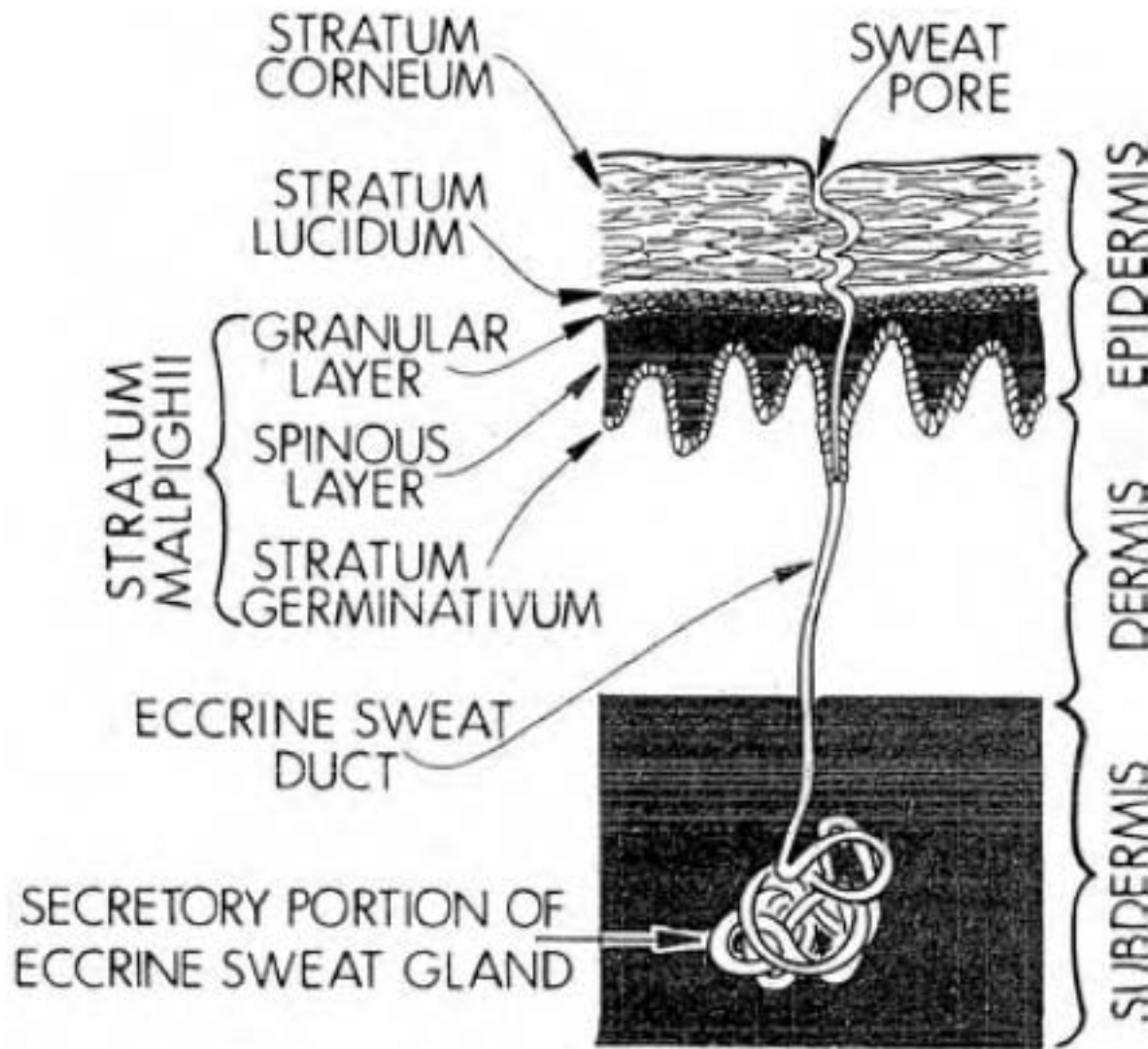


Back to Pontificating about Sweat

Anatomy of a Gland and the Skin



- Sweat glands primarily driven by sympathetic innervation that is cholinergic
- Sudomotor fibers originate in the sympathetic chain, terminate on sudomotor cell of sweat gland
- Stratum Corneum acts as a variable resistor, with decreased resistance due to sweat

Figure 7.1. Anatomy of the eccrine sweat gland in various layers of skin. (Adapted from Hassett, 1978).

From
Dawson et al 2007

Glands Act as Resistors in Parallel

- Resistance will therefore decrease with increased recording surface area – **keep surface area constant across subjects**
- Resistance is not linearly related to the # of resistors

$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$

- Conductance, however, is linearly related to the number of resistors in the circuit
 - Therefore, there exists a linear relation between measures of conductance and sweat secretion
 - Not so for Resistance
 - The metric of conductance more accurately reflects the activity of the system

METHODOLOGY

The relationship of sweat gland count to electrodermal activity

LAUREN W. FREEDMAN,^a ANGELA SCARPA SCERBO,^a MICHAEL E. DAWSON,^a
ADRIAN RAINE,^a WILLIAM O. McCLURE,^a AND PETER H. VENABLES^b

^a Department of Psychology, University of Southern California, Los Angeles

^b Department of Psychology, University of York, Heslington, England

METHODS

The re
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LAUREN V
ADRIAN R

^a Department c
^b Department c

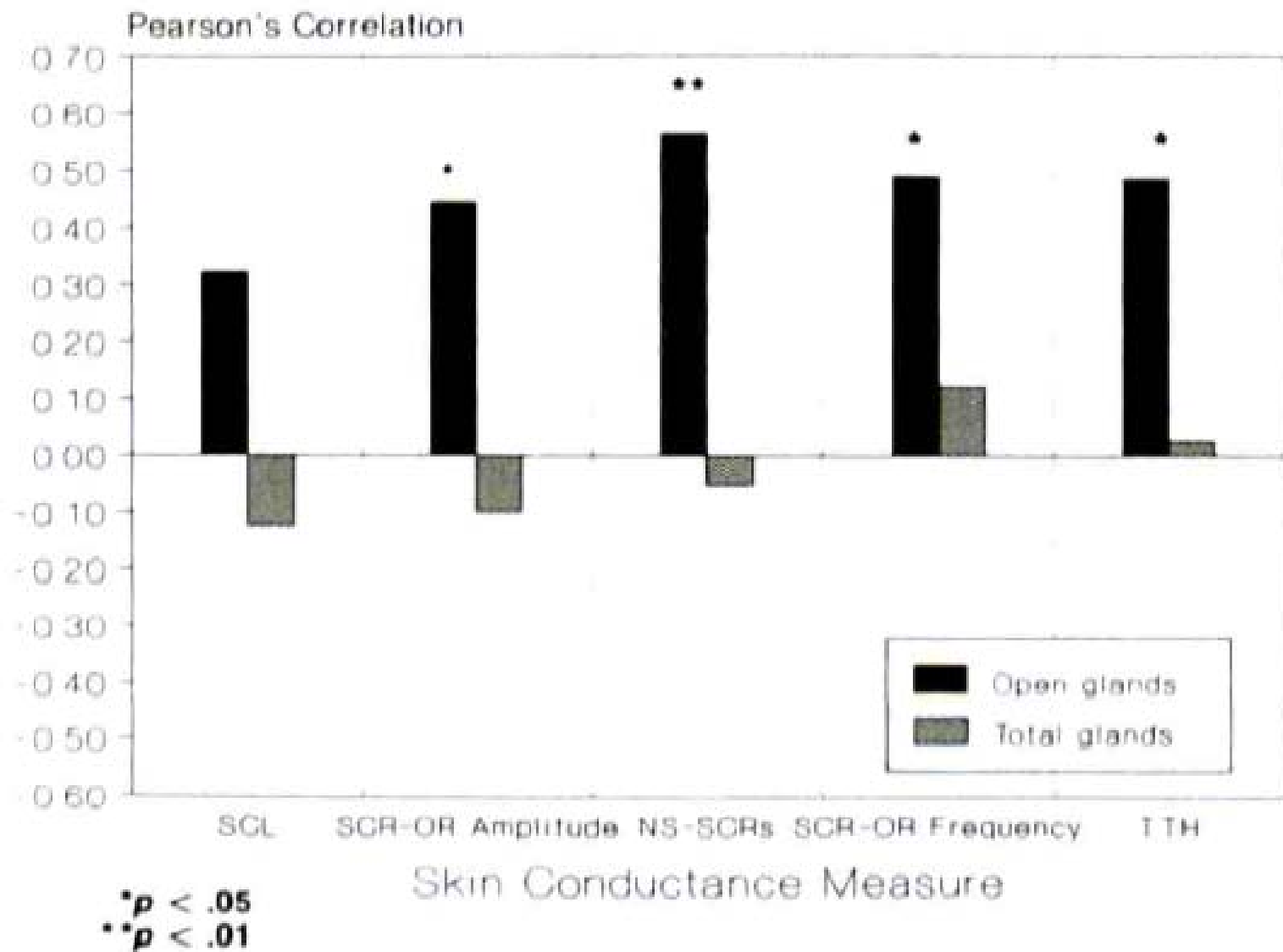


Figure 1. Pearson's correlations of number of open and total glands with skin conductance level (SCL), skin conductance orienting response (SCR-OR) amplitude, frequency of nonspecific responses (NS-SCRs), frequency of SCR-ORs, and trials to habituation (TTH).

	SRL (Ω)	SCL(μ S)	SRR	SCR
R1 Pre	100,000	10		
R1 Post	99,000	10.1	1000	0.1
R2 Pre	20,000	50		
R2 Post	19,000	52.6	1000	2.6

- Conductance is the Reciprocal of Resistance
- This shows how two vastly different responses will appear the same using skin resistance response metrics

Recording -- Placement

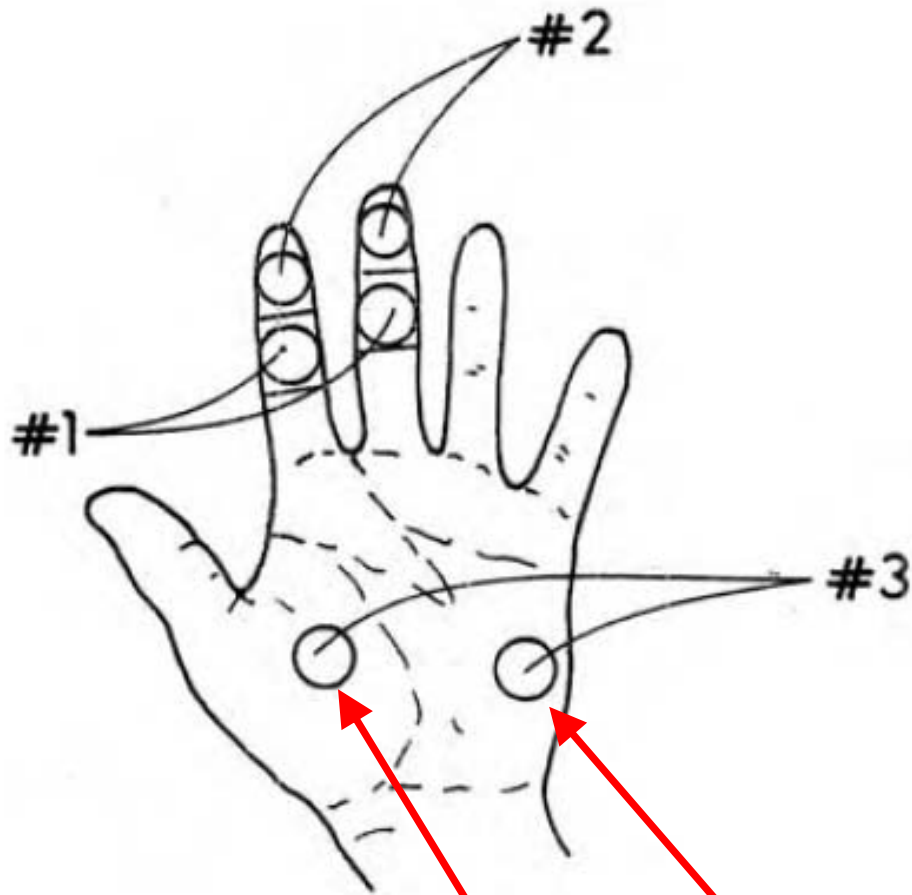


Figure 7.3. Three electrode placements for recording electrodermal activity. Placement #1 involves volar surfaces on medial phalanges, placement #2 involves volar surfaces of distal phalanges, and placement #3 involves thenar and hypothenar eminences of palms.

From Dawson et al 2007

Methodology

A Major Effect of Recording Site on Measurement of Electrodermal Activity

ANGELA SCARPA SCERBO, LAUREN WEINSTOCK FREEDMAN,
ADRIAN RAINE, MICHAEL E. DAWSON,
Department of Psychology, University of Southern California

AND PETER H. VENABLES
Department of Psychology, University of York, England

ABSTRACT

Although the medial phalanx has been recommended as the preferred site for recording skin conductance activity, a review of articles published in *Psychophysiology* indicates that a large minority (34%) of studies employ the distal phalanx. Informal observations also suggest that the distal site may be more reactive than the medial site. This study formally tests this observation by recording skin conductance from both medial and distal phalanges. Twenty-four right-handed subjects (12 male, 12 female) were exposed to a series of 10 orienting and defensive stimuli. **Electrodes were placed on the fore and middle fingers of each hand, with distal sites used on one hand and medial sites on the other for each subject. Skin conductance amplitudes were 3.5 times larger at distal than medial sites ($p < .002$), while skin conductance levels were 2.08 times larger at distal sites ($p < .0005$). A significant Site \times Stimulus interaction ($p < .025$) indicated that the distal site was more sensitive to habituation over trials and to increases in skin conductance amplitudes with increasing stimulus intensity than the medial site. On the basis of these findings it is recommended that distal sites be used in preference to medial sites in the recording of skin conductance activity.**

Recording Considerations

- Prep the Skin?
 - Never abrade
 - Don't use other agents (ETOH)
 - Washing with soap and H₂O recommended to standardize across subjects
- Electrodes – Ag-AgCl
 - More expensive and fragile (unless sintered)
 - But well worth it – resist polarization
- Conductive Paste
 - Because current passed continuously, can interact with with the tissue
 - Unibase + physiological saline (Fowles et al, 1981) will keep properties of tissue and paste constant over duration of recording session
 - Other gels are bad news;
 - highly conductive, but saturated with NaCl,
 - over time will migrate to skin tissue, inflating SCL
- Surface Area Exposed
 - Keep constant across subjects and session
- Constant Voltage Amplification
 - Preferred over Constant current (Lykken and Venables, 1971)
- Temporal responsivity – SC system is S...L...O...W

The Generic SCR

- Latency typically 1-3 secs
- Rise time typically 1-4 secs

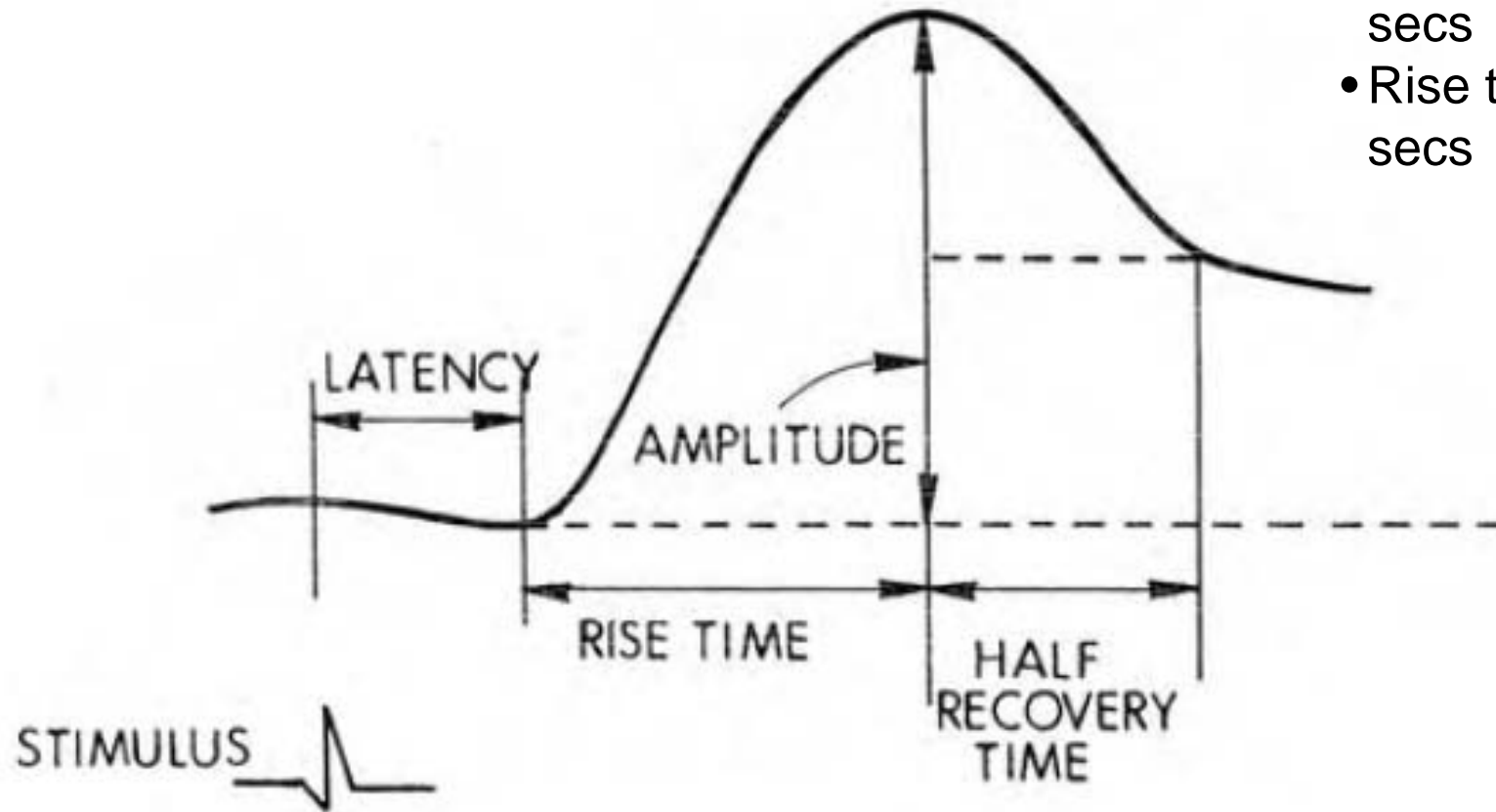


Figure 7.5. Graphical representation of principal EDA components.

Scoring Issues

- Responses that ride on responses
- Range Correction (Lykken et al., 1966)

- Level

$$\frac{(SCL_{observed} - SCL_{min})}{(SCL_{max} - SCL_{min})}$$

- Response

$$\frac{(SCR_{observed})}{(SCR_{max})}$$

- Note also slope and intercept regression approaches

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)

Applications

- Orienting (Bauer, 1984; Tranel and Damasio, 1985)
- Fear conditioning (Öhman)
- Individual Differences
- Deficient anticipatory fear (Hare)
- Deception Detection

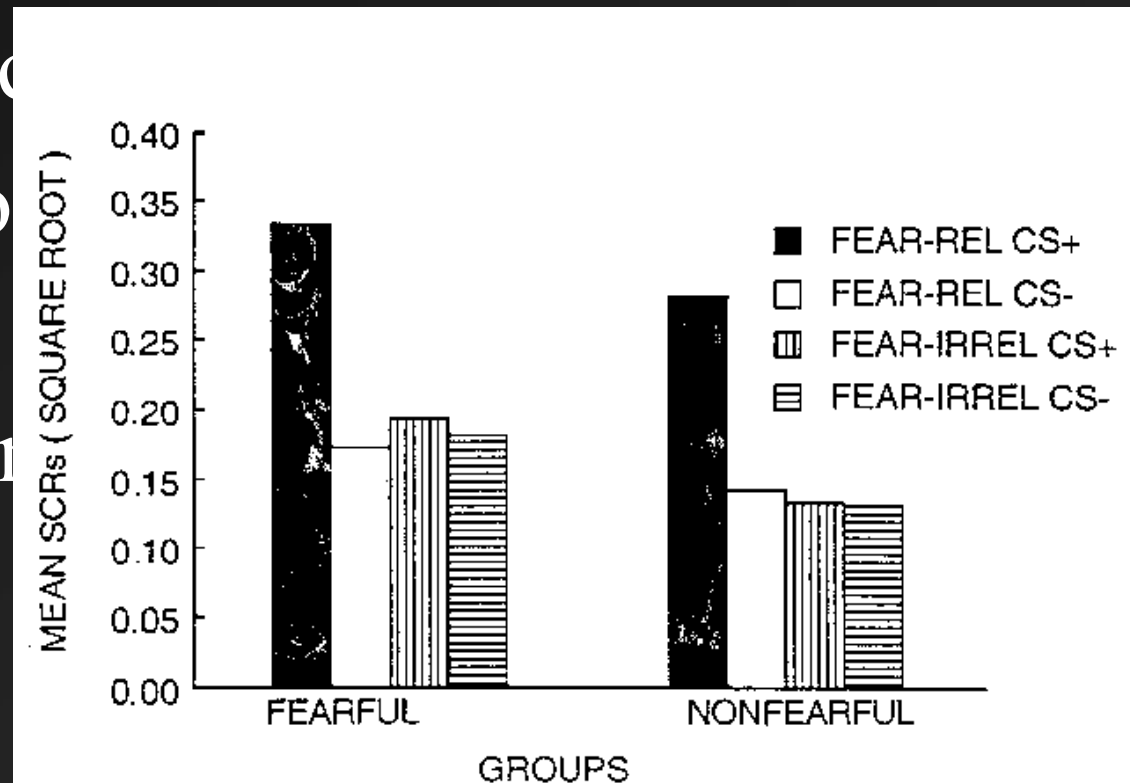


Figure 1. Mean skin conductance responses (SCRs) (square-root transformed) to fear-relevant (snakes, spiders, and rats) or fear-irrelevant (flowers and mushrooms) stimuli previously followed (CS+) or not followed (CS-) by an electric shock unconditioned stimulus among the fearful and nonfearful groups of subjects during extinction.

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*

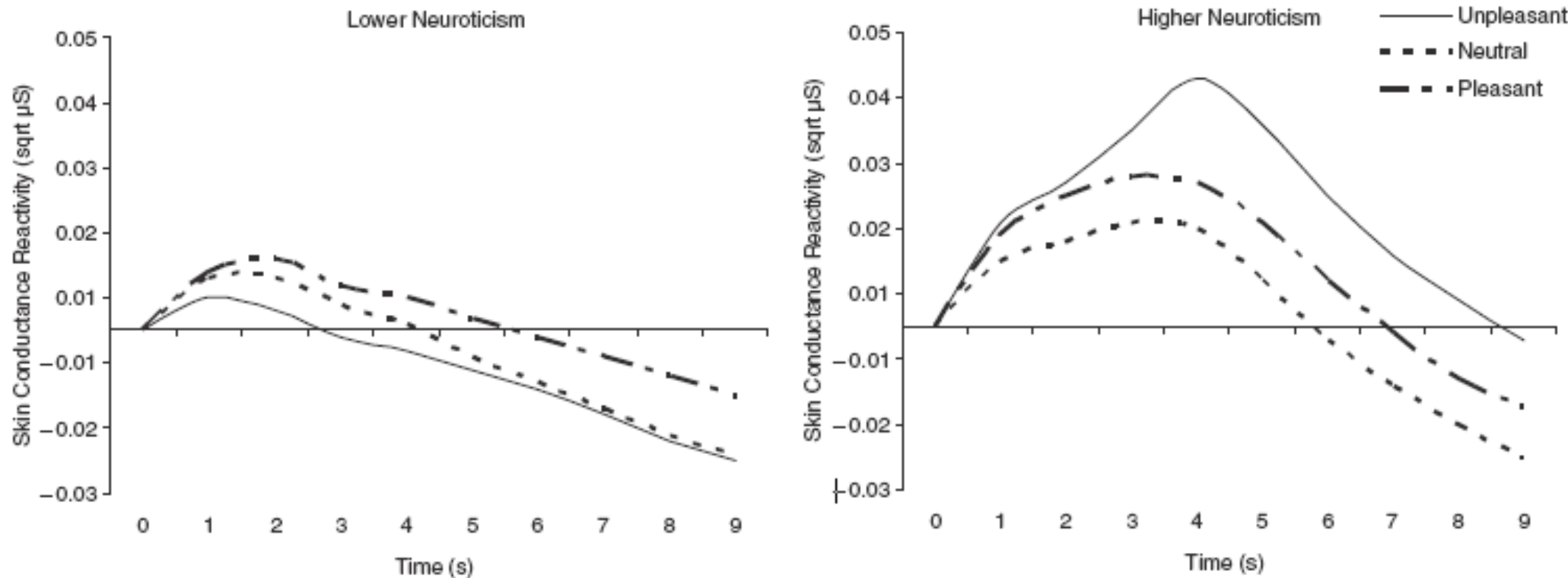
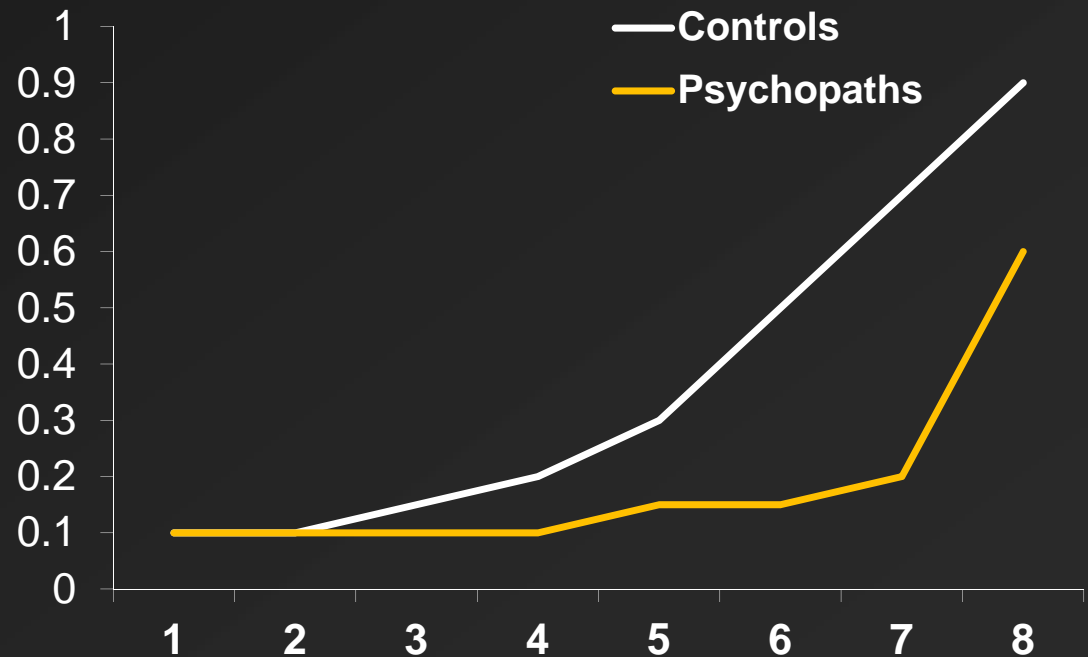


Figure 1. Skin conductance reactivity as a function of picture valence, time, and neuroticism. Pictures were presented from 1–6 s. Estimated means for participants lower (1 *SD* below the mean) and higher (1 *SD* above the mean) in neuroticism are plotted separately.

Anticipatory Arousal in Psychopathy

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



Fearless Dominance (dual-process model of Psychopathy)

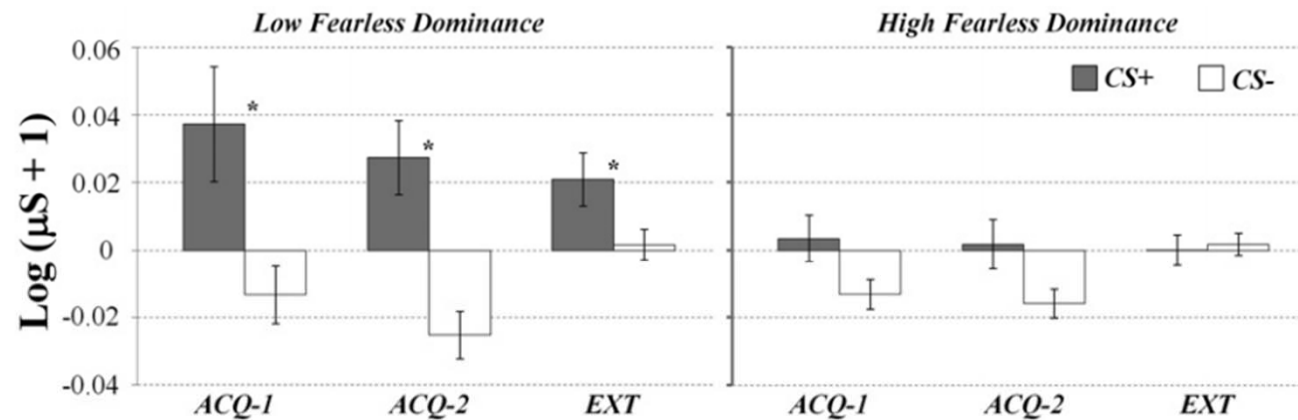


Figure 1. Mean skin conductance change (log [$\mu\text{S} + 1$]) for high and low fearless dominance groups when viewing CS+ and CS- during acquisition (ACQ-1 and ACQ-2) and extinction (EXT) phases of the fear conditioning procedure.

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

“I don't know anything about lie detectors other than they scare the hell out of people.”

-- Richard Nixon



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:

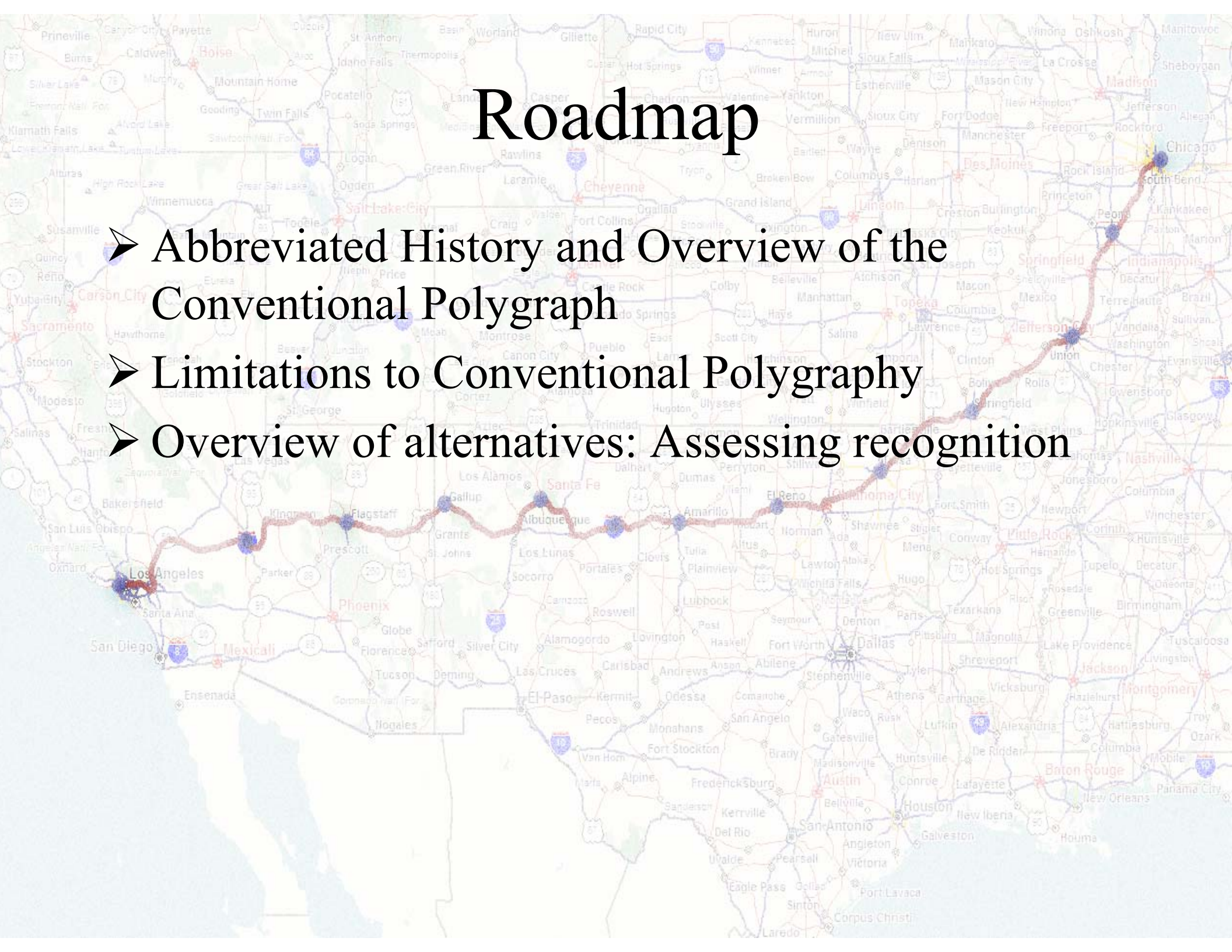
[Political Ad](#)

[Entertainment](#)

[More Entertainment](#)

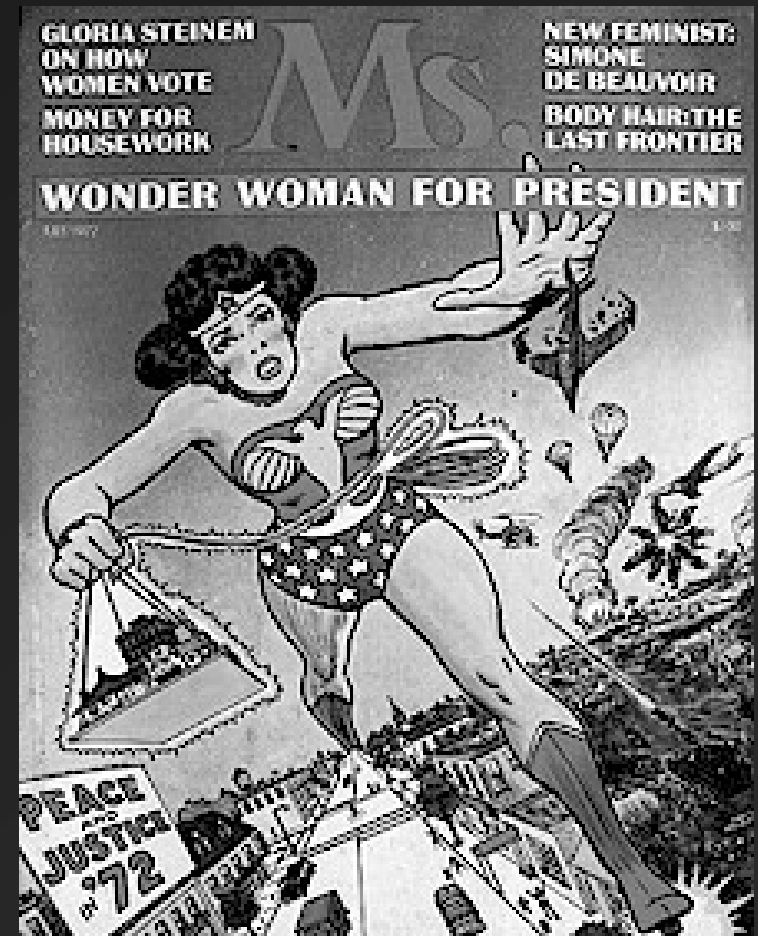
Roadmap

- Abbreviated History and Overview of the Conventional Polygraph
- Limitations to Conventional Polygraphy
- Overview of alternatives: Assessing recognition





- 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:

Physiological responding differs when one is truthful versus being deceptive

Note: Detects physiological responses,
but not lying per se

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
- Accusations of parental wrongdoing
- Paternity Suits

➤ **Screening Situations**

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

Uses (and abuses) of Polygraph Tests

➤ **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
- “Maintenance polygraphs”

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"

Conventional Polygraphs

Each instrument comes with a one year warranty on all parts and labor. With each four- or five-pen instrument you will receive the following standard accessories: two pneumo chest assemblies, GSR electrode set, standard Kovacic arm cuff, pump bulb assembly, pens and bottles for each recording module, one extra ink bottle, pen pad, ink filler, ink, tool kit, two rolls of chart paper and an instruction manual. Other optional accessories include auto power conversion, in-case calibrator, various styles of event markers and thermal writing capabilities.

The Statesman

Zero® case, the clean Halliburton lines are enhanced by the black morocco grain finish. The case is high-impact thermo-formed ABS plastic to ensure durability. (Total weight: 21.5lbs. or 24.5lbs. with calibrator. Dimensions: 13"W x 21"L x 6.5"D).



The Factfinder II

The 10" chart drive allows five pens to be used simultaneously with greater pen swing. The practice of "pigeon toeing" the outside pens on a five-pen polygraph is no longer necessary and charts are easier to read because of reduced tracing overlap. This leaves plenty of room for important notations. Every Factfinder II maintains all of the quality and conveniences of our standard 8" chart drive models. Available only in a Statesman case, no thermal models are available.

The Courier II

Our newest conventional case style offers a gold anodized look and compact size. The case was designed with the traveling examiner in mind. The lid is designed with plenty of storage space and includes an in-case calibrator. The case is made of exceptionally strong, deep-drawn aluminum that resists dents and is also dust and weather resistant. (Total weight: 21.5lbs. Dimensions: 13"W x 18"L x 6.5"D).

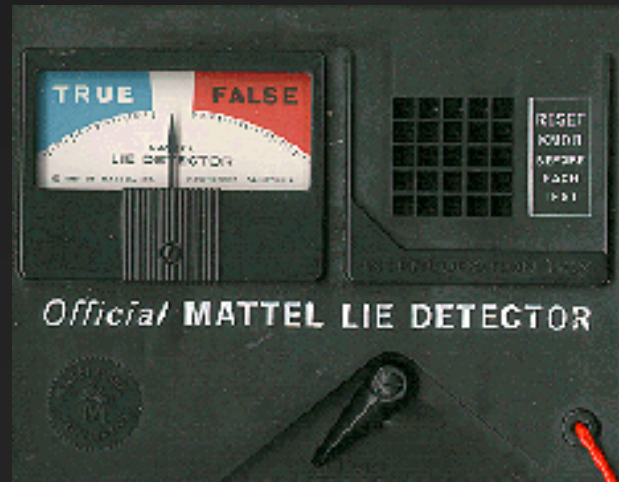


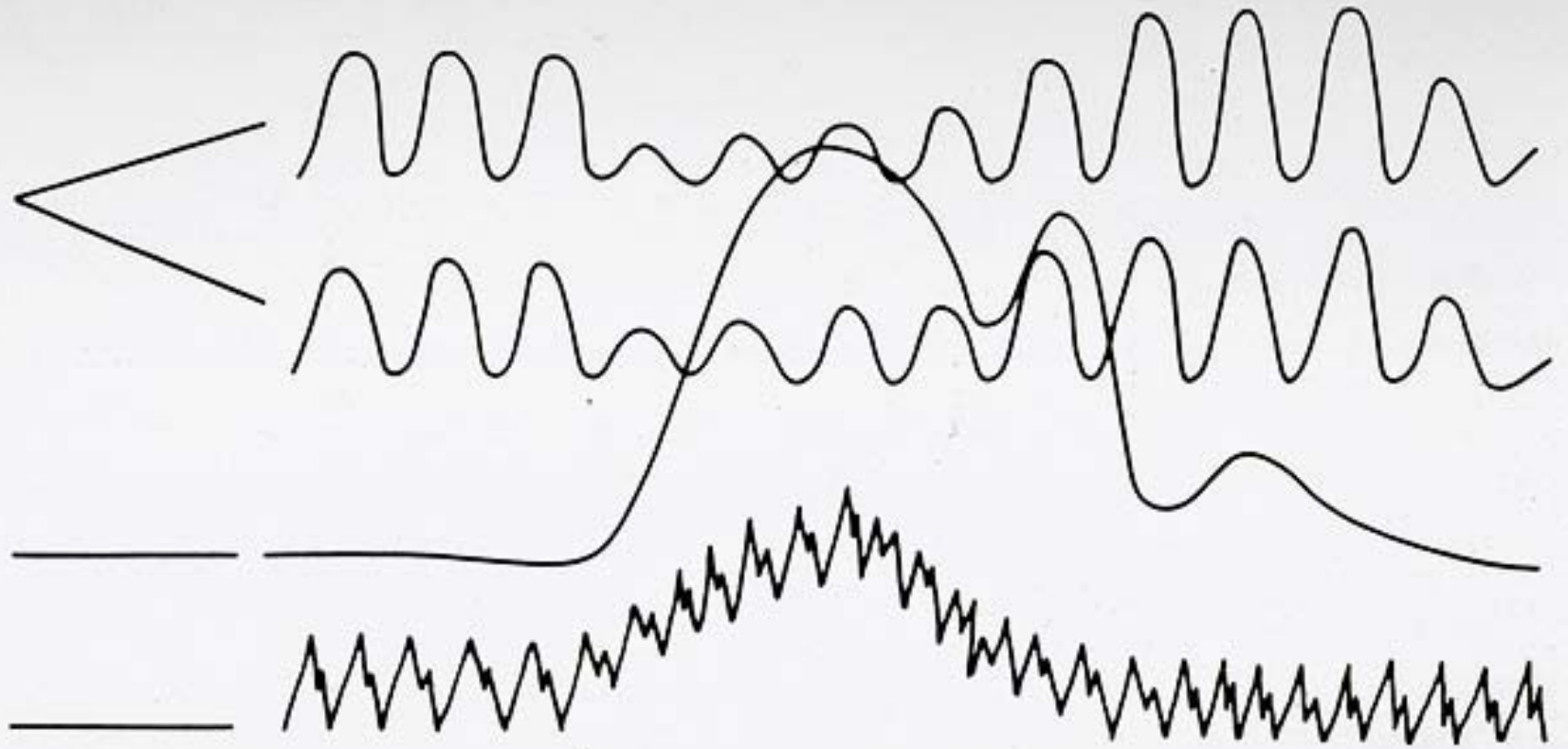
EXHIBIT "B"

A CLASSIC "LYING" REACTION

PNEUMO
TRACINGS

GSR
TRACINGS

CARDIO
TRACINGS



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



Office of Technology Assessment 1983 report:
"There is no known physiological response that is unique to deception."

Thus...

Anyone who claims to measure lying ...
... is lying!

Approaches to Detecting Deception

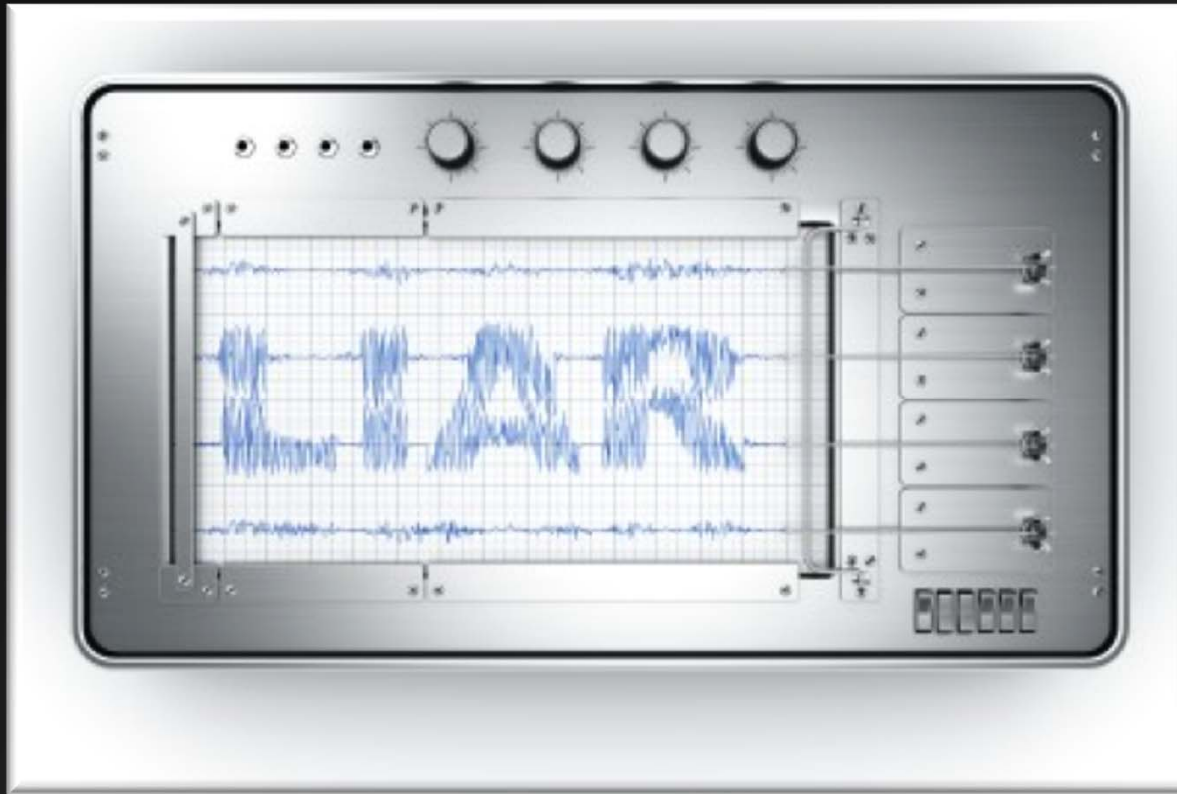
Emotion/Arousal	Memory/ Recognition	Other Cognitive Correlates
<ul style="list-style-type: none">➤ “The” Polygraph➤ Facial Expression➤ Voice Stress➤ Facial Blood Flow➤ Thermography➤ Demeanor	<ul style="list-style-type: none">➤ Guilty Knowledge Test<ul style="list-style-type: none">➤ Autonomic (SCR)➤ 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 320 hours

What is the Polygraph Test?



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
- The pretest interview stresses 2 ways to fail test, and that test is infallible

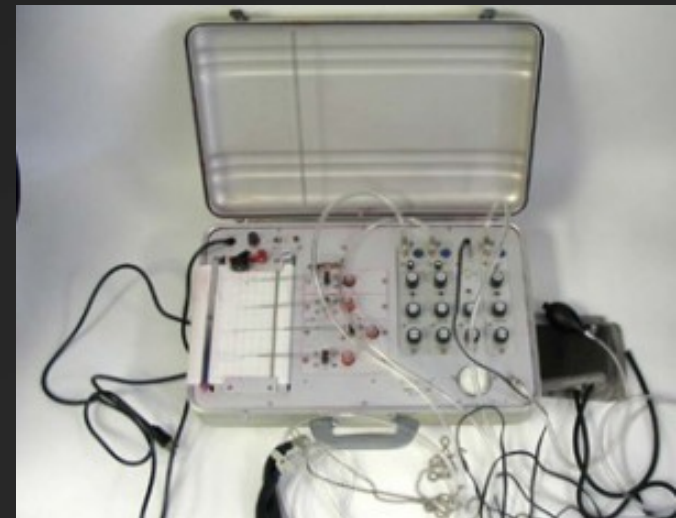
ZCT MQTZCT
CIT7 IZCT DLST
AFMGQT

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 touch Susie between her legs?**
- **Have you found teen girls attractive?** **Relevant**
- **Have you been naked in sight of Susie?** **“Control”**
- **Have you lied to try to stay out of trouble?**
- **Have you viewed pornography?**
- **Have you fantasized sexually about Susie?**



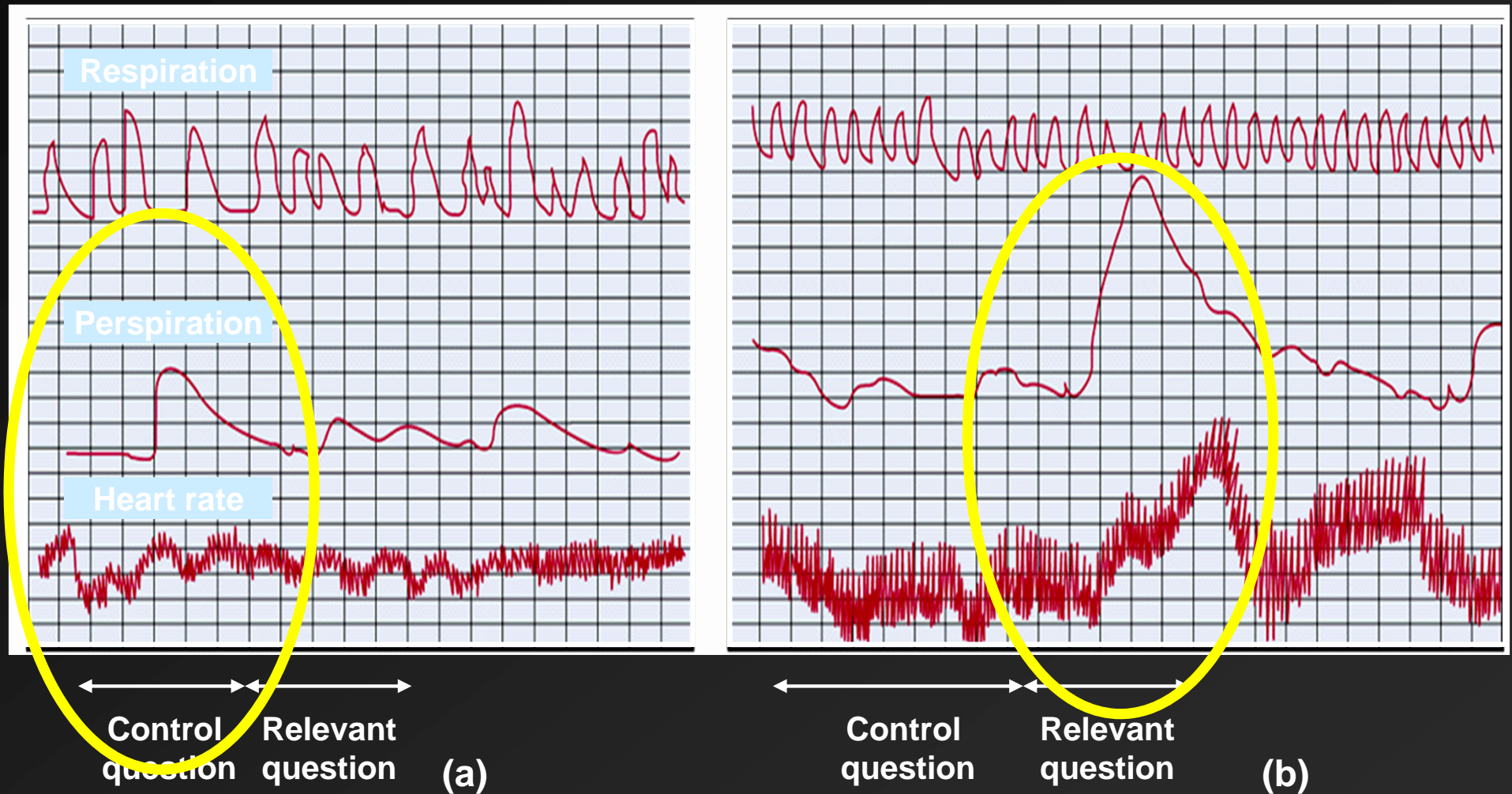
Control Question Test (CQT; John Reid, 1947) (for Specific Incidents Investigations)

- 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

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

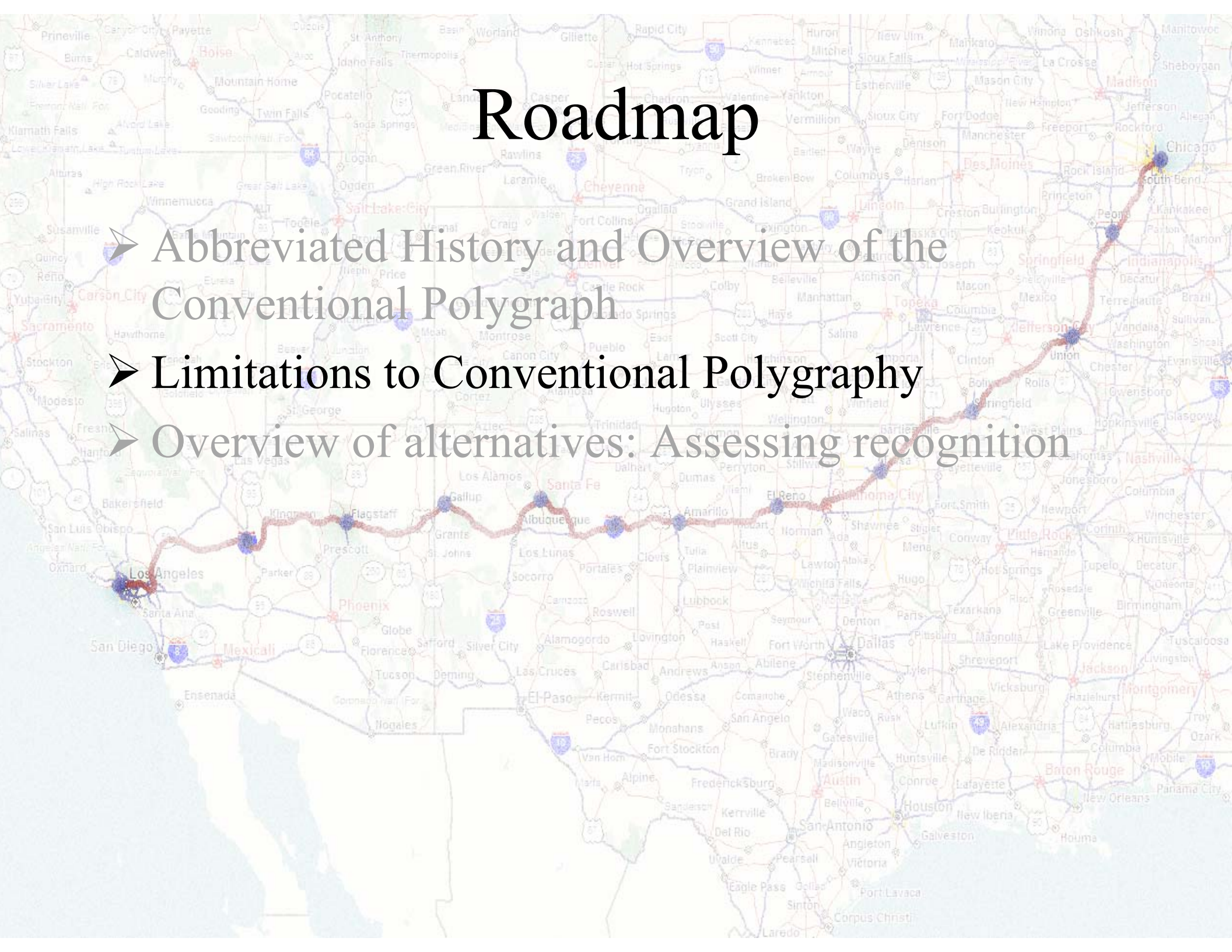
- Expectancy Effects (the "60 Minutes study")
 - Three polygraph firms each examined four employees accused of theft of a camera (none actually stolen)
 - Without the knowledge of the employees, each polygrapher was told that a different employee was suspected by management
 - In each instance, the suspected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

Roadmap

- Abbreviated History and Overview of the Conventional Polygraph
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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		
	Nonpsychopath	20		

Effects of Enhancing Realism in Laboratory Studies

Study	Group	N	% Accuracy	
			Guilty	Innocent
Raskin & Hare (1978)	Psychopath	23	100	~92
	Nonpsychopath	20	100	~90

Effects of Enhancing Realism in Laboratory Studies

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

Effects of Enhancing Realism in Laboratory Studies

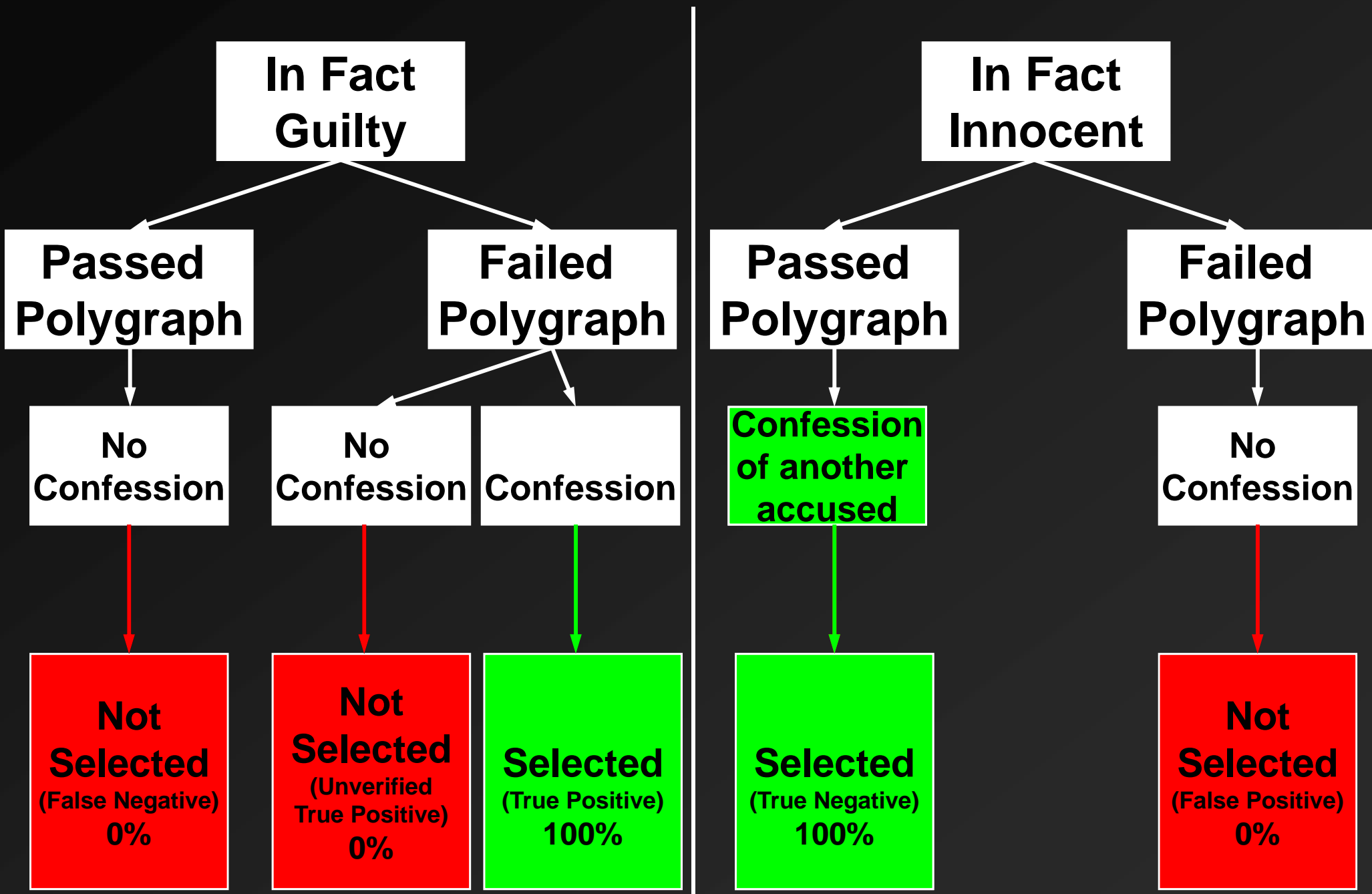
Study	Group	N	% Accuracy	
			Guilty	Innocent
Raskin & Hare (1978)	Psychopath	23	100	~92
	Nonpsychopath	20	100	~90
Patrick & Iacono (1989)	Psychopath	20	83	63
	Nonpsychopath	21	91	50

Problems with Field Studies

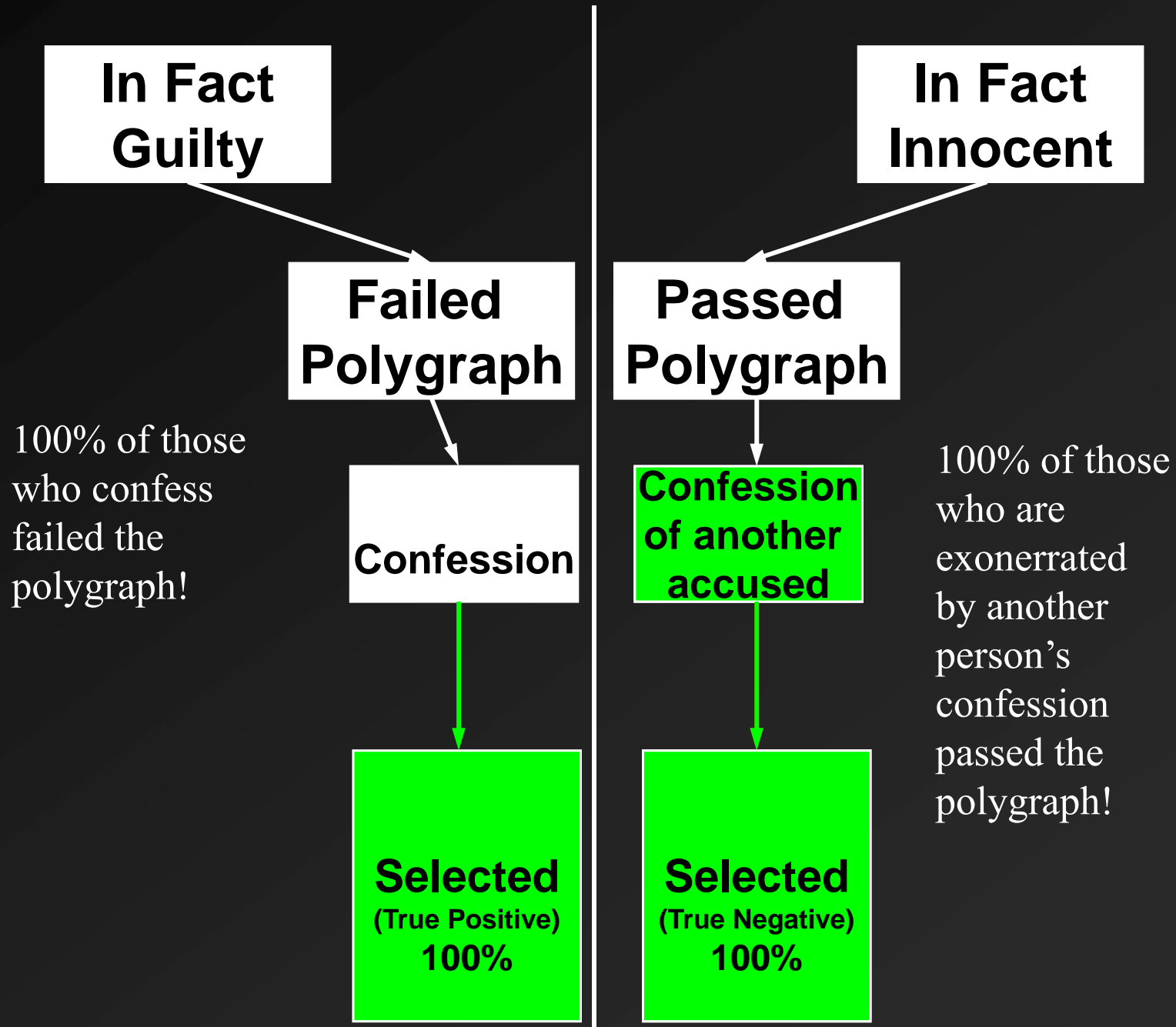
- How is ground truth established?
 - Judicial verdicts inadequate
 - plea bargains and false convictions
 - evidence not beyond a reasonable doubt
 - judicial verdict may be influenced by outcome of polygraph!
 - Therefore confessions are used to identify the culpable and to clear the innocent.
 - Confessions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



Why Using Confessions Overestimates Accuracy



Feedback Polygraphers Receive



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	40	50	90
			100

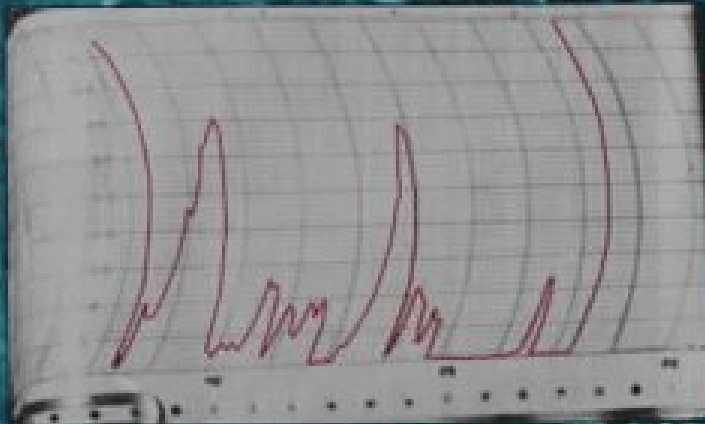
Probability a guilty verdict is correct: 18.4%

Total correct verdicts = 59%

Implications

- If most accused folks are not culpable, a very large number of False-Positives will result
- Impact of False-Positives on the accused and the family
- Cumulative risk of False-Positives with Maintenance Polygraph Tests is substantial (and no evidence to suggest that maintenance polygraphs are effective, Meijer et al. 2008, Int J Law Psych)
- Countermeasures can reduce True Positive rate

A
TREMOR
IN THE
BLOOD



USES AND ABUSES OF THE
LIE DETECTOR

DAVID T. LYKKEN

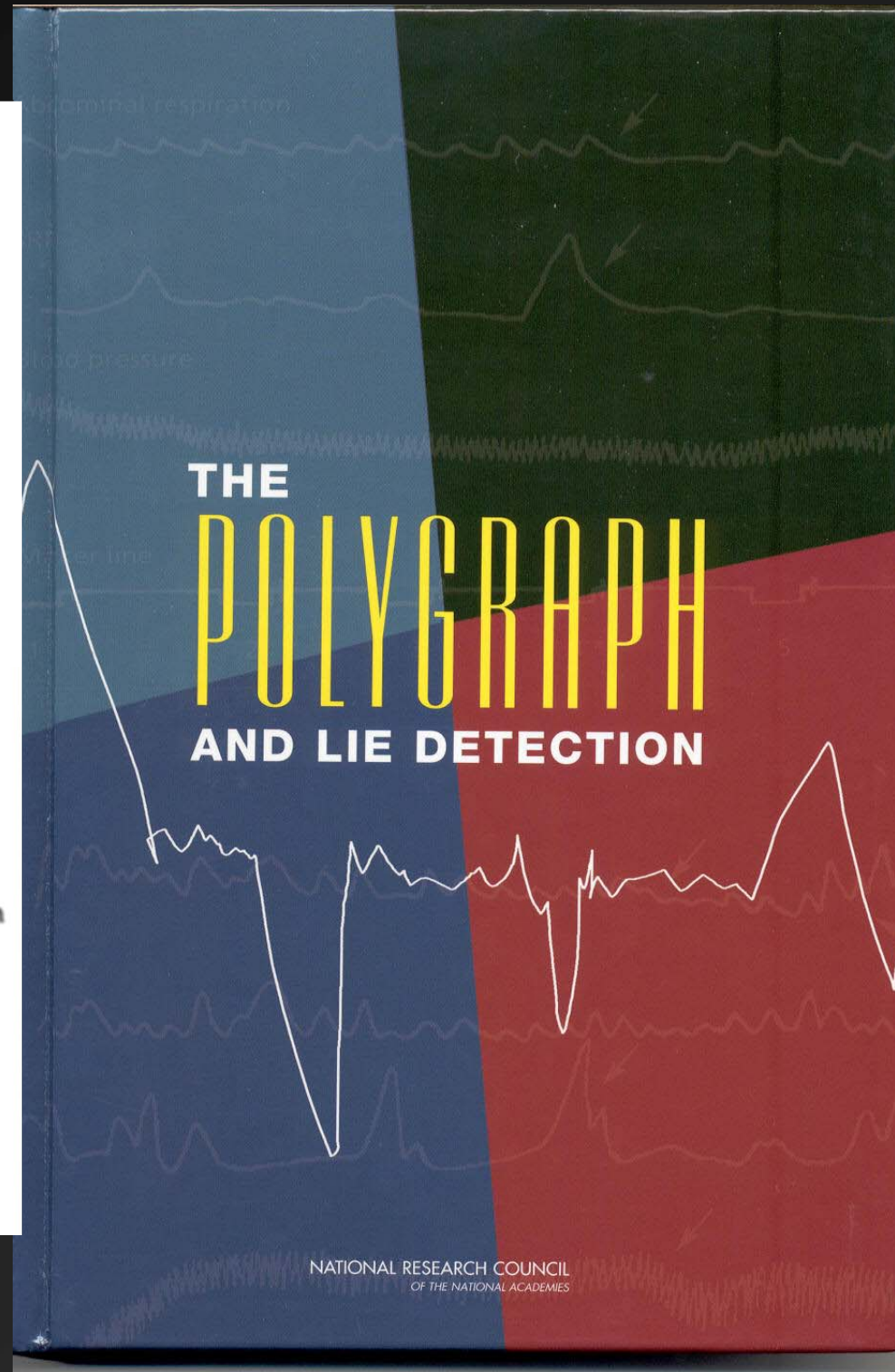
Abnormal respiration
Blood pressure
Heart rate
Sweat line

THE
POLYGRAPH
AND LIE DETECTION

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

**COMMITTEE TO REVIEW THE SCIENTIFIC
EVIDENCE ON THE POLYGRAPH**

- STEPHEN E. FIENBERG (*Chair*), Department of Statistics, Carnegie Mellon University
- JAMES J. BLASCOVICH, Department of Psychology, University of California, Santa Barbara
- *JOHN T. CACIOPPO, Department of Psychology, University of Chicago
- RICHARD J. DAVIDSON, Department of Psychology, University of Wisconsin, Madison
- PAUL EKMAN, Department of Psychology and Human Interaction Laboratory, University of California, San Francisco
- DAVID L. FAIGMAN, Hastings College of Law, University of California, San Francisco
- PATRICIA L. GRAMBSCH, Department of Biostatistics, University of Minnesota, Minneapolis
- PETER B. IMREY, Department of Biostatistics and Epidemiology, The Cleveland Clinic Foundation, and Departments of Statistics and Medical Information Sciences, University of Illinois at Urbana-Champaign.
- EMMETT B. KEELER, RAND Health, Santa Monica, California
- KATHRYN B. LASKEY, Systems Engineering and Operations Research Department, George Mason University, Fairfax, Virginia
- KEVIN R. MURPHY, Department of Psychology, Pennsylvania State University, University Park
- MARCUS E. RAICHLE, Department of Radiology and Neurology, Washington University, St. Louis
- RICHARD M. SHIFFRIN, Department of Psychology, Indiana University, Bloomington
- JOHN A. SWETS, BBN Technologies (emeritus), Tequesta, Florida

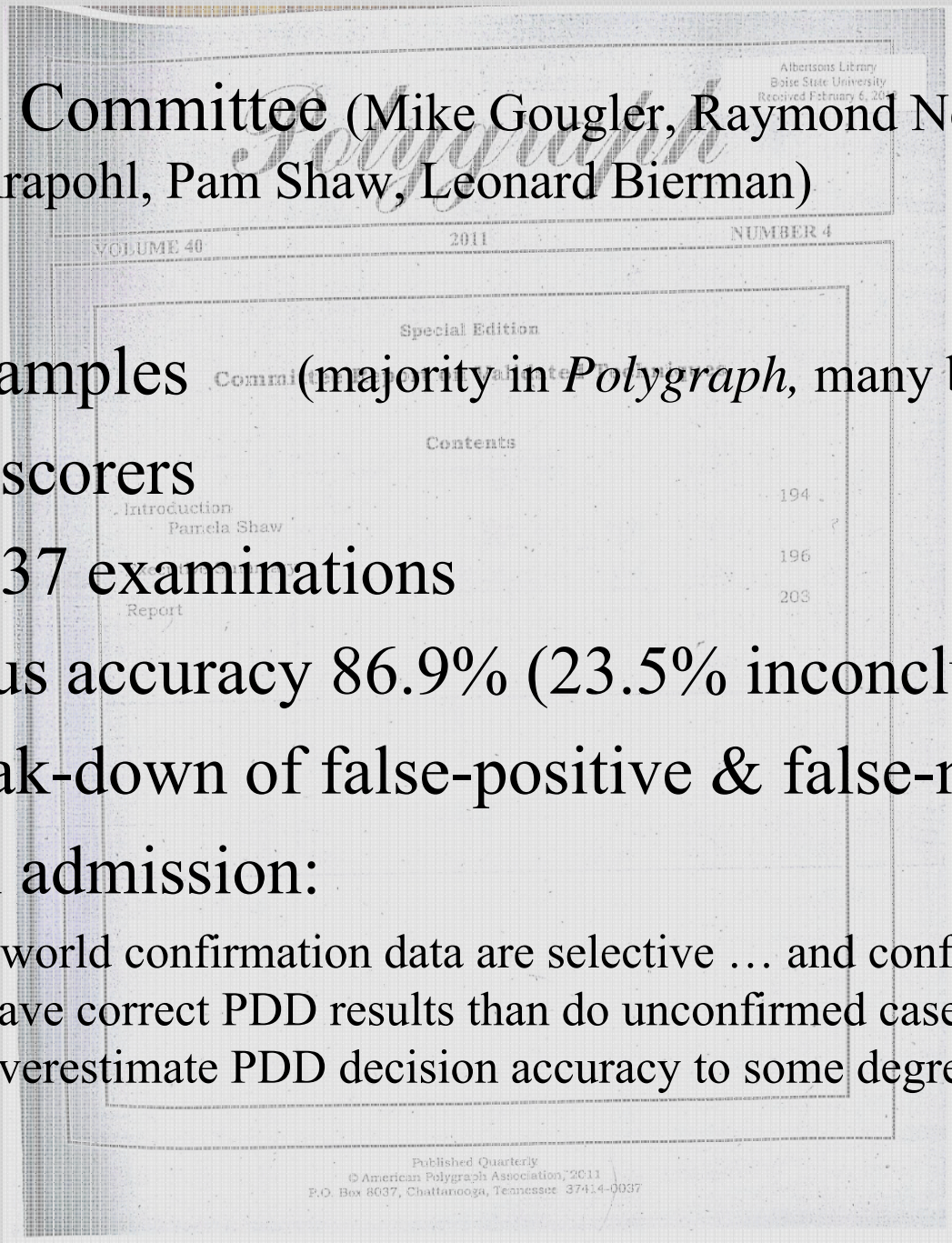


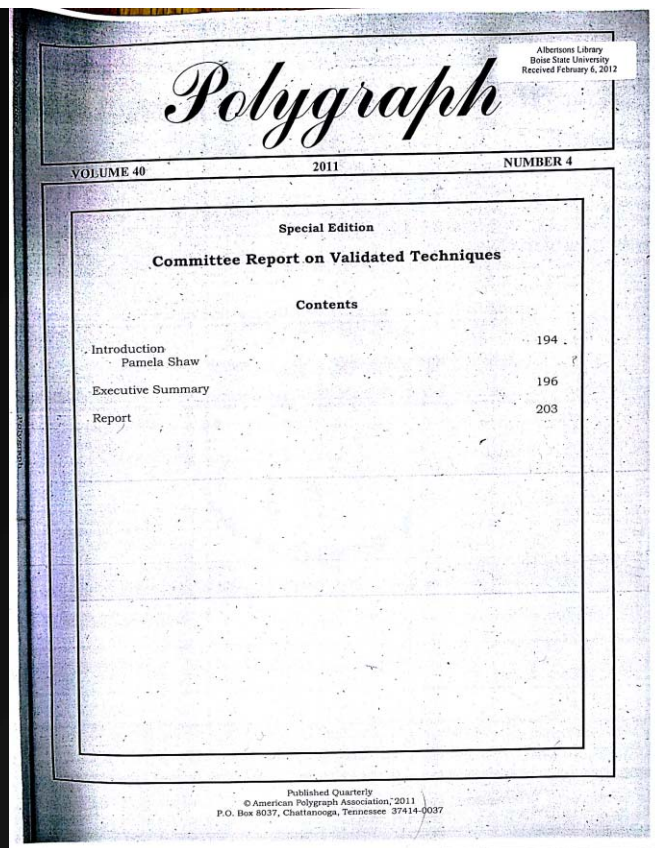
NRC (2003) Key Conclusions

- “What is remarkable, given the large body of relevant research, is that claims about the accuracy of the polygraph made today parallel those made throughout the history of the polygraph: practitioners have always claimed extremely high levels of accuracy, and these claims have rarely been reflected in empirical research.”
- “Almost a century of research in scientific psychology and physiology provides little basis for the expectation that a polygraph test could have extremely high accuracy.”

“Meta-Analytic Survey” by APA

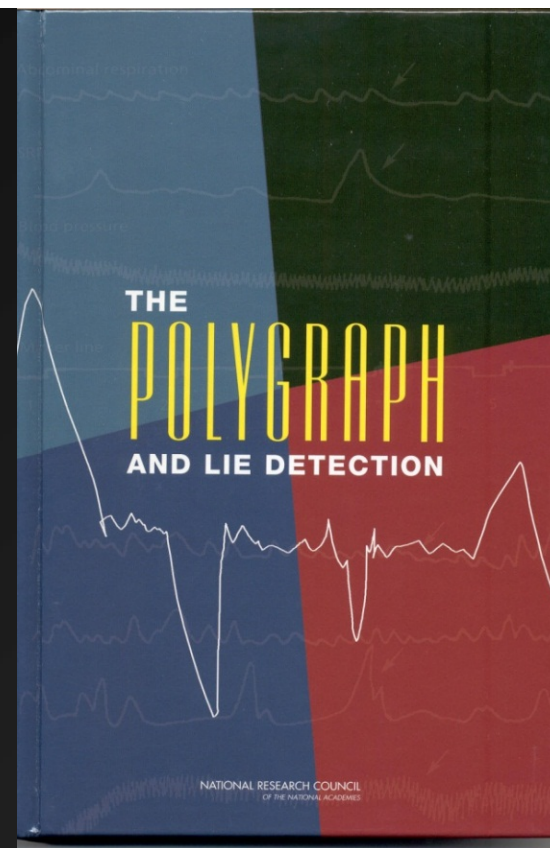
- Ad-hoc Committee (Mike Gougler, Raymond Nelson, Mark Handler, Donald Krapohl, Pam Shaw, Leonard Bierman)
- Scope:
 - 45 samples (majority in *Polygraph*, many by Raymond Nelson)
 - 295 scorers
 - 11,737 examinations
- Omnibus accuracy 86.9% (23.5% inconclusive)
- No break-down of false-positive & false-negative
- Critical admission:
 - “Real world confirmation data are selective ... and confirmed cases more often may have correct PDD results than do unconfirmed cases. As a result, field studies may overestimate PDD decision accuracy to some degree.”





“To strategically plan for and ensure our survival in the years ahead, the APA has been implementing initiatives...”

“We are at a great time in polygraph history and we can be proud of the steps we are taking to move our profession forward”

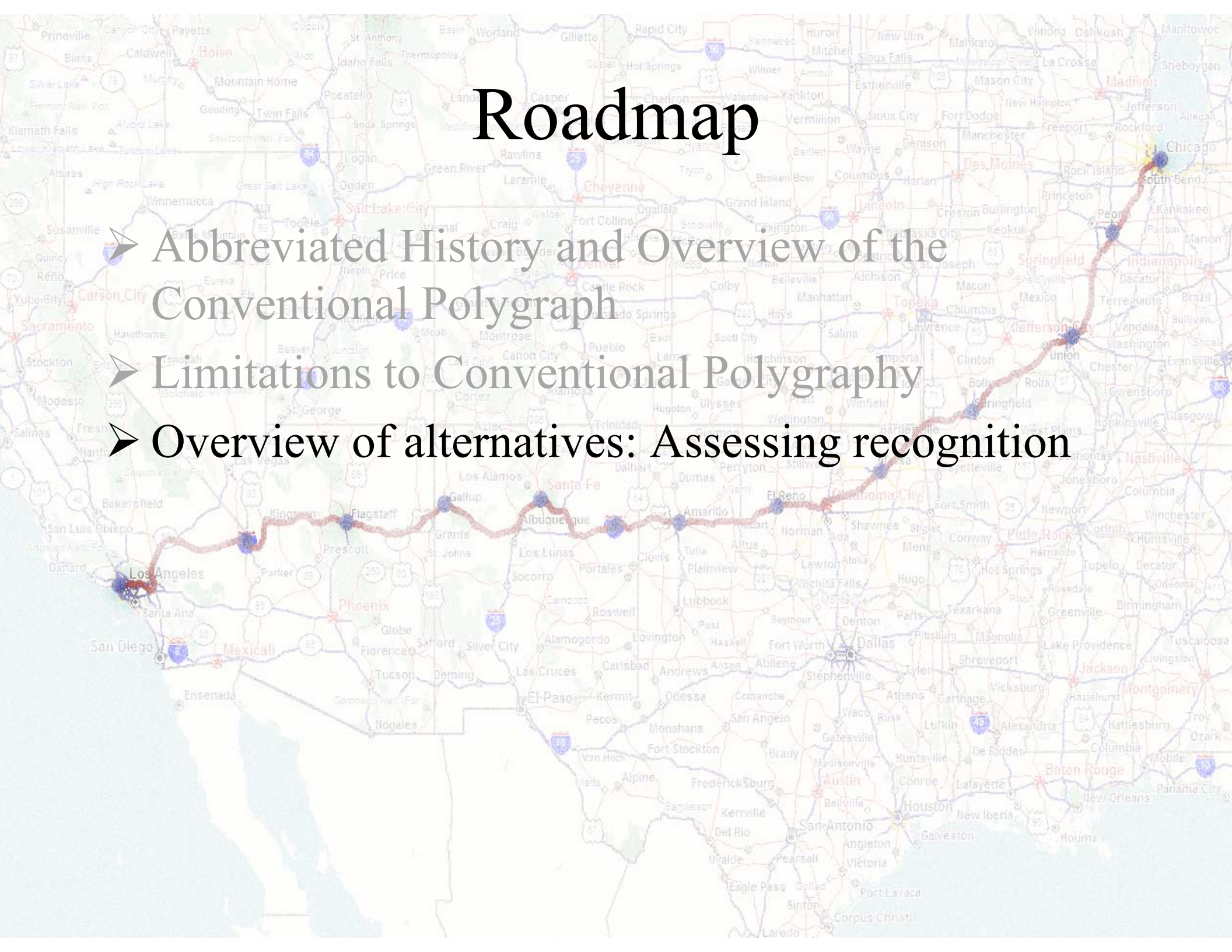


“... specific-incident polygraph tests can discriminate lying from truth telling at rates well above chance, though well below perfection. ... polygraph accuracy for screening purposes is almost certainly lower than what can be achieved by specific-incident polygraph tests in the field.”

jallen.faculty.arizona.edu/polygraph

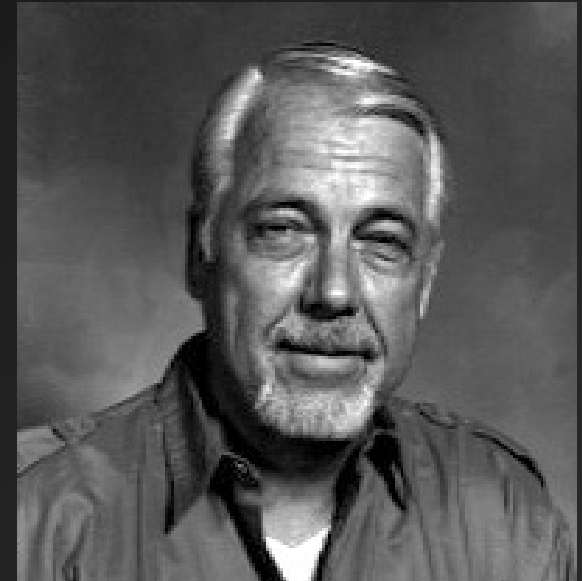
Roadmap

- Abbreviated History and Overview of the Conventional Polygraph
- Limitations to Conventional Polygraphy
- Overview of alternatives: Assessing recognition



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)**
- **Sometimes termed “Concealed Information Test” (CIT)**



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
- Over 5,000 GKT tests given in Japan each year, for example

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%

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%)

Synopsis

- There is no unequivocal lie response
- Polygraphy:
 - assesses emotional reactions
 - has an unacceptably high false-positive rate
 - Is vulnerable to countermeasures that can reduce true-positive rate
- Polygraphers overestimate accuracy 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; i.e. “scare the hell out of people”