How to catch a criminal?
Memory detection, not lie detection

Bruno Verschuere
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White lies

Some examples:

- Taxes
- Insurance
- Relationships
- Job interviews

DePaulo: 1-2 lies/day

Lie detection?

When lying matters…

- Insurance companies
- Business (shop theft)
- Terrorism (Schiphol: 50.000.000)
- State secrets (Los Alamos)
- Forensic Psychiatry
- Criminal investigations

Forensic toolbox

- DNA
- fingerprint
- teeth
- smell
- earprint

Yet

- available?
- 100%?

« I did not have sexual relations with that woman, Monica Lewinsky »

‘’No’’ ‘’No’’

TRUTH LIE

Lie detection

- Nonverbal behavior: *smiling, gestures, voice pitch*
- Verbal behavior; *CBCA, RM, SCAN*
- Psychophysiology *polygraph, ERPs, fMRI*

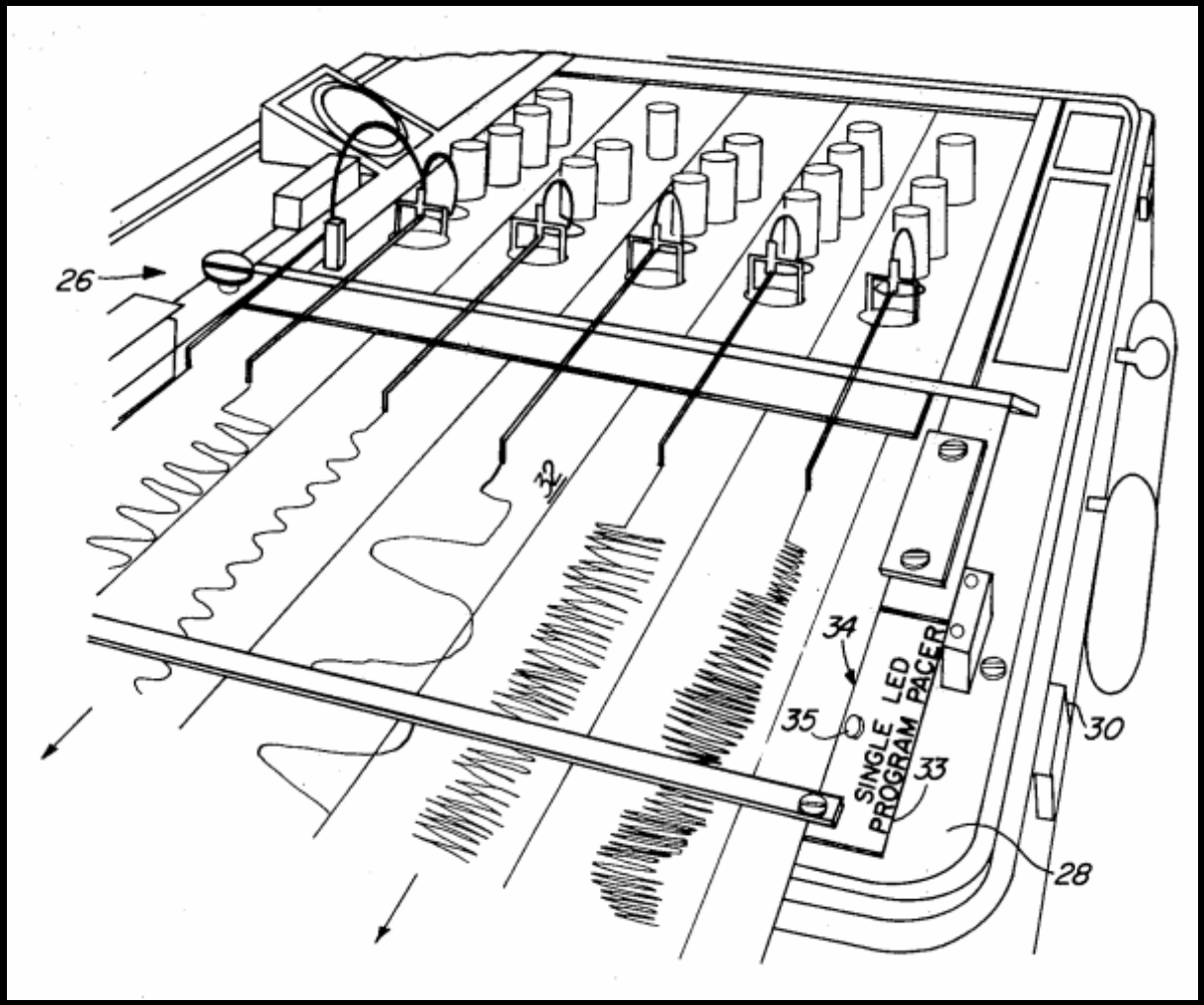
Psychophysiological lie detection

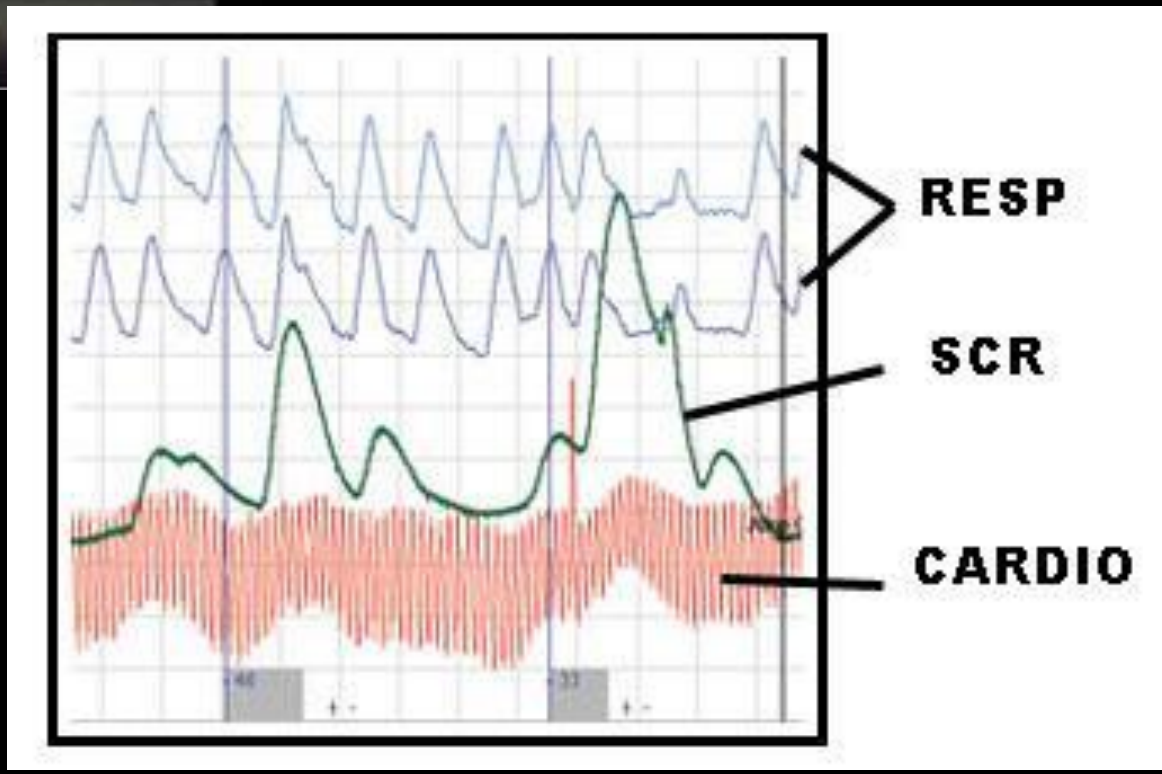
ANS

Wild West

History

- China
- Inquisition
- Desert


26
32
34
35
SINGLE LED PROGRAM PACER
33
30
28


RESP
SCR
CARDIO

Yup! She's definitly faking it...

Polygraph

Polygraph + Interrogation technique

“Lie detector”

- Relevante /Irrelevante question technique
- Control Question Technique

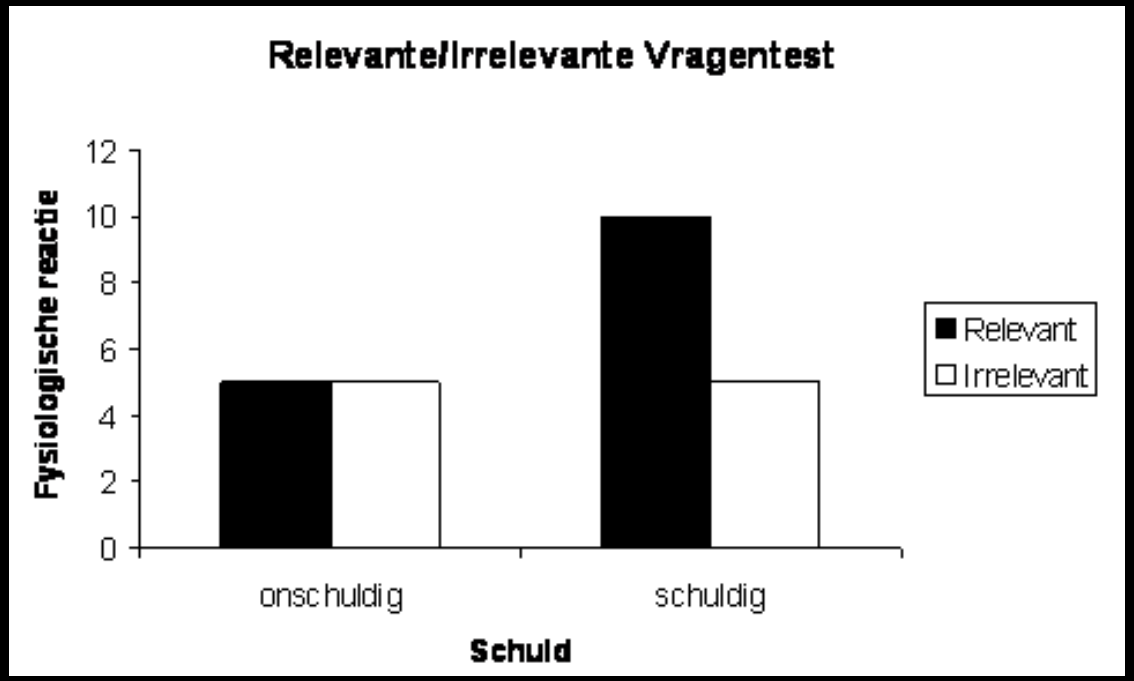
“Memory detector”

Relevant/IRrelevant question test

(R/IR; Larson, 1922)

- Do you like it at the university?;
- How much is 30 x 40?;
- Are you scared?;
- Like to dans?;
- Did you steal the money?.

R/IR: assumptions



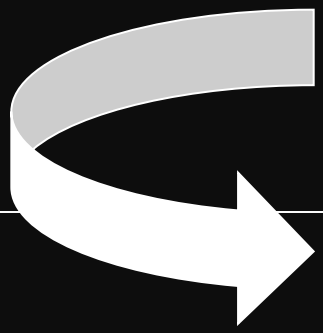
Lie research

Lie research

	"Ground truth"	Ecological validity
Lab	√	X
Field	X	√

Lie research

	"Ground truth"	Ecological validity
Lab	√	X
Field	X	√



Accuracy R/IR

Horowitz et al 1997

- Mock crime
- N=30
  - listen (innocent)
  - enact (guilty)
- 10$ + 25$ reward
- Questions
  - 3 x IR: Is 2+2 = 4?
  - 3 x R: Did you take the ring from the desk?

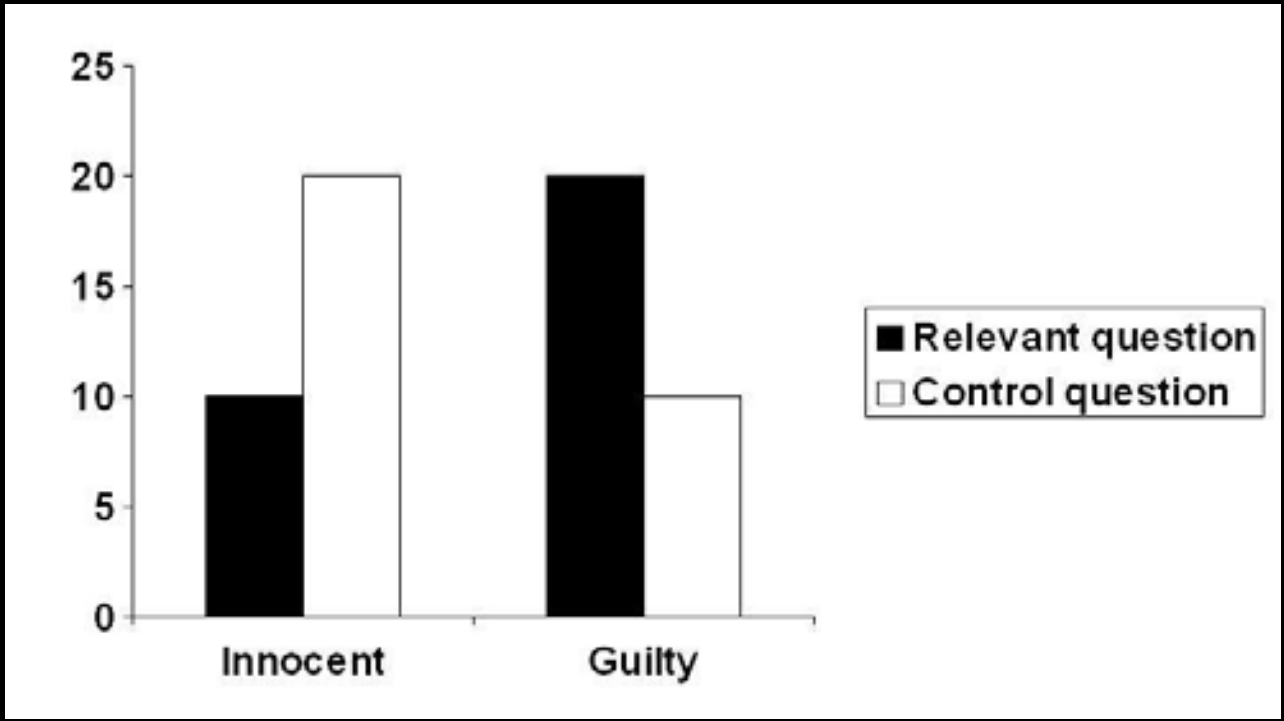
Results

Horowitz et al 1997

Experimental group[a]	Test outcomes (%)			
	Correct	Wrong	Inconclusive	% correct decisions[b]
Guilty				
Relevant–irrelevant	100	0	0	100
Innocent				
Relevanti–irrelevant	20	73	7	22

Control Question Technique

- Relevant questions: Did you steal the camera?
- Control questions: During the first 25 years of your life, did you ever tell an important lie?



But why?

Pretest interview

- « Polygraaf = bulletproof »
- Importance control questions

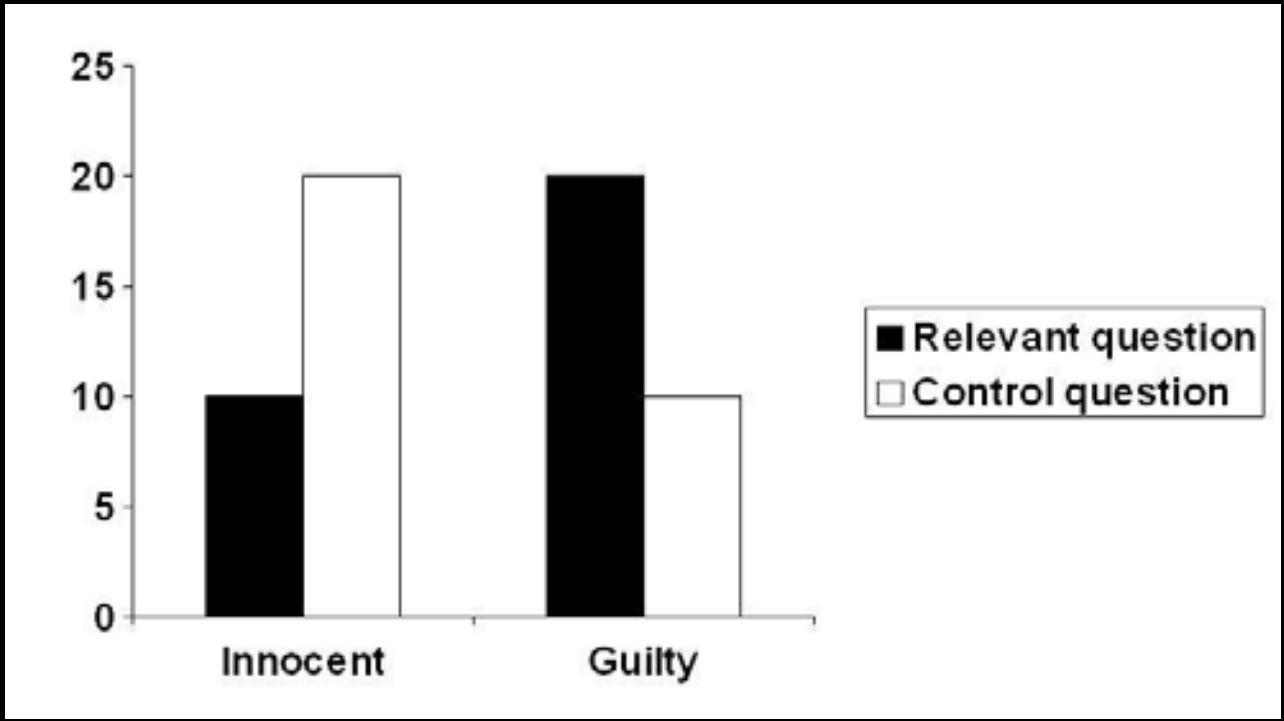
I am going to ask you some questions to find out what your history concerning this matter looks like. I want to give you the reason, too, why I have to ask you such indiscrete questions. I want to find out whether one would consider you capable of an action such as removing a voucher for 50 € based on your history or not. In a nutshell, I want to know whether such an action, taking something of monetary value out of a closed room fits your personality profile or not.

These personal questions also have to be answered entirely truthfully. The more of these questions you can truthfully negate, the better it is for you, because then one can say that such an action does not fit your personality profile. If, however, you have to truthfully answer yes, then I will have to continue asking what the context was, so that I can get an impression of whether these were small and harmless delinquencies or whether there were some serious ones as well. Depending on what you tell me, it may begin to become imaginable that you may have done what we are talking about here as well.

The personal questions have nothing to do with whether you have taken the voucher or not. To make that clear from the beginning of every question, each personal question will start with: "In the first 25 years of your life, . . .," so that you will know right away, "this is about my past." For the result of the polygraph examination it is important, that you answer these questions truthfully as well.

Control Question Technique

- Relevant questions: Did you steal the camera?
- Control questions: During the first 25 years of your life, did you ever tell an important lie?



Problem 1

Problem 2

Lack of standardization

- cf IQ-test?
- polygraph or polygrapher
- (un-)conscious biases; e.g., CBS

Problem 3

Conclusions CQT Research

	Guilty Participant/Suspect			Innocent Participant/Suspect		
	Test Outcome Correct	Test Outcome Incorrect	Test Outcome Inconclusive	Test Outcome Correct	Test Outcome Incorrect	Test Outcome Inconclusive
Laboratory studies						
Office of Technology Assessment (1985)	74	7	19	60	16	24
Kircher et al. (1988)	74	8	18	66	12	22
Ben-Shakhar and Furedy (1990)	80	7	13	63	15	22
Honts (2004)	82	7	11	83	10	7
Field studies						
Office of Technology Assessment (1985)	87	11	2	75	19	6
Ben-Shakhar and Furedy (1990)	84	13	3	72	23	5
Honts (2004)	89	1	10	59	12	29

Source: Meijer & Verschuere, 2010

The earplug murder

- R: “On june, 2ed, 1998, did you cut Ran´s throath?”
- C: “Did you ever tell an important lie?”

The Bervoets case 2011

Relevant questions:

- “On september, 2ed, did you intentionally shoot Nathalie?”

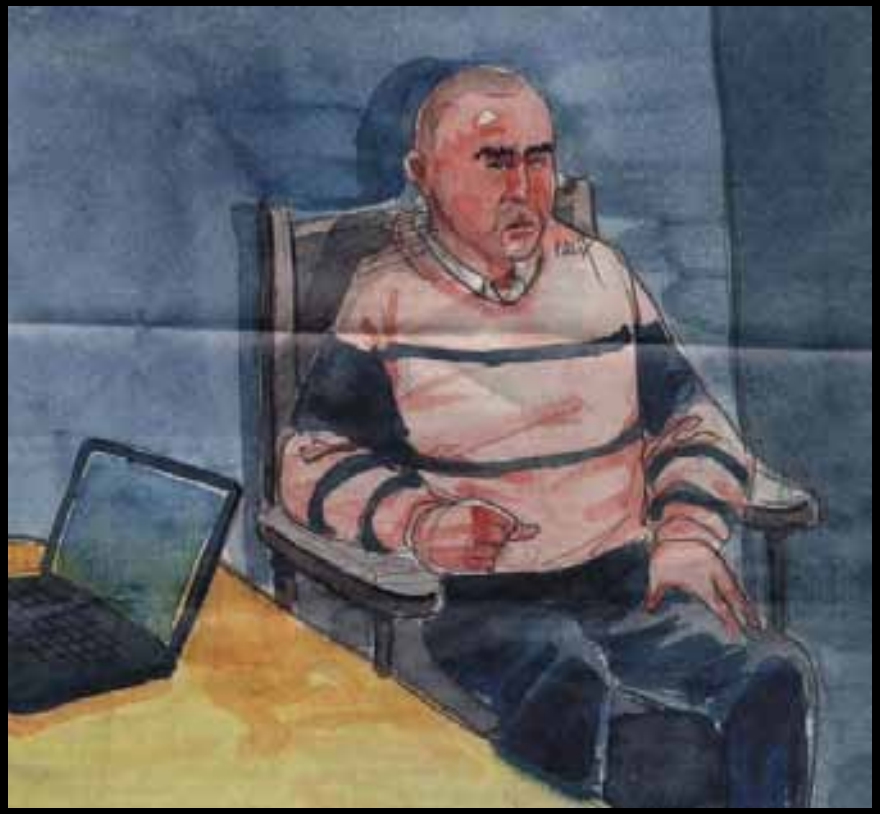
Control questions:

- “Did you ever tell an important lie?”

Conclusions CQT

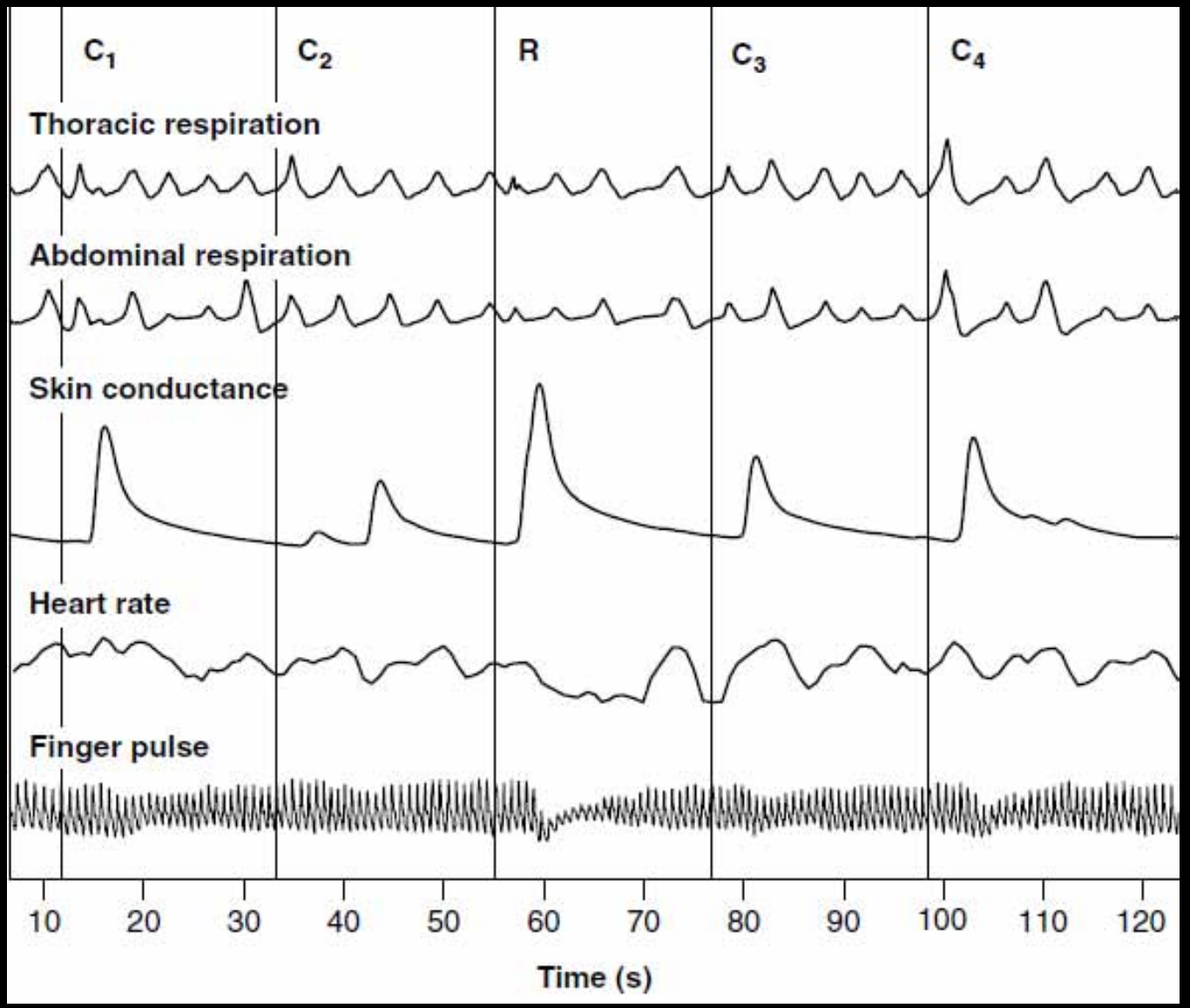
What is remarkable, given the large body of relevant research, is that claims about the accuracy of the polygraph made today parallel those made throughout the history of the polygraph: practitioners have always claimed extremely high levels of accuracy, and these claims have rarely been reflected in empirical research (NRC, 2003)

Memory detection



Where did we find Nathalie and Stacey?

- In the woods
- Under a bridge
- In a garden shed
- *In the sewer*
- In the lake
- In the basement


C1
C2
R
C3
C4
Thoracic respiration
Abdominal respiration
Skin conductance
Heart rate
Finger pulse
10
20
30
40
50
60
70
80
90
100
110
120
Time (s)

Memory detection

Research on memory detection

(Ben-Shakhar & Elaad, 2003)

Category	*N*	Corrected *N*[b]	*a*
Card test	57	1978.5	0.805
POT	9	332.5	0.782
Code words	37	1145.0	0.743
Personal items	24	590	0.839
Mock crimes	42	1534	0.872
Across all experimental conditions	169	5198	0.815

Review mock crime studies

(Meijer & Verschuere, 2010)

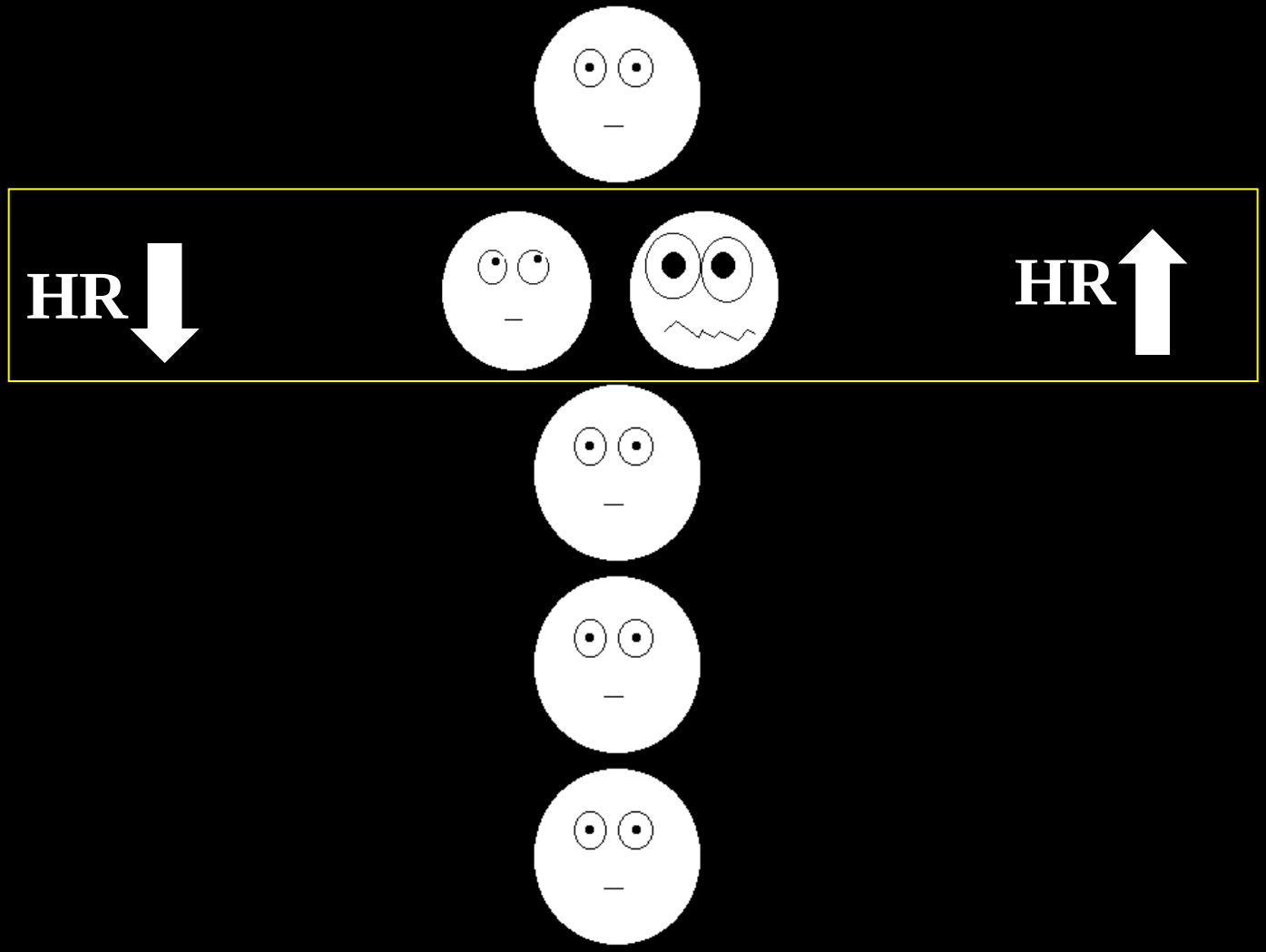
	Guilty Participant/Suspect		Innocent Participant/Suspect	
	Test Outcome Correct	Test Outcome Incorrect	Test Outcome Correct	Test Outcome Incorrect
Laboratory studies				
Ben-Shakhar and Furedy (1990)	84	16	94	6
Elaad (1998)	81	19	96	4
Lykken (1998)	88	12	97	3
MacLaren (2001)	76	24	83	17

Mechanism?

Attention

Fear

Heart rate

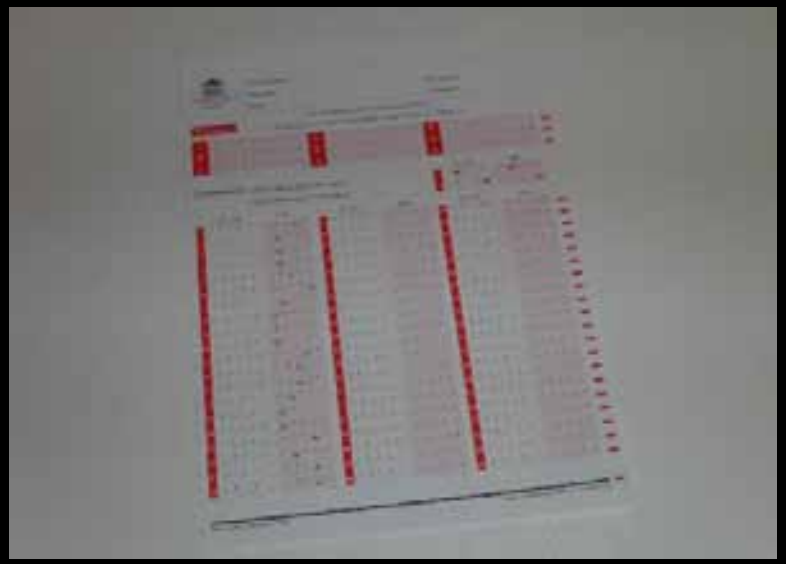


Verschuere et al. (2004, *Psychophysiology*)

Condition A
theft 10 euro

critical

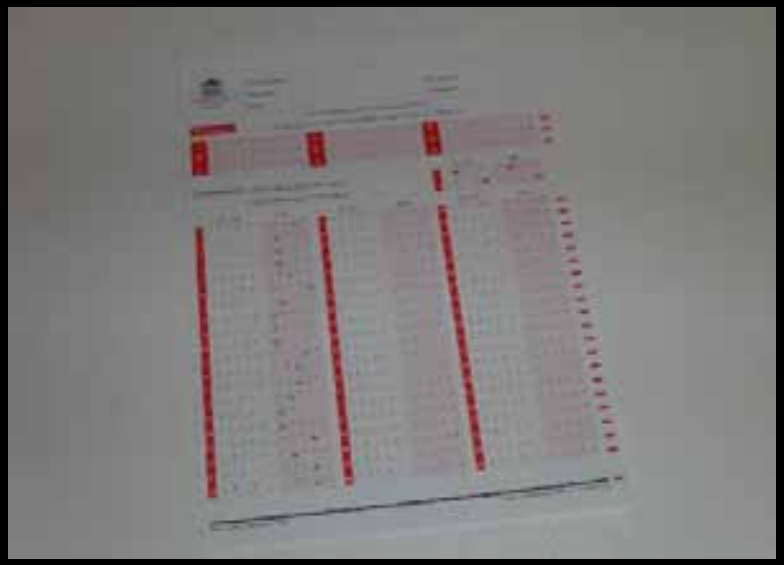
control



Conditie B
Exam fraud

Control

Critical



Results

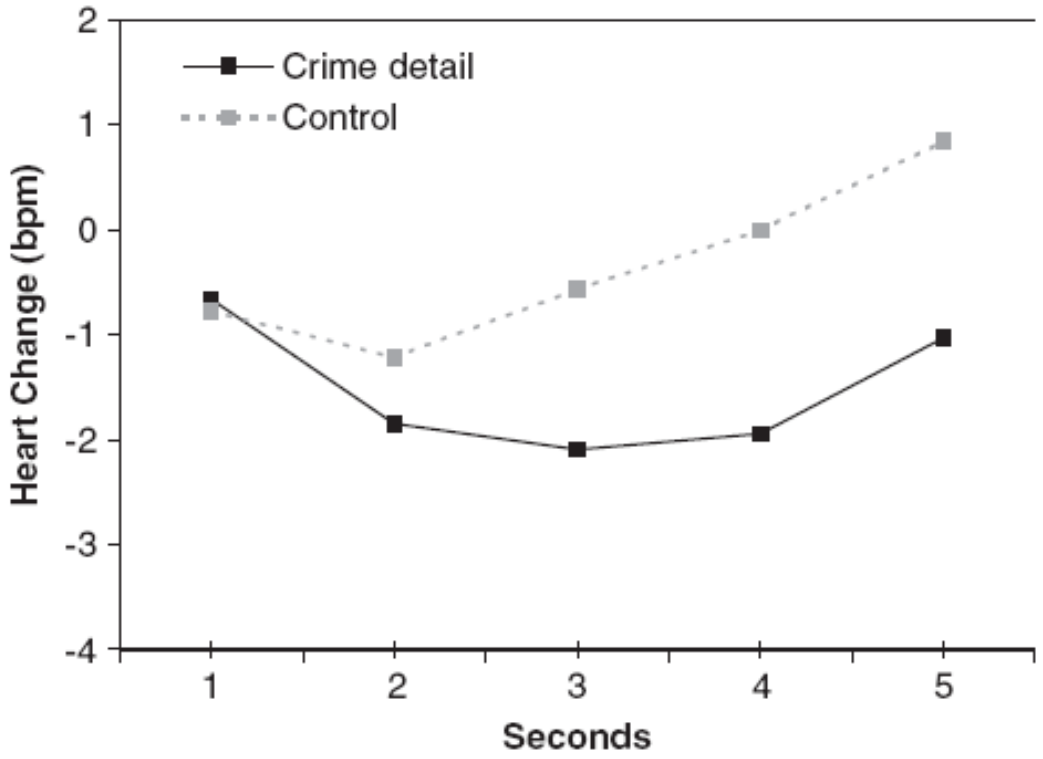


Figure 1. Effect of picture type (crime detail/control) on second-by-second change in heart rate (in beats per minute).

HR ↓

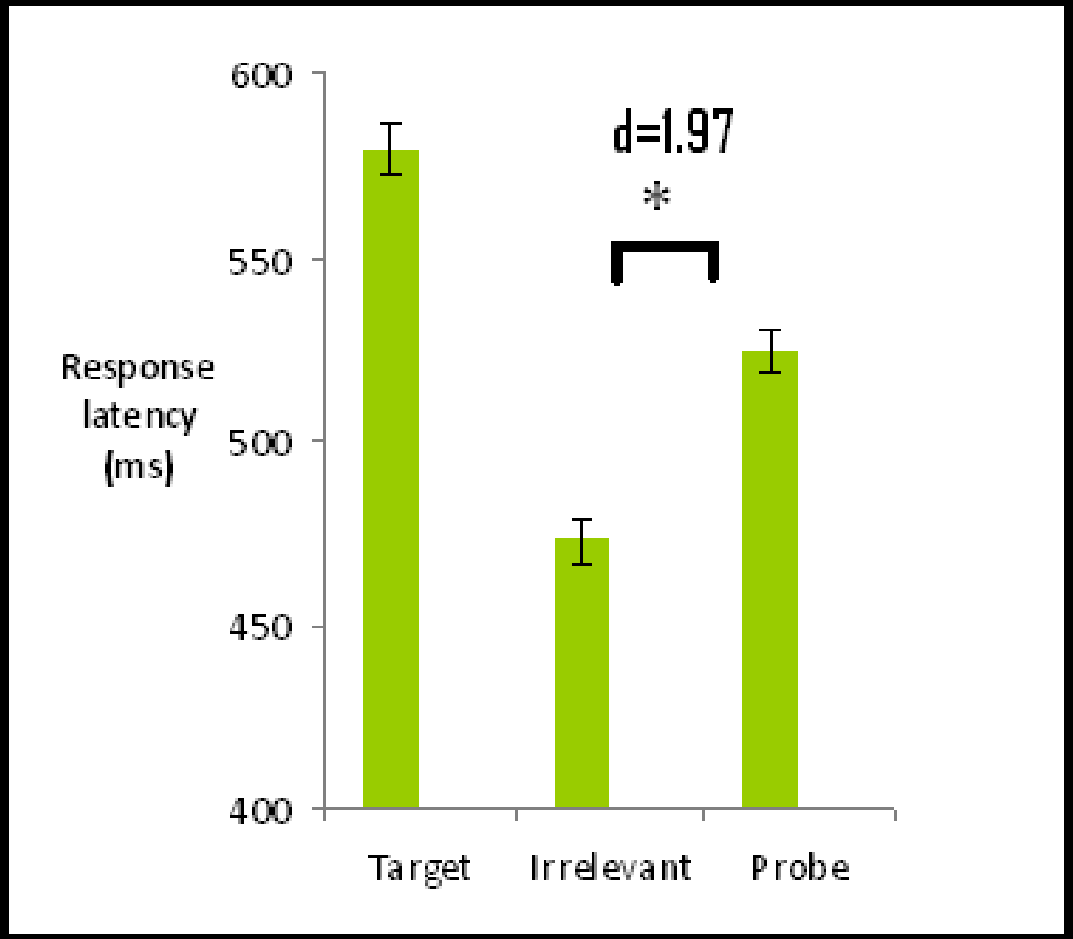
Own name

´YES´

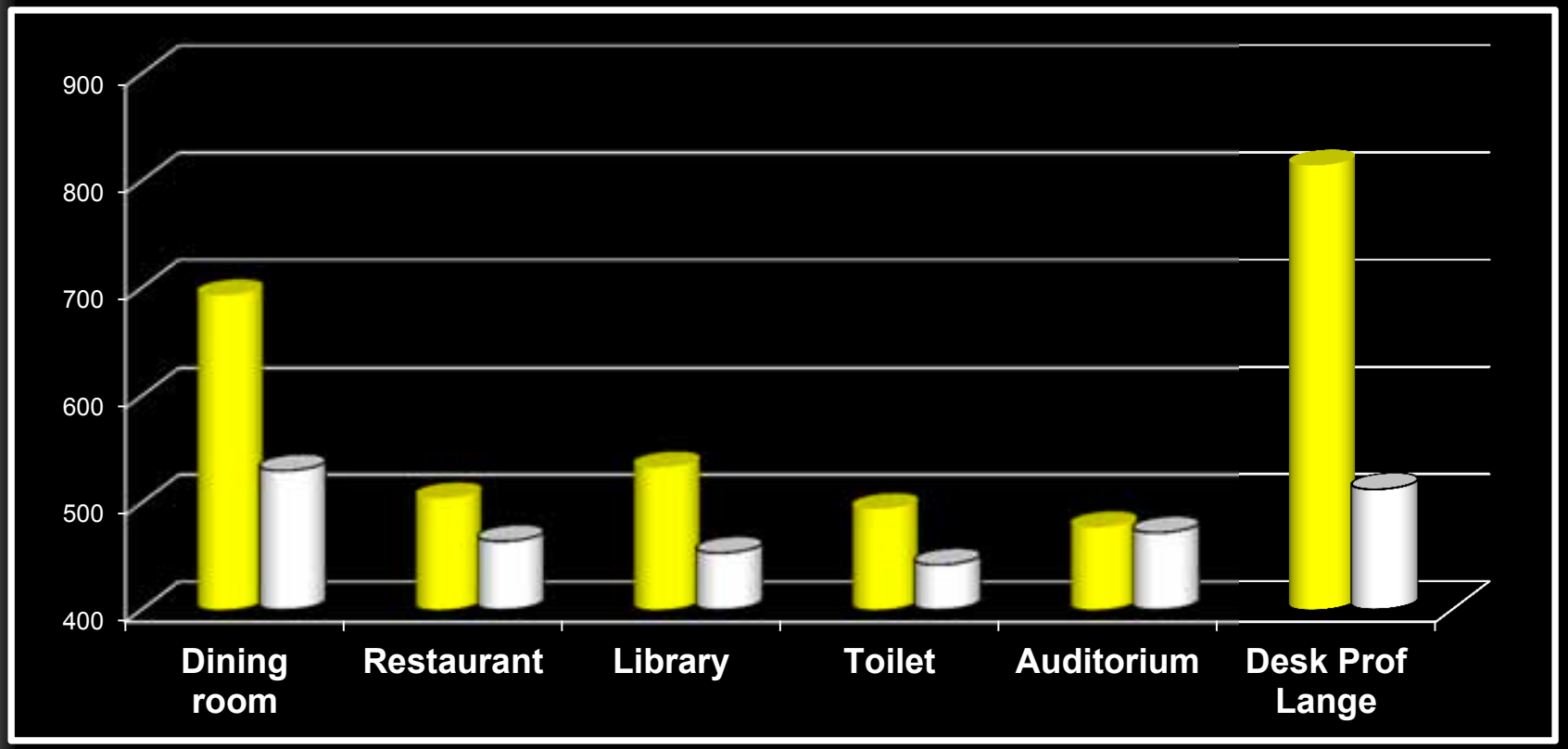
Frank

´NO´

Steven
Bill
Bruno
Hendrik
Jan


600
550
500
450
400
Response latency (ms)
d=1.97
*
Target
Irrelevant
Probe

Labyrint


900
800
700
600
500
400
Dining room
Restaurant
Library
Toilet
Auditorium
Desk Prof Lange

Labyrint

Lie detection vs Memory detection

Theory +

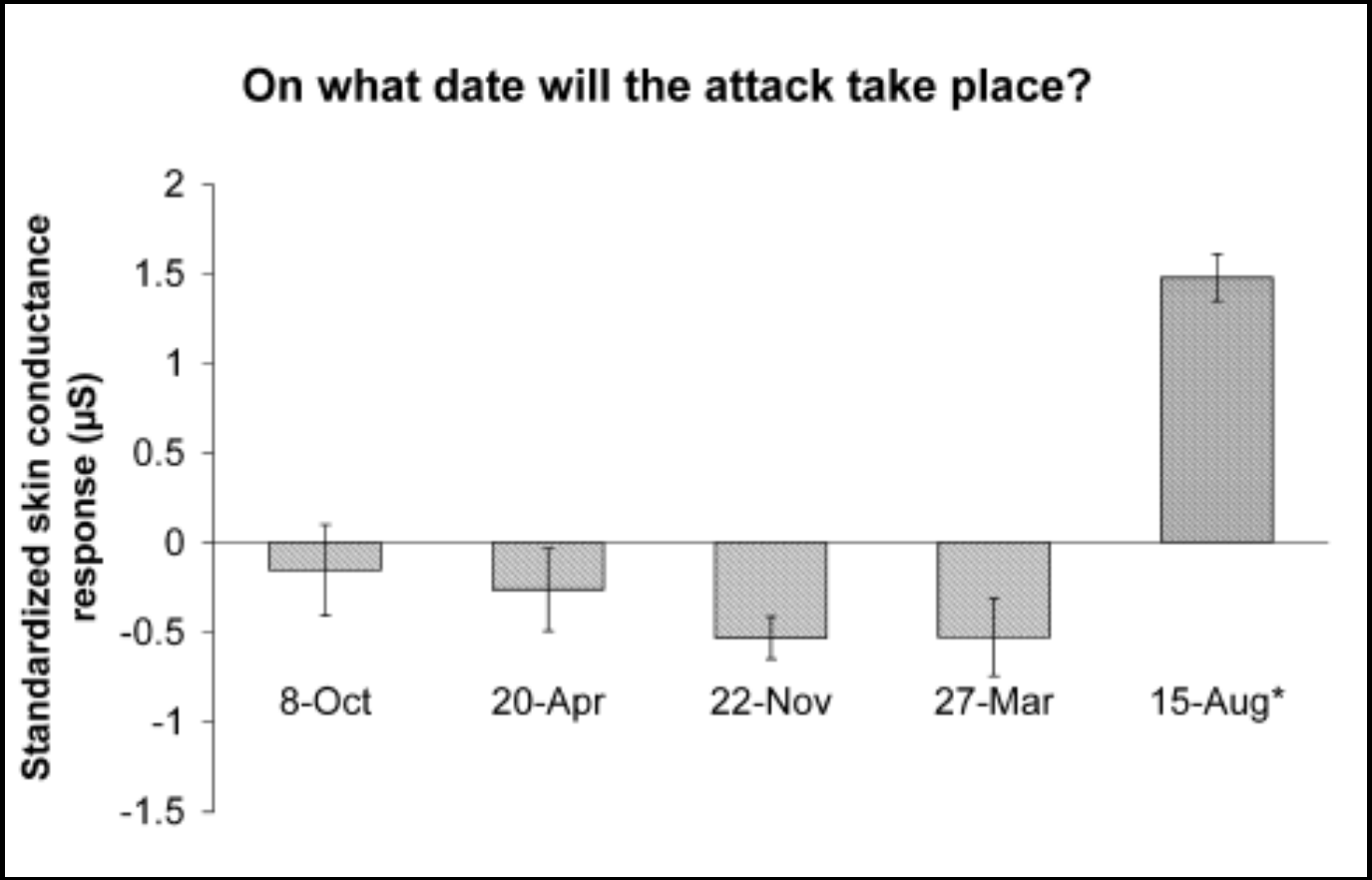
Errors +

+ Applicability

Searching memory detection test

Terrorism

(Meijer et al., 2010)

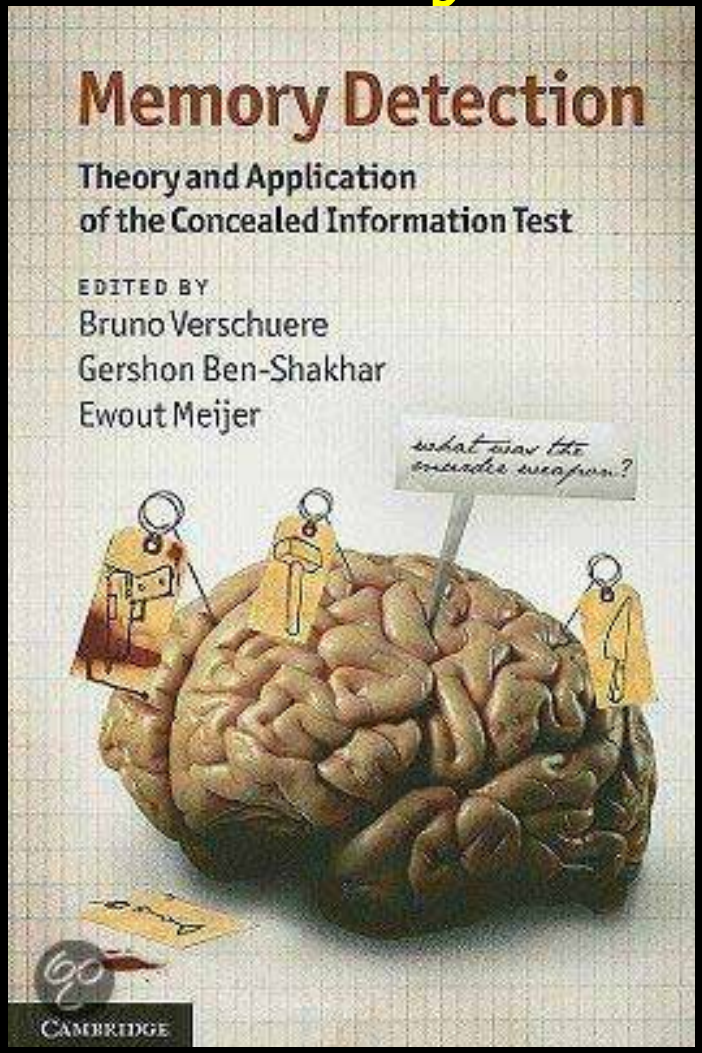


Take home message

- Lie detection
  - Flawed theory
  - False positives

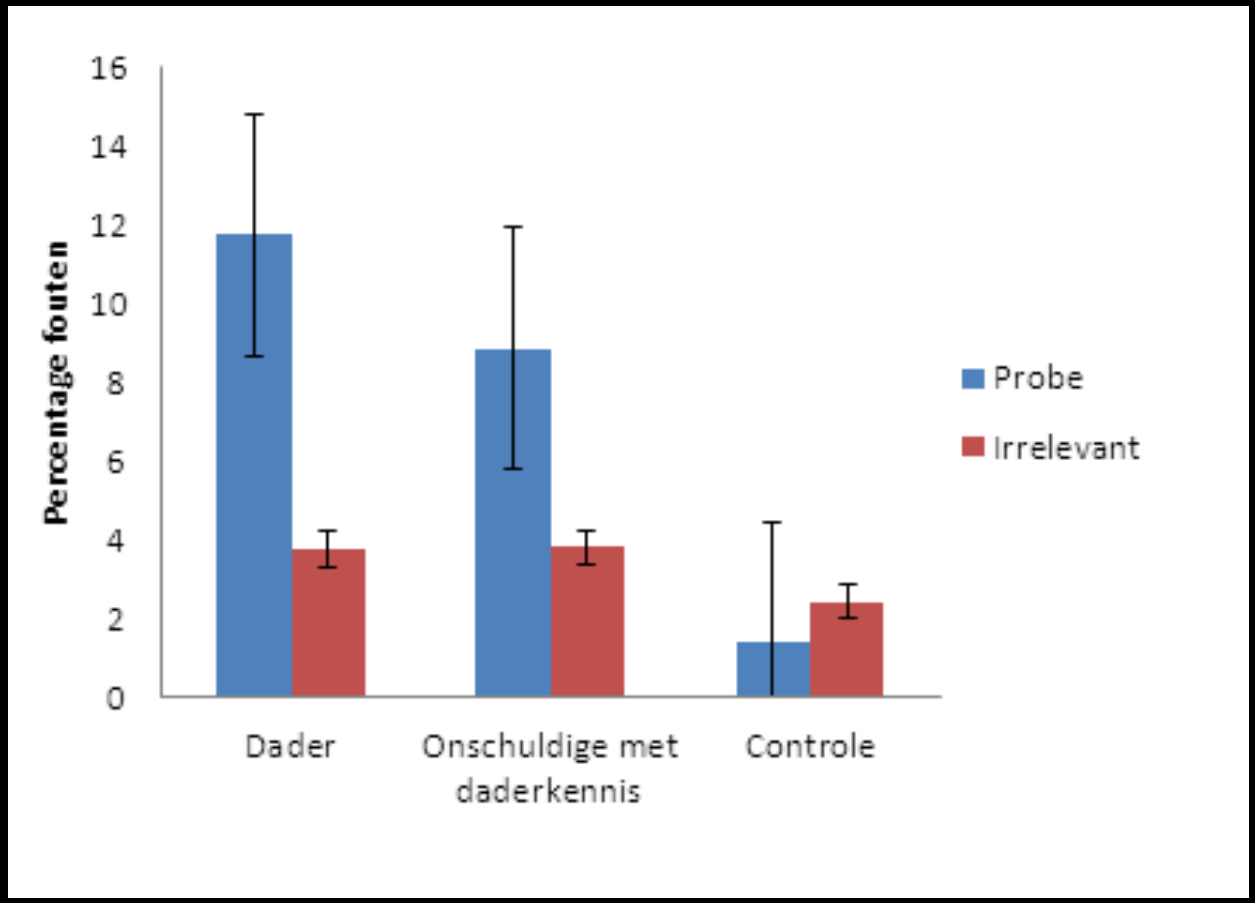
- Memory Detection
  - Sound theory
  - Valid using simple laptop

Thank you


Memory Detection
Theory and Application
of the Concealed Information Test
EDITED BY
Bruno Verschuere
Gershon Ben-Shakhar
Ewout Meijer
what was the murder weapon?
CAMBRIDGE

Leakage

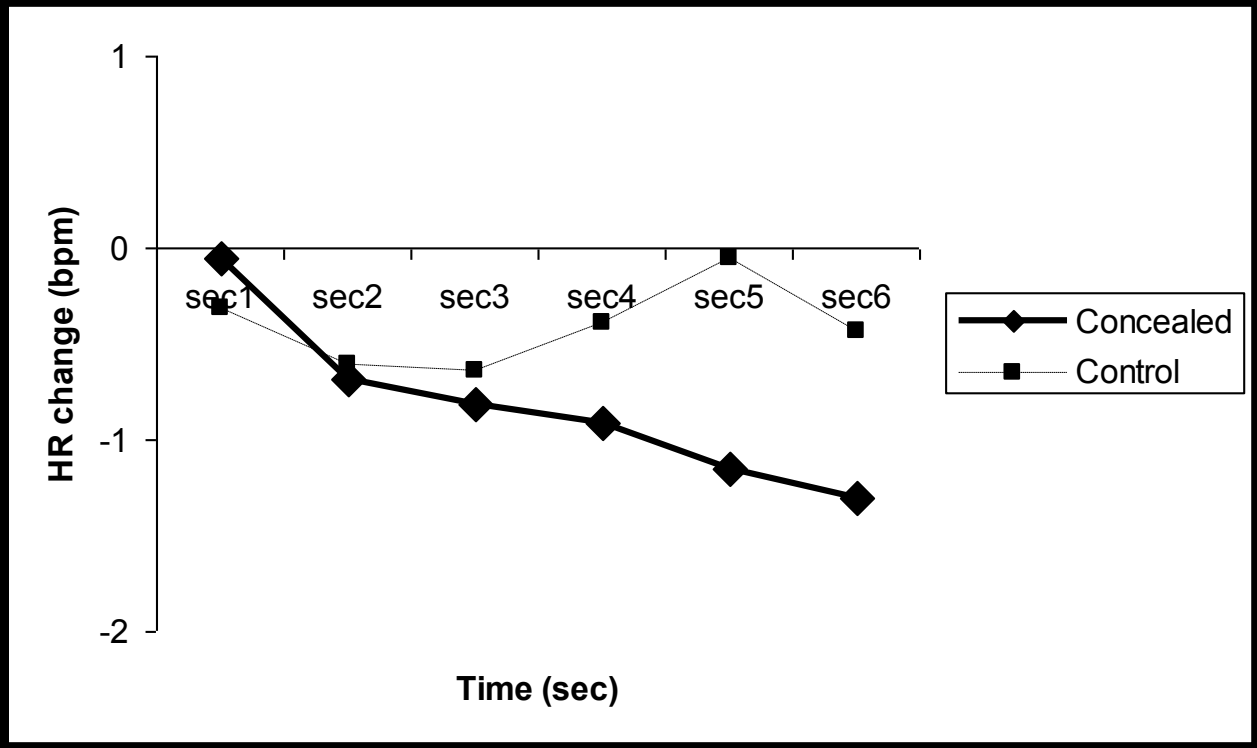
(Masterthesis Brenda Duits 2012)

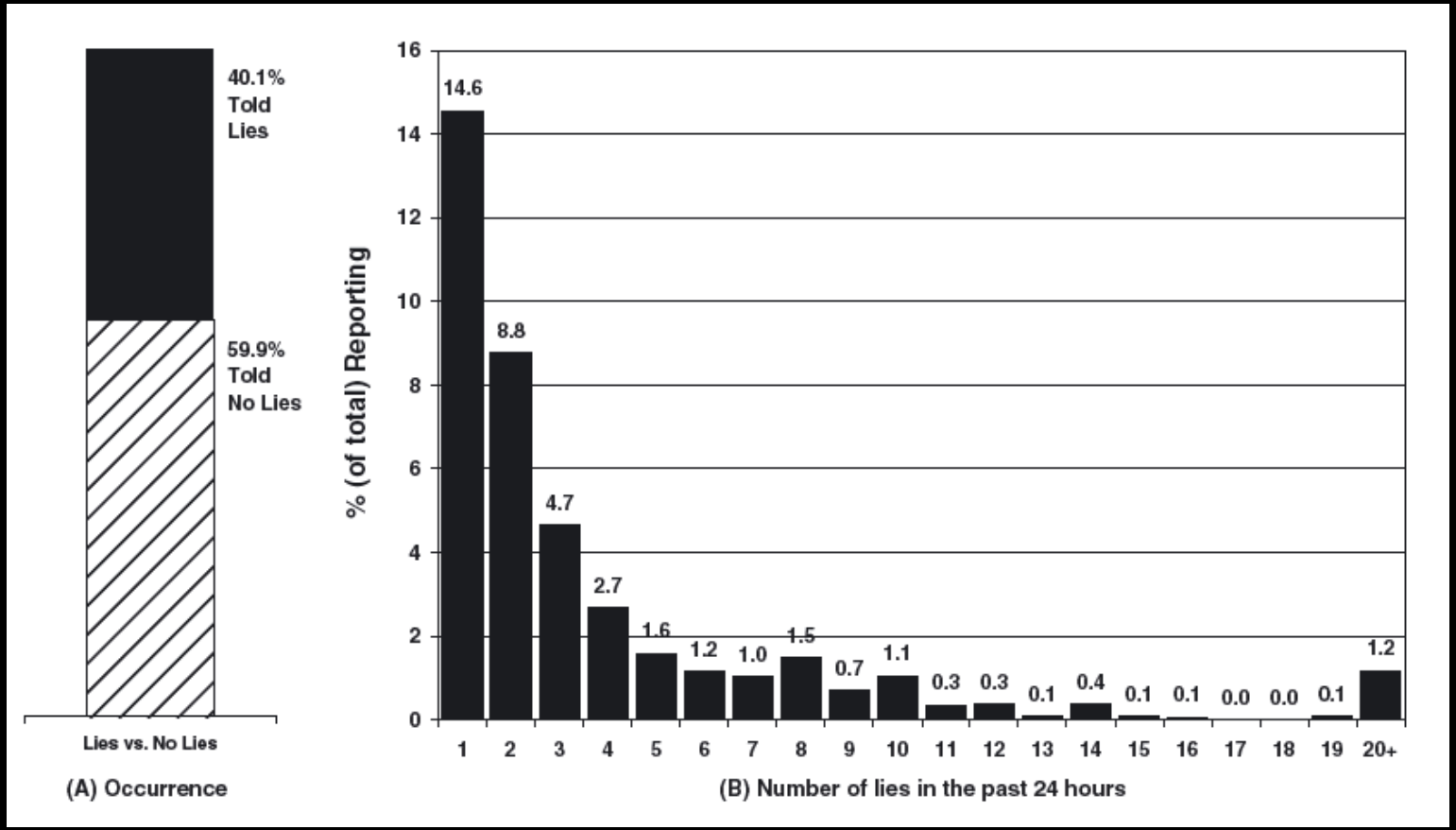


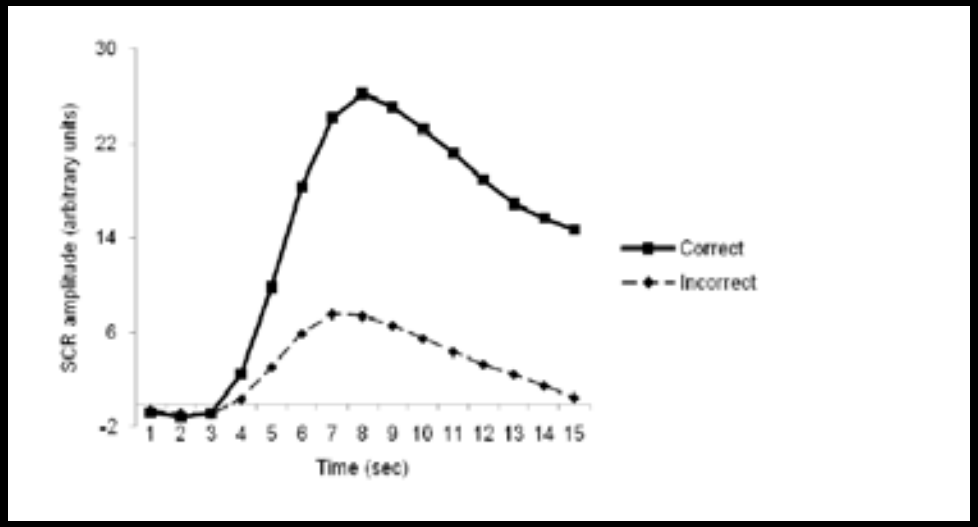
	Bevinding	Methode
DePaulo et al. (1996a, b)	0.97 - 1.96	Dagboek
Hancock et al (2004)	1.58	Dagboek
George and Robb (2008)	0.59 - 0.90	PDA
Serota et al (2010)	1.65	Internet survey

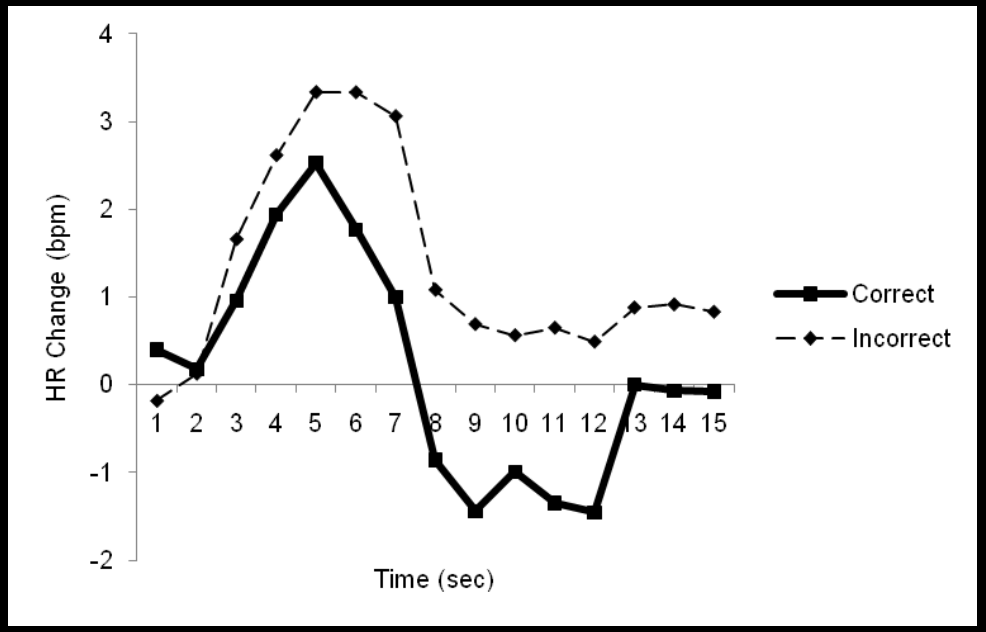
Heart rate (prisoners)

Verschuere et al, 2005, Psychophysiology




40.1%
Told
Lies
59.9%
Told
No Lies
Lies vs. No Lies
(A) Occurrence
% (of total) Reporting
16
14
12
10
8
6
4
2
0
14.6
8.8
4.7
2.7
1.6
1.2
1.0
1.5
0.7
1.1
0.3
0.3
0.1
0.4
0.1
0.1
0.0
0.0
0.1
1.2
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20+
(B) Number of lies in the past 24 hours


SCR amplitude (arbitrary units)
30
22
14
6
-2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Time (sec)
Correct
Incorrect


HR Change (bpm)
4
3
2
1
0
-1
-2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Time (sec)
Correct
Incorrect

Advocates

Very, very, very strong selection

Charles R. Honts

Table 5.3 *Per cent correct decisions by original examiners in field cases*

Study	Innocent	Guilty
Honts & Raskin (1988)	100	92
Raskin et al. (1988)[a]	96	95
Patrick & Iacono (1991)	90	100
Honts (1996)[b]	100	94
Unweighted means	96.50	95.25

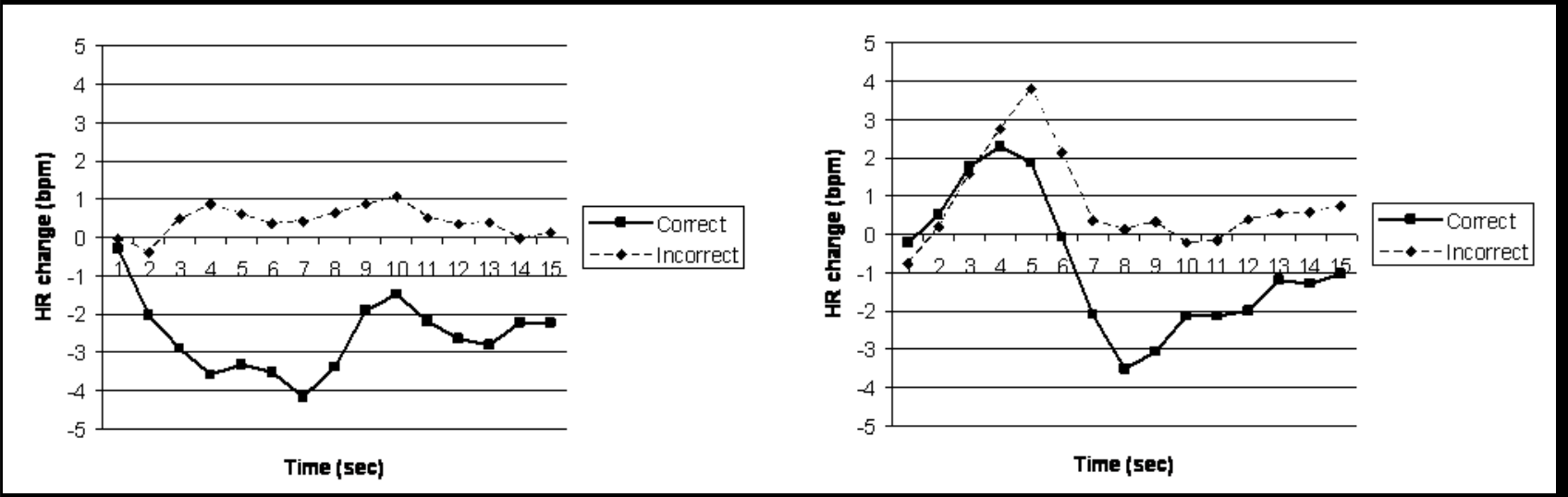
The polygraph industry

The role of verbalization

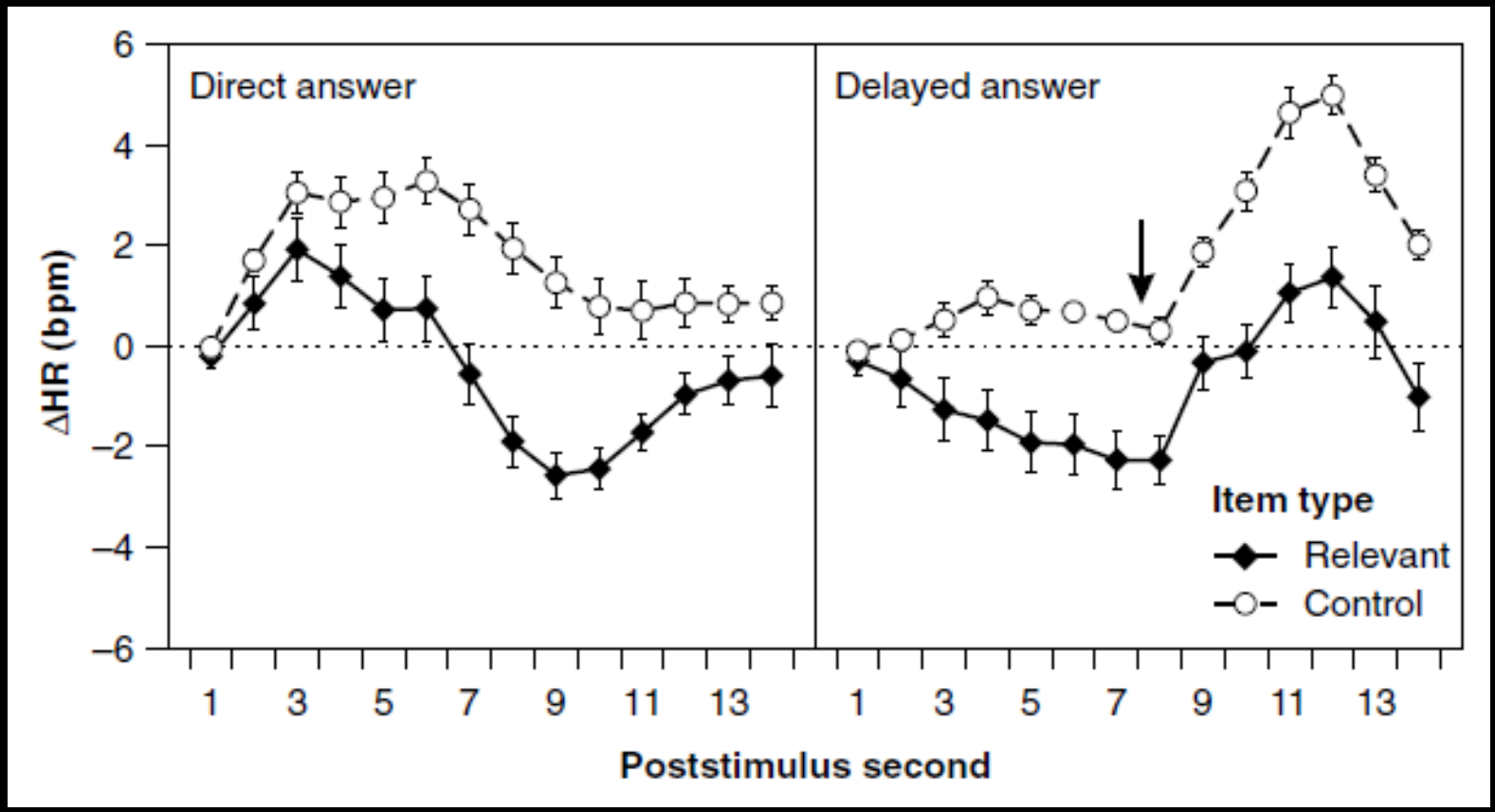
Verschuere et al, 2009, *Applied Psychophysiology & Biofeedback*

Silent

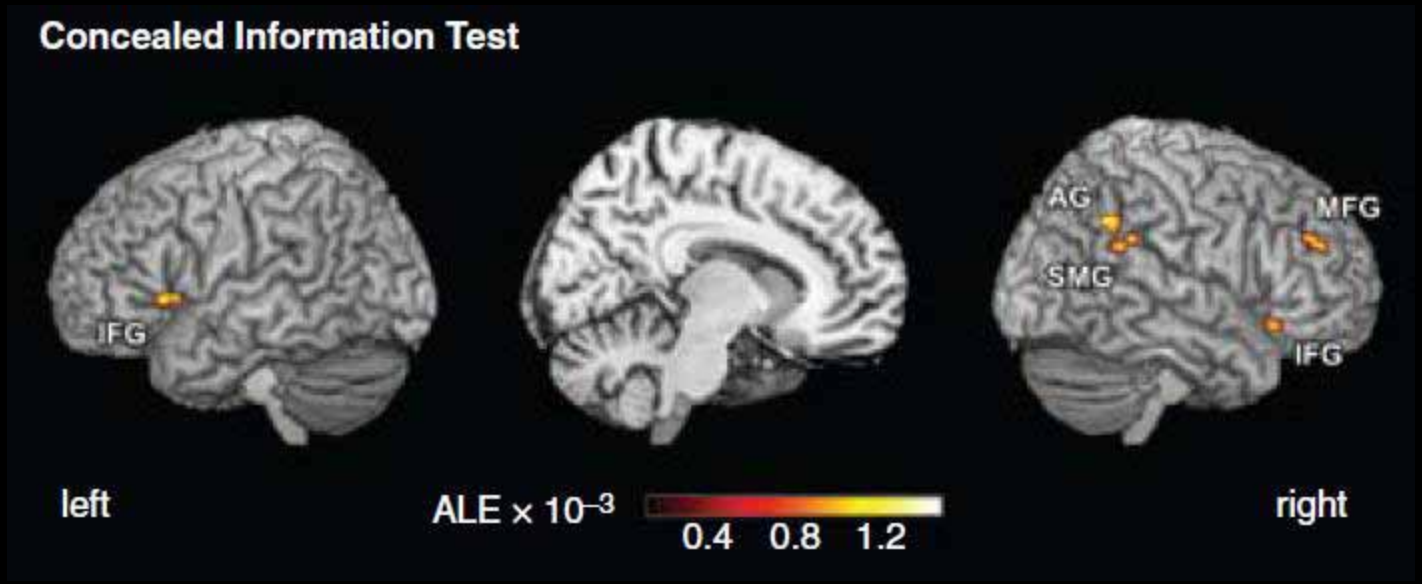
´No´



Gamer 2011


Direct answer
Delayed answer
ΔHR (bpm)
6
4
2
0
−2
−4
−6
1
3
5
7
9
11
13
Poststimulus second
Item type
Relevant
Control

Gamer 2011


Concealed Information Test
IFG
AG
SMG
MFG
IFG
left
ALE × 10–3
0.4 0.8 1.2
right

Detecting Concealed Information with Reaction Times: Validity and Comparison with the Polygraph

BRUNO VERSCHUERE[1*,†], GEERT CROMBEZ[1], TESSIE DEGROOTTE[1] and YVES ROSSEEL[2]

Stimulus Type	Proportion	Required response
Probe (own name)	1/6	No
Target (memorized name)	1/6	Yes
Irrelevant (new names)	4/6	No