# CIT meeting in Fukuyama: Verification of new indices on CIT

August 26th, 27th, 2017
Fukuyama University, JAPAN

Program Committee
Shinji Hira[1] (Fukuyama University)
Isato Furumitsu (Hiroshima Shudo University)
Robin Orthey (Maastricht University, University of Portsmouth)

# PROGRAM

## CIT meeting in Fukuyama: Verification of new indices on CIT

**DATE & TIME:**

Saturday, August 26th and Sunday, August 27th, 2017

10:00 A.M.-5:00 P.M.

**PLACE:**

Fukuyama University, No.29, #29205, 29303

**PROGRAM:**

Saturday, August 26th

10:00 A.M.-10:30 A.M.

Shinji Hira (Fukuyama University)

"The aim of CIT meeting in Fukuyama and a short introduction of participants"

"History of the CIT Meeting for the Japanese and the EU researchers"

10:30 A.M.-11:40 P.M. Oral presentation

Shinji Hira (Fukuyama University) & Isato Furumitsu (Hiroshima Shudo University)

"P300-based CIT using simultaneous visual and auditory stimulus presentation method"

11:40 A.M.-1:00 P.M. Lunch Time

1:00 P.M.-5:00 P.M. Oral presentation and General Discussion with Refreshment break

Akemi Osugi (Hyogo Prefectural Police Headquarters)

"Effective use of the concealed information test in Japan"

Kazuo Kobayashi (Hiroshima Prefectural Police Headquarters)

"Demonstration and explanation of Japanese field police polygraph"

Robin Orthey (Maastricht University, University of Portsmouth)

"Detecting deception with the forced choice paradigm"

Ailsa E. Millen (University of Stirling)

"Tracking the truth: Using eye tracking to expose recognition of familiar faces during lies"

6:00 P.M.- Social (near JR Fukuyama Station; Presenter is FREE.)

Sunday, August 27th

10:00 A.M.-11:40 A.M. Demonstration of CIT using ERP

11:40 A.M.-1:00 P.M. Lunch Time

1:00 P.M.-1:30 P.M. Demonstration of Tobii's Screen-based eye tracker

1:30 P.M.-2:30 P.M. Oral presentation

Yuki Hamamoto (Shizuoka Prefectural Police Headquarters)

"P300-based CIT: Effects of the criminal past, the nature of tested object, and the recall facilitation protocol

2:30 P.M.-4:00 P.M.. Discussion about Future Study and Closing ceremony

**PRICE**

All participant is FREE.

# Abstracts

## CIT meeting in Fukuyama: Verification of new indices on CIT

### "The aim of CIT meeting in Fukuyama and A short introduction of participants"
### &
### "History of the CIT Meeting for the Japanese and the EU researchers"
### Shinji Hira (Fukuyama University)

I confirmed several aims of CIT meeting in Fukuyama. The first aim of the meeting is giving the information about the current state of Japanese polygraph test to overseas researchers who attend the meeting. It is our responsibility to do so because I think Japan is the only one country that uses the CIT exclusively in field practice. The second aim of the meeting is to introduce each other's research. It focuses on new indices such as ERP, gazing, RT, and Forced Choice Task rather than conventional indices. The third aim is to establish a close relationship between Japanese polygraphers and overseas researcher who attended today for the future cooperation. The fourth aim is to confirm of the CIT procedures using ERP. So our Lab's member will be demonstrated CIT using 3 tones oddball paradigm in tomorrow's morning. The fifth aim is to discuss future study using CIT. I think that overseas researchers would expect the Japanese police polygraphers to construct a database of physiological recordings that were taken during field CIT practice and make the database available for everyone who needs access. For the CIT being coming into wide use, such a database with decision norm of guilty or not, if possible, should be available for the worldwide polygraph community. And then I introduced briefly all participants.

Prior to the research presentation, I introduced the history of the CIT meeting held in the past. For the past major meetings, please refer to the Appendix 1 (PowerPoint file).

### "P300-based CIT using simultaneous visual and auditory stimulus presentation method"
### Shinji Hira (Fukuyama University) & Isato Furumitsu (Hiroshima Shudo University)

First of all, we explained our research on the P300-based CIT, especially from a point of a time lag between a guilty incident and polygraphic examination. That is my presentation for Symposium at the Society for Psychophysiological Research 43rd Annual Meeting in 2003. Titled is "The P300-based guilty knowledge test: Does it stand the test of time?" Approximately 5,000 polygraph examinations are carried out annually in Japan for criminal investigations and most of them utilize the CIT. Because the CIT procedure is similar to the oddball paradigm that is commonly used to measure P300, some Japanese forensic and laboratory researchers are now collaborating studies

which employ P300 to detect concealed guilty information. Most of them, however, made participants undergo CITs immediately after a mock crime, which can be seen as unrealistic situation because more than 50% of forensic CITs have been conducted at least one month after the crime occurrence. In our series of studies, we made our participants go through the P300-based CITs three times; namely, immediately after the commission of a mock crime, and then a month and a year after the first CIT. The participants had stolen one of five items (earrings, broach, ring, necklace, or watch); the test comprised 80 300-ms presentations of pictures of the five objects in random order, with inter-picture intervals of 2500 ms. Results indicated that the Pz-recorded P300 amplitude correctly identified all participants as guilty, not only when they were tested immediately after the mock crime ($n$=9) but also when they were tested a month later ($n$=9) and a year later ($n$=5). Recently the National Research Institute of Police Science in Japan has decided to introduce a new EEG recordable polygraph system into each prefectural police department. Our results with the new polygraph system might accelerate the use of P300-based CIT examination in forensic scene in Japan.

Next we explained our procedure briefly. We compared pictures and words as the visual stimuli. All participants ($n$=10) were instructed to steal one of five items from a room. After the mock crime, all participants underwent the P300-based CIT. There were two main conditions: a picture as visual stimulus with auditory stimulus, and a word as visual stimulus with auditory stimulus. Each stimulus was simultaneously presented using a computer display and headphones. During the picture condition, mean P300 amplitudes for the probe and irrelevant stimuli were 14.7 and 9.0 μV, respectively. For the word condition, mean P300 amplitudes for the probe and irrelevant stimuli were 10.6 and 8.6 μV, respectively. A repeated measures analysis of variance revealed significant differences for the main effect for the stimulus ($F(1,9)$=5.398, $p$=.045) but no significant differences for the main effect for the condition ($F(1,9)$=3.106, $p$=.112). Moreover, the interaction between stimulus and condition showed a clear tendency toward significance ($F(1,9)$=5.053, $p$=.051). Simple main effects revealed that the probe elicited significantly larger P300 amplitudes than the irrelevant stimuli ($p$<.01) in the picture condition. Additionally, the probe-elicited P300 amplitude in the picture condition was significantly larger than that in the word condition ($p$<.05). We conclude that the picture was highly effective in the simultaneous presentation of auditory and visual stimuli during the P300-based CIT.

Please refer to the Appendix 2.


## 1:00 P.M.-5:00 P.M.
## Oral presentation and General Discussion with Refreshment break


## "Effective use of the concealed information test in Japan"
## Akemi Osugi (Hyogo Prefectural Police Headquarters)


The Concealed Information Test (CIT) is used extensively in criminal investigations in Japan. First I introduce the academic background of polygraph examiners, how they are trained, and how the accuracy of polygraph examination is kept in Japan. Then I provides detailed information of the CIT procedures, and why and how the CIT is applied effectively in this country. The Japanese CIT has features distinct from the typical CIT, including intensive use of searching questions and application of question-focused judgments. To understand these features, the CIT's roles in specific investigations using the Japanese CIT are introduced with some hypothetical case examples. Future prospects and limitations concerning the CIT in Japan are also discussed.

**"Demonstration and explanation of Japanese field police polygraph"**
**Kazuo Kobayashi (Hiroshima Prefectural Police Headquarters)**

MR Kobayashi demonstrated the card test, the first step of a CIT examination. The card test has two purposes. On the one hand the examinee is familiarized with the CIT procedure, to ensure that the examinee correctly partakes in the examination. On the other hand, the card test helps to identify non-responders, that is examinees that show no physiological reactivity in one or more measures.

The card test works just like any other CIT question. First the examinee draws one of five face down playing cards and is instructed to deny having any knowledge about it. Then the different answer alternatives are presented orally in random sequence to the examinee, while his/her physiological responses are recorded. This process is repeated 3 to 5 times.

At the end of the card test the police polygrapher should be able to identify which card the examinee secretly picked by visual inspection of the physiological responses and with the aid of computer assisted evaluating system.

In this demonstration, MR Kobayashi brilliantly identified the card picked by the examinee. In a real police polygraph, however, judgement result of the card test is not usually informed to the examinee because the card test is carried out only for the two purposes mentioned above.

**"Detecting deception with the forced choice paradigm"**
**Robin Orthey (Maastricht University, University of Portsmouth)**

Forced choice tests was used as a clinical malingering tool (known as the Symptom Validity Test) to detect whether psychological symptoms were fake or genuine. In deception detection the forced choice paradigm tests for hidden knowledge of crime relevant details. In this paradigm a suspect is presented with a questions, for example "What was the murder weapon" and two equally plausible answer alternatives, such as "gun" and "knife". The suspect is instructed to select the correct answer alternative or guess if they don't know it. Truth tellers, who by definition are unaware of the correct response, have to guess on each question and therefore their total score falls within levels of chance. Empirical evidence suggests, that liars faced with this paradigm purposefully select incorrect answers, providing total scores lower than expected by chance. This is known as underperformance and is used to determine deception. While the test is very accurate at detecting truth tellers (around 90 – 95%), it's detection accuracy for liars is only mediocre (around 40%).

My research is focused on the theoretical understanding of the Forced Choice Test (FCT) and it's applicability in real life. In my opinion the FCT literature lacks a theoretical background, explaining why and how the test works. In my first article (Orthey, Vrij, Leal, & Blank, 2017) we suggest a new theoretical concept to understand behaviour in the FCT. We distinguish three different cases. Each case has a strategy level (0 to 2), an associated test behaviour and test outcome. The different cases are hierarchical, with the strategy level indicating how sophisticated the examinee judges the classification mechanism of forced choice testing. We propose that behaviour in the FCT is determined by the beliefs the examinee holds over the test. The believes are based on the test instruction ("*Select the*

*correct answer alternative. Guess, if you don't know.*").

A level 0 strategy does not consider the test instructions at all. The associated behaviour is *compliance to test instructions*, which means that liars following this strategy produce test scores *above chance performance* as they comply with the test instructions and select the correct answer alternatives. A level 1 strategy assumes that the test uses a level 0 strategy to detect liars, therefore the associated behaviour is a response to the level 0 strategy. So, when asked by the test to select the correct answer alternatives, an obvious response is to purposefully select incorrect answer alternatives instead. Therefore the level 1 test behaviour is to *avoid correct answer alternatives*, which is associated with *underperformance*, a total score with less answers correct than expected by chance performance. Consequently, a level 2 strategy assumes that the FCT uses a level 1 strategy. The associated test behaviour is a response to the level 1 strategy. So, if the examinee believes that the test looks for underperformance, a sensible counterstrategy is to *provide a mixture of correct and incorrect answer alternatives*. Therefore, a level 2 strategy should lead to a test score that falls *within range of chance performance*.

Prevalence, Criteria, & Detection Accuracy

The different strategy levels seem to have different prevalences as well. The most common strategies used by liars are level 1 and level 2 strategies. Around 40% of liars utilize a level 1 strategy and around 55% use a level 2 strategy. Level 0 strategies occur only rarely (around 5%). The different prevalences are important when considering that forced choice testing only uses the *underperformance* criterion to detect liar. That means only test scores that are lower than expected by chance are classified as deceptive. While this criterion is very good at detecting level 1 strategies (detection accuracy around 90%), the overall detection accuracy is capped at the prevalence of level strategies. In other words, even though the test detects level 1 strategies very well, only 40% of liars taking this test can be detected (because the rest is using either a level 0 or level 2 strategy). Consequently, detection accuracy can only be increased by either developing new criteria that are sensitive to level 0 or level 2 strategies or influence the prevalence of level 1 strategies.

References

Orthey, R., Vrij, A., Leal, S., & Blank, H. (2017). Strategies and misdirection in forced choice performance testing in deception detection. *Applied Cognitive Psychology, 31, 139 – 145*. DOI: 10.1002/acp.3310

**Ailsa E. Millen (University of Stirling)**
**"Tracking the truth: Using eye tracking to expose recognition of familiar faces during lies"**

Criminal associates, such as terrorist group members, are likely to deny knowing members of their network when questioned by the police. The aim of our research is to identify novel and non-invasive ways to detect person recognition when liars explicitly deny knowledge. In Experiments 1-3 we eye tracked participants whilst they lied and told the truth about photographs of familiar and unfamiliar faces. Results revealed consistent differences in eye fixations during recognition of familiar faces despite explicit denial of knowledge (Experiment 1) and spontaneous attempts to beat the test (Experiment 2). In Experiment 3 eye fixations and pupil size exposed recognition despite informed

strategies to avoid detection. Experiment 4 established a novel behavioural approach to detecting concealed face recognition that exploited the holistic processing advantage for recognition of familiar faces. We suggest our novel approaches to detecting concealed face recognition could help police detect crime when suspects lie about known criminal identities.

**Sunday, August 27th**
**10:00 A.M.-11:40 A.M.**
**Demonstration of CIT using ERP**

The CIT paradigm using EEG measures the P300 event related potential at midline channels Fz, Cz, Pz, and Oz (most prominent at Pz). In this paradigm the stimulus presentation deviates from the traditional ANS CIT paradigm. The examinee is seated in front of a computer screen and receives two buttons, one for each hand. During the examination three types of stimuli are presented: Probe,

Irrelevant, & Target. The probe is the critical item, irrelevant refers to equally plausible but incorrect items and target represents an unrelated word (for example "Sakura"). The examinee is instructed to press the button in the dominant hand when the target stimulus is presented and the other button in any other case. Empirical data shows that this paradigm elicits much larger P300s for critical than for irrelevant stimuli.
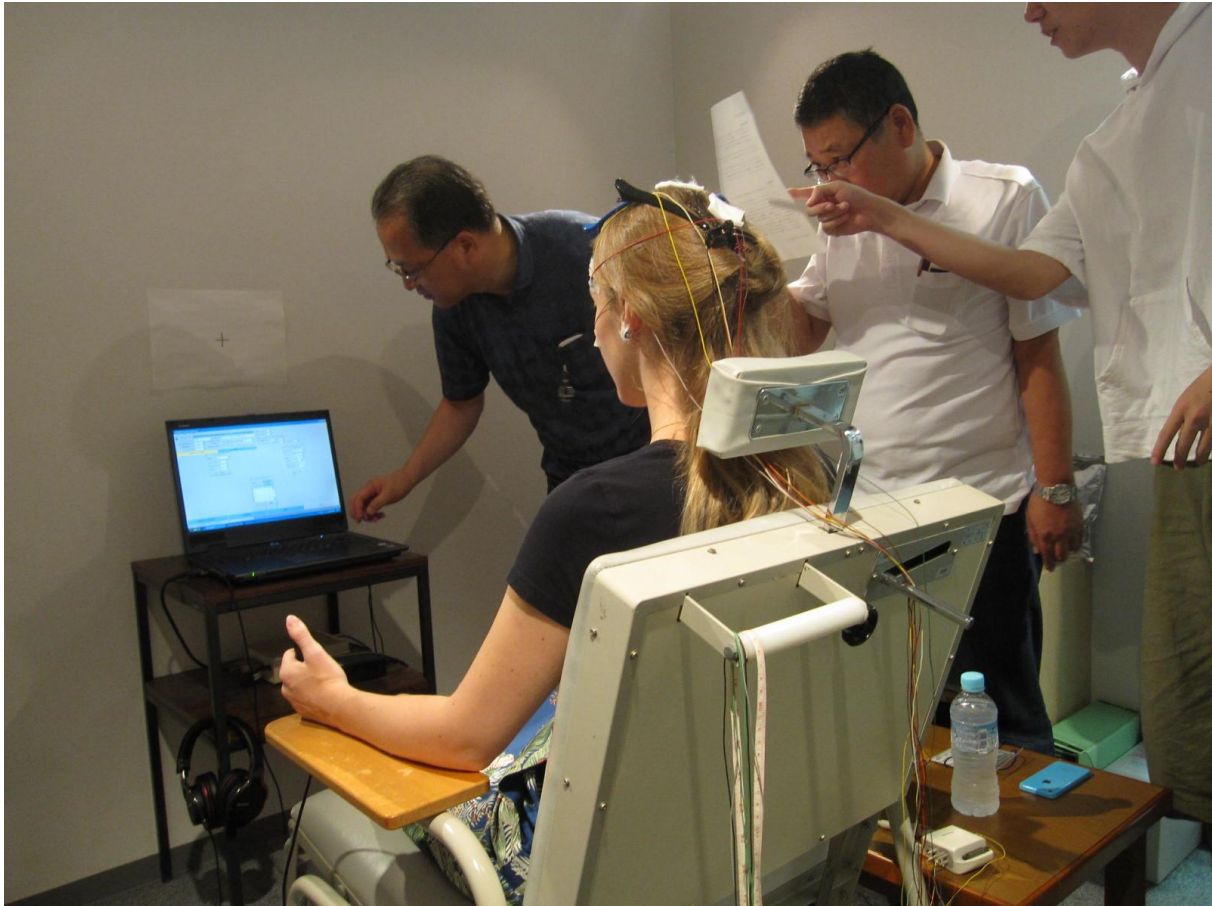


**1:00 P.M.-1:30 P.M.**
**Demonstration of Tobii's Screen-based eye tracker**

A brief demonstration of the Tobii system eyetracker. After a brief calibration phase the examinee can be presented with visual stimuli, while the Tobii system records the eye movement pattern as well as fixation length. These measures could serve as potential indicators in future CIT paradigms.

**1:30 P.M.-2:30 P.M.**
**Oral presentation**

**"P300-based CIT: Effects of the criminal past, the nature of tested object, and the recall facilitation protocol"**
**Yuki Hamamoto (Shizuoka Prefectural Police Headquarters)**

To realize a practical use for the P300-based concealed information test (CIT), we examined the effects of the criminal past (Innocent, Guilty-1 month, and Guilty-1 year conditions) and the nature of tested object (Central and Peripheral objects) under the use of CIT protocols with and without the recall facilitation procedure (RF and NRF protocols). Participants in the two Guilty conditions carried out a mock crime which involved entering a room and stealing a ring (Central object). In addition, the participants incidentally encountered a paperclip (Peripheral object) during the mock crime. 1 month or 1 year after the mock crime, the participants were asked to take the P300-based CITs regarding the Central and Peripheral objects. Participants in the Innocent condition did not carry out the mock crime and were asked to take only the P300-based CITs. Immediately before the CITs, half of the participants in each criminal past condition were shown a movie that was related to the mock crime (RF protocol), while the other half were not (NRF protocol). Results showed that in the two Guilty conditions P300 amplitude was larger for the crime-related objects than crime-unrelated objects regardless of the nature of tested object and the recall facilitation protocol, while in the Innocent condition such a difference was not observed. These results provide further scientific support toward a practical use of the P300-based CIT.

**2:30 P.M.-4:00 P.M. Discussion about Future Study and Closing ceremony**



# Appendix

Appendix 1: A short introduction of participants & history of the CIT meeting

Appendix 2: P300-based CIT using simultaneous visual and auditory stimulus presentation method

Appendix 3: Detecting deception using the forced choice paradigm.

## CIT Meeting in Fukuyama: Verification of new indices on CIT

Shinji Hira (Fukuyama University)

This meeting was supported by JSPS KAKENHI
Grant Number JP17K04475

## Aims of Today's Meeting

1. To introduce the current state of Japanese police polygraph to overseas researchers
2. To know about each participant's CIT study
3. To establish a close relationship between Japanese polygraphers and overseas researchers
4. To introduce ERP-based CIT
5. To discuss future study using CIT

## A short introduction of participants

➤Chairs
- Shinji Hira (Fukuyama University)
- Isato Furumitsu (Hiroshima Shudo University)

➤Program Committee
- Shinji Hira (Fukuyama University)
- Isato Furumitsu (Hiroshima Shudo University)
- Robin Orthey (Maastricht University,University of Portsmouth)

## Introduction of Today's Speakers

➤Introduction of CIT Meeting and our study
- Shinji Hira (Fukuyama University)
- Isato Furumitsu (Hiroshima Shudo University)

➤Presentation by Japanese Police Polygraphers
- Akemi Osugi (Hyogo Pref. Police HQ)
- Kazuo Kobayashi (Hiroshima Pref. Police HQ)
- Yuki Hamamoto (Shizuoka Pref. Police HQ)

## Introduction of Today's Speakers

➤Presentation by Overseas Researchers
- Dr. Ailsa E. Millen (University of Stirling)
- Robin Orthey (Maastricht University, University of Portsmouth)
  - ◆Both are currently visiting researchers at Fukuyama University

## Other Japanese Participants

➤University researchers
- Dr. Yuichi Ito (Keio University)
- Dr. Yuki Miyazaki (Fukuyama Univ.)
- Yoko Saragai (Fukuyama Univ.)
- Two Graduate Students
- Undergraduate Students

## Today's Time Schedule

- 10:00 A.M.-10:10 A.M. A short introduction of participants
- 10:10 P.M.-11:40 A.M. Oral presentation
  - 11:40 A.M.-1:00 P.M. Lunch Time
- 1:00 P.M.-5:00 P.M. Oral presentation and General Discussion
  - 3:10 P.M.-3:20 P.M. Refreshment break
- 6:00 P.M.- Social at Fukuyama city

## Tomorrow's Time Schedule

- 10:00 A.M.-11:40 A.M. Demonstration of CIT using ERP
  - 11:40 A.M.-1:00 P.M. Lunch Time
- 1:00 P.M.-1:30 P.M. Demonstration of Tobii's Screen-based eye tracker
- 1:30 P.M.-2:30 P.M. Oral presentation
  - 2:30 P.M.-2:50 P.M. Refreshment break
- 2:50 P.M.-5:00 P.M. Discussion about Future Study and Closing Ceremony

## History of the CIT Meeting for the Japanese and the EU researchers

Shinji Hira (Fukuyama University)
Isato Furumitsu (Hiroshima Shudo University)

This work was supported by JSPS KAKENHI Grant Number JP17K04475

## 43rd Annual Meeting of SPR (2003)

- Symposium 7
  - The Concealed Information Test: Theory and Applications
- Presenters
  - Bruno Verschuere (Ghent University, Belgium)
  - Gershon Ben-Shakhar (The Hebrew University of Jerusalem)
    - Behavioral and physiological measures in the detection of concealed information
  - Peter Rosenfeld (Northwestern University)
    - P300 Amplitudes and Scalp Distributions in GKTs: Countermeasures
  - Shinji Hira (University of East Asia )
    - The P300-based guilty knowledge test: Does it stand the test of time?

## SPR in Chicago



## SPR in Chicago
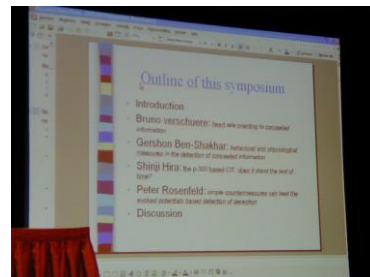
**Slide 1:**

SPR 43rd Annual Meeting

Symposium 7

The Concealed Information Test: Theory and Applications

The P300-based guilty knowledge test:
Does it stand the test of time?

University of East Asia
Shinji Hira

**Slide 2:**

## SPR in Chicago

Bruno Verschuere    Gershon Ben-Shakhar    Shinji Hira

**Slide 3:**

## SPR in Chicago

Professor Emanuel Donchin

**Slide 4:**

Clinical Psychiatry News, January 2004

## P300 Detects Information over the Long Term

Norton, Patrice G. W., Clinical Psychiatry News

CHICAGO -- The P300 event-related potential can detect concealed information over an extended period of time, Shinji Hira, Ph.D., said at the annual meeting of the Society for Psychophysiological Research.

The P300 amplitude correctly identified all subjects in a mock crime experiment as guilty, not only when they were tested immediately after the crime, but also when tested a month later and a year later, said Dr. Hira of the University of East Asia in Yamaguchi, Japan.

"Our results suggest the P300 is still feasible even after 1 year has passed from a criminal act," Dr. Hira said. "The P300 is a promising measure for detecting guilty knowledge."

**Slide 5:**

## Overview of Ewout and Bruno's visit to Japan in 2004

➤ July 26th
  ● Visit to NRIPS
➤ July 28th, 29th
  ● Kobe Meeting
    ◆ Six presenters and 20 participants including Ewout & Bruno
    ◆ Visit to Forensic Science Laboratory of Hyogo Pref. Police H.Q.
➤ July 30th
  ● Visit to Hiroshima Shudo University

**Slide 6:**

Ewout and Bruno's visit to Japan in 2004

3

## European Expert Meeting on Polygraph Testing (2006)

- March 29th-March 31st, 2006
- Maastricht University
- Participants
  - Harald Merckelbach, Ewout Meijer, Bruno Verschuere, Fren Smulders, Nieke Elbers
  - Sjinji Hira, Isato Furumitsu, Makoto Nakayama
  - Charles Honts, John Kircher, Frank Horvath, William Iacono
  - Sharon Leal, Aldert Vrij, Ray Bull
  - Gershon Ben-Shakhar, Eitan Elaad
  - Matthias Gamer, Gerhard Vossel, Gisela Klein, Don Grubin, Peter van Koppen, Udo Undeutsch, Marc van de Plas, Sven Svebak

**European Expert Meeting on Polygraph Testing 29 - 31 March 2006, Maastricht, The Netherlands**





## CIT Meeting in Kyoto: Application of the CIT in Forensic Investigations in Japan

DATE:   Thursday, July 30th, 2009
PLACE: Doshisha University, Imadegawa Campus,
        No.20 Kobukan, #104

## Participants of CIT Meeting in Kyoto

- Chairs
  - Shinji Hira (Fukuyama University)
  - Yukihisa Yokoi (Aichi Pref. Police H.Q.)
  - Izumi Matsuda (NRIPS)
- Three NRIPS researchers
- Twenty-two police polygraphers
  - From 17 prefectural police H.Q.
- Six University researchers

## Time Schedule in Kyoto Meeting

- 1:00 P.M.-1:10 P.M. A short introduction of participants
- 1:10 P.M.-2:10 P.M. Keynote Address by Gershon Ben-Shakhar
- 2:10 P.M.-3:10 P.M. Oral presentation
- 3:10 P.M.-3:20 P.M. Refreshment break
- 3:20 P.M.-4:20 P.M. Oral presentation
- 4:20 P.M.-5:00 P.M. Oral presentation by Overseas Researchers
- 5:00 P.M.-6:00 P.M. Discussion and Closing ceremony
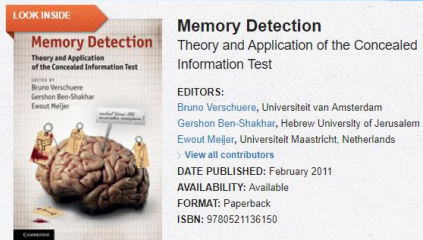- 6:30 P.M.-  Social at Heian Kaikan

## Keynote Address and Presentations

- Keynote Address
  - Gershon Ben-Shakhar
- Presentation by Japanese Police Polygraphers
  - Akemi Osugi (Hyogo Pref. Police)
  - Kazuo Kobayashi (Hiroshima Pref. Police)
  - Hidetoshi Izumikawa (Osaka Pref. Police)
  - Yukihisa Yokoi (Aichi Pref. Police)
- Presentation of Overseas Researchers
  - Thinka Bethlem (Amsterdam Police)
  - Ewout Meijer (Maastricht University)
  - Bruno Verschuere (Ghent University)

---

## CIT Meeting in Kyoto



---

## Memory Detection
### Edited by Bruno, Gershon & Ewout



**Memory Detection**
Theory and Application of the Concealed Information Test

EDITORS:
Bruno Verschuere, Universiteit van Amsterdam
Gershon Ben-Shakhar, Hebrew University of Jerusalem
Ewout Meijer, Universiteit Maastricht, Netherlands
> View all contributors
DATE PUBLISHED: February 2011
AVAILABILITY: Available
FORMAT: Paperback
ISBN: 9780521136150

Chapter 14. Daily application of the Concealed Information Test: Japan
Akemi Osugi

---

## Announcement
### The 17th World Congress of Psychophysiology (IOP2014) will take place in Japan!

Dates: September 23-27, 2014
Venue: International Conference Center, Hiroshima



Honorary Presidents: Shinichi NIWA & Tadao HORI
President: Hisaki OZAKI
Executive Committee Chairman: Hiroshi NITTONO

---

## Special Interest Dinner on Deception Research at IOP2014 in Hiroshima



---

## Bruno Verschuere is the proud recipient of the Ig Nobel Prize (2016)



**News**
UvA News    Professional appointments    UvA in the spotlight

< List

**UvA lie researcher wins fake Nobel Prize**
23 September 2016

Bruno Verschuere, associate professor of Forensic Psychology at the University of Amsterdam (UvA), is the proud recipient of the Ig Nobel Prize, the parody of the Nobel Prize. Verschuere was selected for a study conducted in collaboration with colleagues in Belgium and the United States in which he asked more than one thousand people to be honest about how much they lie. Verschuere and his team were awarded the prize for Psychology.

In a one-minute speech, Verschuere accepted the prize on behalf of his research team during an award ceremony held on 22 September at Harvard University's Sanders Theatre in the USA.

The Ig Nobel Prizes are presented one week before the announcement of the Nobel Prize winners and are awarded in ten categories. Conferred by genuine Nobel Laureates, the aim of the awards is to 'honour achievements that first make people laugh, and then make them think'.

Bruno Verschuere. Credits: Danny Schwarz

**Research conference of Center for Applied Psychological Science (CAPS)**

DATE:   August 1st, 2nd, 2017
PLACE: Kwansei Gakuin University,
Nishinomiya Uegahara Campus,   No.F, #304



CAPS Meeting at Kwansei Gakuin University

Shinji Hira
  Application of Concealed Information Test born from Criminal Investigation

Robin Orthey
  Detecting Deception using the Forced Choice Paradigm

Robin Orthey & Shinji Hira
  So you want to do a PhD in Europe?



Let's start CIT Meeting
in Fukuyama 2017 !!

Appendix 2　P300-based CIT using simultaneous visual and auditory stimulus presentation method

---

# P300-based CIT using simultaneous visual and auditory stimulus presentation method

**Shinji Hira**
(Fukuyama University)

**Isato Furumitsu**
(Hiroshima Shudo University)

福山大学
THE FUKUYAMA UNIVERSITY

---

## New indices on CIT: From ANS to CNS

**ANS**
- respiration
- electrodermal activity
- heart rate
- pulse volume

**CNS**
- EEG
- MEG
- ERP
- fMRI
- fNIRS

P300
N400
CNV

---

### The validity of the detection of deception using P300

| Study | Number of participants | Percent of correct decision |
|---|---|---|
| Allen & Iacono(1997) | 60 | 86.7% |
| Farwell & Donchin(1991) | 20 | 90.0% |
| Ellwanger et al.(1996) | 27 | 88.9% |
| Ellwanger et al.(1997) | 14 | 82.4% |
| Johnson & Rosenfeld(1992) | 17 | 76.5% |
| Miyake et al.(1986) | 8 | 87.5% |
| Neshige et al.(1991) | 9 | 100.0% |
| Rosenfeld et al.(1987) | 10 | 90.0% |
| Rosenfeld et al.(1988) | 7 | 100.0% |
| Rosenfeld et al.(1991) | 13 | 92.3% |
| Sasaki et al.(2001) | 33 | 87.9% |
| Weighted average | 221 | 87.8% |

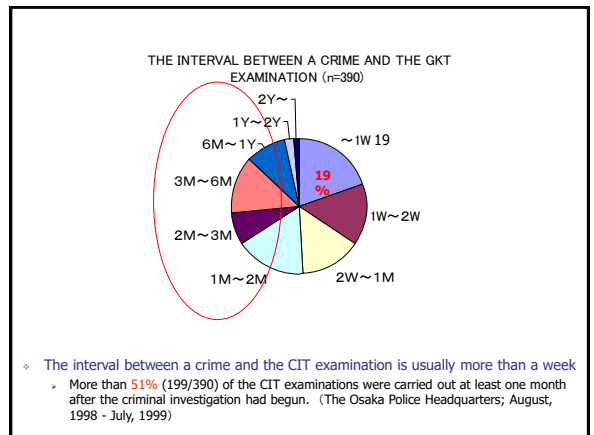conventional autonomic polygraph method：83.9%(Ben-Shakhar & Furedy, 1991 )

---

SPR 43rd Annual Meeting
Symposium 7
The Concealed Information Test: Theory and Applications

## The P300-based guilty knowledge test: Does it stand the test of time?

University of East Asia
Shinji Hira

---

## Features of early CIT laboratory studies using P300

✧ The interval between a memory task and CIT examination was relatively short

1. Rosenfeld et al.(1988)
   - The examination was carried out immediately after a memory task.
2. Farwell & Donchin(1991)
   - The examination was carried out on the next day of a memory task.

---

THE INTERVAL BETWEEN A CRIME AND THE GKT EXAMINATION（n=390）

2Y~
1Y~2Y
6M~1Y
3M~6M
2M~3M
1M~2M
~1W 19
**19%**
1W~2W
2W~1M

✧ The interval between a crime and the CIT examination is usually more than a week
  - More than 51% (199/390) of the CIT examinations were carried out at least one month after the criminal investigation had begun. （The Osaka Police Headquarters; August, 1998 - July, 1999）

## The effects of retention intervals on detection of deception using P300

⋄ Does it stand the test of time?
  ➢ The P300-based CIT examination was carried out once immediately after the commission of the mock crime, and then repeated one month and one year after the commission of the crime.

Mock crime ▐▐▌➡ Exam.1  ▐▐▌➡ Exam.2  ▐▐▌➡ Exam.3

Immediate      1 month later      1 year later
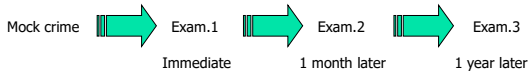
## Method

➢ Participants
  ➢ Five undergraduate students（2 female, 3 male）
  ➢ Informed consent was obtained from all participants
➢ Apparatus
  ➢ Polygraph（Nihon Koden  EEG-7410）
  ➢ InstEP System（INSTEP）
  ➢ Display（Nanao  FlexScanT550）
➢ Dependent Measures
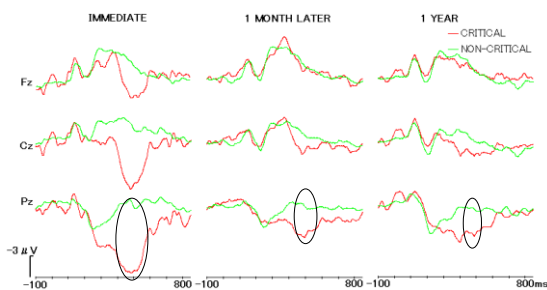  ➢ EEG（Fz,Cz,Pz）
  ➢ RT

## Method (continued)

➢ Procedure
  ➢ Mock Crime
    ➢ All participants were instructed to steal one of the five precious goods (Earrings, Brooch, Ring, Necklace, Watch) in another room.
  ➢ Instructions for EEG measurement
    ➢ When a picture is presented on a computer screen, please push a button as quickly as possible.  Please make an effort not to reveal the item you stole during the examination.
➢ Stimuli
  ➢ Five Pictures：10 × 10 cm
  ➢ Duration：300 ms
  ➢ ISI (interstimulus interval)：2500 ms
  ➢ Stimulus repetition: 80 times for each stimulus at random

## Five pictures used in this experiments

Earrings          Brooch          Ring

Necklace          Watch
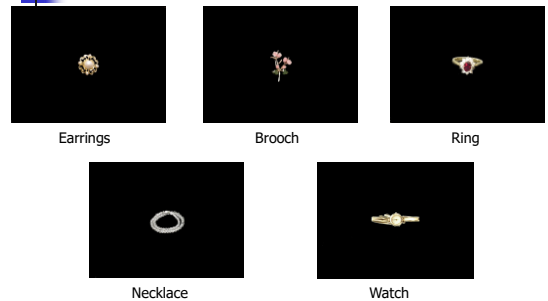
## Grand average waveforms contrasting critical/non-critical items at the Fz, Cz, and Pz ($n$=5)

IMMEDIATE      1 MONTH LATER      1 YEAR

— CRITICAL
— NON-CRITICAL

Fz

Cz

Pz

−3 μV

−100      800 −100      800 −100      800ms

## The P300-based CIT has high reliability

➢ The P300-based CIT was effective even 1 month and 1 year after the commission of the mock crime.
➢ This result suggests that field applications (that have considerable delays between the commission of crime and the administration of the CIT) may be feasible, with P300 as the dependent variable.

Does it stand the test of time?        "Yes"

## The theme of recent P300 based-CIT in Hira Lab

- "Recall Facilitation" procedure
  - Presented by Yuki Hamamoto

- Comparison of auditory and visual stimulus presentation during the P300-based CIT
  - Misaka, Hira, & Furumitsu (2009)

- The examination of simultaneous auditory and visual stimulus presentation method during the P300-based CIT
  - Hira, Saragai, Hamamoto, & Furumitsu (2016)

## Comparison of auditory and visual stimulus presentation during the P300-based CIT

|  | Merit | Demerit |
|---|---|---|
| Auditory presentation | Ignoring questions could be relatively difficult. | Less information could be provided in one question. |
| Visual presentation | Much information could be provided in one question. | Ignoring questions could be relatively easy. |

## Method

- Participants
  - Fourteen undergraduates experienced both the auditory and the visual stimulus condition (within design)
  - Informed consent was obtained from all participants
- Apparatus
  - Brainwaves were recorded from Fz, Cz, and Pz sites by TEAC polygraph system (Polymate AP1524)
  - The participants wore the Noise-cancelling headphone (SONY MDR-NC500D) to cut environmental noise in the auditory condition
- Dependent Measures
  - EEG-P300 (Fz,Cz,Pz)
  - RT

## Method (continued)

- Procedure
  - The participants were asked to pick up only one candy in a bag and to taste it. Although they were told that the bag contained six different flavored candies, it actually contained only Strawberry flavored one.
  - Their task during the ERP-based CIT procedure was to conceal which flavored candy they chose, and if they couldn't, the decision was guilty.
  - During the CIT, participants were asked to push a button in his/her dominant hand to the target stimulus and the other button in his/her non-dominant hand to other stimuli (critical and non-critical stimuli).

## Method (continued)

- Stimuli
  - Target stimulus :Banana（バナナ）
  - Critical stimulus: Strawberry（イチゴ）
  - Non-critical stimulus: Grape（ブドウ）, Orange（ミカン）, Apple（リンゴ）, and Lemon（レモン）
    - In the auditory condition, the stimuli were presented through digitized human voice
    - In the visual condition, each word was presented on a computer screen
  - ISI (interstimulus interval)：1800 ms（±20%）
  - Duration：400 ms

## Results: Peak amplitude of P300 (Pz)

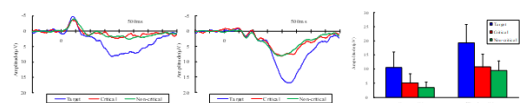Auditory condition ＜ Visual condition



Figure 1. Grand average waveforms in the auditory (left) and the visual condition (right).

Figure 2. The Pz-recorded P300 amplitudes in the auditory and the visual conditions.

## Discussion

- In the present study, the peak amplitude of P300 in the visual condition was significantly larger than that in the auditory condition. This may due to the difference of attentional processing resource allocation between two conditions.
- In the visual presentation of the stimuli, it was possible to grasp whole information in an instant from a visually presented word. In the auditory presentation condition, however, the participants should pay their attention to each syllable to recognize a whole word and this prolonged processing resulted in overall decrease of attentional resource to discriminate words.
- As a result, this was reflected to the decrease of P300 amplitude.

## P300-based CIT using simultaneous visual and auditory stimulus presentation method

- This study examined the effect of simultaneous presentation of auditory and visual stimuli during the P300-based concealed information test (CIT)

- We compared pictures and words as the visual stimuli

## Method

- Participants
  - Ten undergraduates experienced both the picture condition and the word condition (within design)
  - Informed consent was obtained from all participants
- Apparatus
  - Brainwaves were recorded from Fz, Cz, and Pz sites by TEAC polygraph system (Polymate)
  - The participants wore the Noise-cancelling headphone (SONY MDR-NC500D) to cut environmental noise in the auditory condition
- Dependent Measures
  - EEG-P300 (Fz,Cz,Pz)
  - RT

## Method (continued)

- Procedure
  - All participants were instructed to steal one of five items from a room.
  - After the mock crime, all participants underwent the P300-based CIT.
  - There were two main conditions: a picture as visual stimulus with auditory stimulus, and a word as visual stimulus with auditory stimulus.
  - Each stimulus was simultaneously presented using a computer display and headphones.

## Results: Peak amplitude of P300 (Pz)

- Picture condition > Word condition
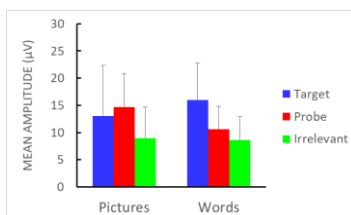


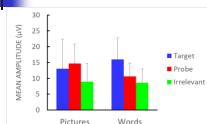## Another data of P300-based CIT using simultaneous visual and auditory stimulus presentation method



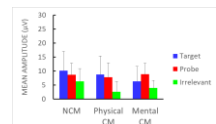Figure 1. Comparison picture and Word

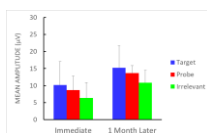Figure 3. Comparison of no-CM, Physical CM and Mental-CM

Figure 2. Comparison immediate and 1 month later

### White Paper 2016 by the National Police Agency: Prevention of international terrorism

平成28年版
警察白書
特集
国際テロ対策

本文（HTML）
本文（PDF）
要約版
英訳版
統計資料

https://www.npa.go.jp/hakusyo/h28/index.html

---

### Prevention of international terrorism using the P300-based CIT

- Establishment of searching type information detection using event related potentials for prevention of international terrorism and organized crime
  - JSPS KAKENHI Grant Number JP17K04475 (2017-2019)
- Tomorrow's Demonstration

---

### Construction of a psychological research network towards prevention of international terrorism

- P300, ANS
  - Hira Lab. (Fukuyama University)
  - Rosenfeld Lab.(Northwestern University)
  - Ewout Meijer (Maastricht University)
- Reaction time
  - Bruno Verschuere（University of Amsterdam）
- Eye movements
  - Gershon Ben-Shakhar(Hebrew University of Jerusalem)
  - Ailsa E. Millen (University of Stirling)
- Forced Choice Paradigm
  - Robin Orthey (University of Portsmouth, Maastricht University)

---

### 29th International Congress of Applied Psychology
### Montréal, Canada, June 25-30, 2018

---

### Annual Conference of the European Association of Psychology and Law 2018
### Turku, Finland, 26-29 June 2018

Welcome   Programme   Registration   General information   Travelling

Annual Conference of the European Association of Psychology and Law 2018

Welcome!

Welcome to the Annual Conference of the European Association of Psychology and Law 2018, to be held in Turku, Finland, on 26-29 June 2018

Important dates
Abstract submission starts 1 Oct 2017
Abstract submission ends 2 Feb 2018
Registration starts 1 Oct 2017
Early bird deadline 15 May 2018

---

### Thank you for your attention!!

Shinji Hira
hira@fuhc.fukuyama-u.ac.jp

Appendix 3    Detecting deception using the forced choice paradigm.

---

## Detecting Deception using the Forced Choice Paradigm

Robin Orthey

University of Portsmouth & Maastricht University

robin.orthey@port.ac.uk

University of **Portsmouth**        ◣ Maastricht University

---

## Forced Choice Paradigm

What was the stolen from the office?
"You will receive a number of questions about the crime.
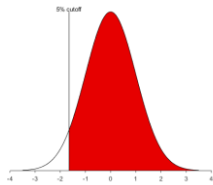Each question will be accompanied by two answer alternatives.

*Please select the correct answer. If you don't know it, guess.*"

Computer                                         Printer

---

## Forced Choice Paradigm

*Truth tellers* – are <u>un</u>aware of the correct answers and guess.
• Total score expected to fall <u>within</u> levels of chance.



---

## Forced Choice Paradigm

*Liars* – are aware of the correct answers and deliberately select incorrect answers.
• Total score expected to fall <u>below</u> levels of chance.
• Underperformance



---
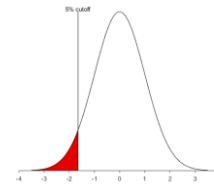
## Why?

Lack of theoretical conceptualization

Observational case studies:
- Pankratz et al, 1975
- Denney, 1996

$\Rightarrow$ Liars' avoidance behaviour has been assumed, but not explained!

---

## What do people do in Forced Choice Tests?!?

Participants' self report different behaviours as strategies (e.g. Jelicic et al, 2004; Shaw et al, 2012)

Understanding of test reduces detection accuracy
(Shaw et al, 2012; Verschuere et al, 2008)

## New theoretical concept

| Strategy level | Behaviour | Test outcome |
|---|---|---|
| 0 | Compliance | *Over*-performance |
| 1 | Avoidance | *Under*-performance |
| 2 | Mixture of truth & lie | *Chance*-performance |

Orthey, Vrij, Leal, & Blank, 2017

## Cognitive Hierarchy Theory (CHT)

• Carmerer et al, 2004:

• Strategy defined by believes over 'opponent'
  • Always 1 level higher than opponent

• Strategy is limited by available cognitive resources => 'Good enough' (as opposed to Nash equilibrium)

## A typical experiment

• 2 (*Veracity*: Truth teller vs Liar) x 2 (*Manipulation*: Control vs Manipulation) design
• DV: Total test scores (z transformed) + other
• Procedure:
  • VR  mock crime
  • Computerized FCT
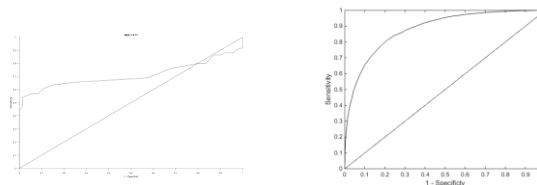  • Self reported strategies (written/oral)

## Strategy levels & Test behaviour

Level 0 strategy $\Rightarrow$ Over performance

Level 1 strategy $\Rightarrow$ Under performance

Level 2 strategy $\Rightarrow$ Chance performance
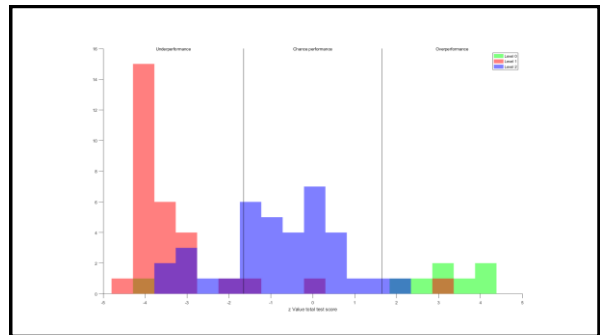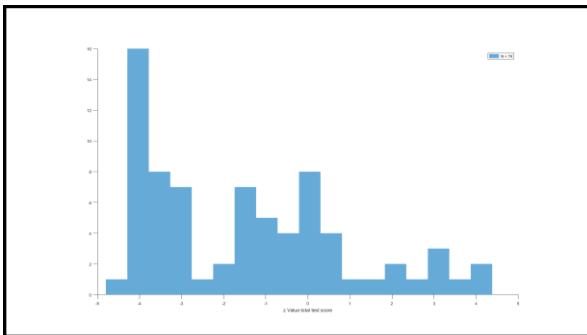
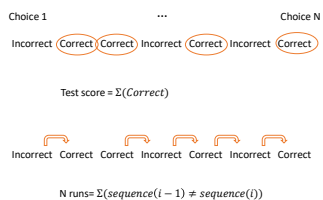## Detection Accuracy
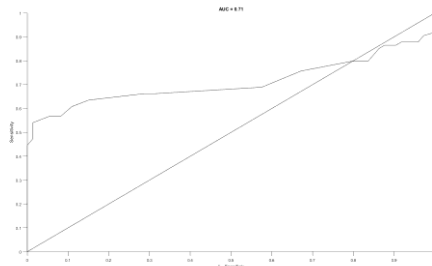


## Empirical vs. Theoretical ROC



## Conclusions

- Traditional criterion only detects level 1 strategies. Level 1 strategies are detected very well.

- Level 2 strategies are most prevalent & remain undetected!

⇒ Detection accuracy can only be increased by focusing on level 2 strategies.

## Coaching in the Forced Choice Paradigm

- Coaching => seeking information on a tests underlying mechanic

- In cases of coaching validity of total score criterion collapses (see Verschuere, et al., 2008)

## A new criterion: Runs test



Choice 1                ...                Choice N

Incorrect (Correct)(Correct) Incorrect (Correct) Incorrect (Correct)

Test score = $\Sigma(Correct)$

Incorrect Correct Correct Incorrect Correct Incorrect Correct

N runs= $\Sigma(sequence(i-1) \neq sequence(i))$

## Assumption

Humans cannot reproduce 'genuine' randomness.
⇒ Strong empirical support (see e.g. Nickerson 2002)

Detection accuracy:
- Verschuere et al., (2008): Detected 21% of coached liars.
- Jelicic et al., (2004): Detected no liars, who deliberately randomised.

## Alteration rates in artificial randomness

Table 1
*Mean Alternation Rate, P(A), Generated or Perceived as Most Random in Different Studies*

| Reference | Randomness task | Size of set | P(A) |
|---|---|---|---|
| | Generation | | |
| Bakan (1960) | Sequence | 300 | .59 |
| Falk* (1975) | Sequence (constrained) | 40 (20 of each type) | .61 |
| Wiegersma (1986) | Sequence | 120 | .56* |
| Budescu* (1987, Table 2 & | Sequence | 20; 40; 60 | .59 |
| Table 3) | Sequence | 20; 40; 60 | .58 |
| Rapoport & Budescu (1992) | Sequence | 150 | .59 |
| Kareev* (1992) | Sequence | 10 | .61 |
| Budescu & Rapoport | Sequence | 150 | .58 |
| (1994, Exhibit 6) | | | |

Table 1 taken from Falk & Konold, 1997. Irrelevant lines removed.

## Redefining the runs criterion
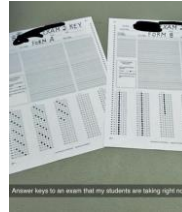


What *'looks random'*

vs

total score *within chance performance*

Horizontal position of correct answer alternative alternated between trials.

Answer keys to an exam that my students are taking right now

---

*Horizontal switches:*
Alterations between answer alternatives presented on the left/right.

| Question 1: | Correct | | Incorrect |
| | Incorrect | | Correct |
| | Correct | | Incorrect |
| ⋮ | Incorrect | | Correct |
| | Correct | | Incorrect |
| | Incorrect | | Correct |
| | Correct | | Incorrect |
| Question N: | Incorrect | | Correct |

---

*Semantic switches:*
Alterations between correct and incorrect answer alternatives.

| Question 1: | Correct | | Incorrect |
| | Incorrect | | Correct |
| | Correct | | Incorrect |
| ⋮ | Incorrect | | Correct |
| | Correct | | Incorrect |
| | Incorrect | | Correct |
| | Correct | | Incorrect |
| Question N: | Incorrect | | Correct |

## Design

IVs:
- Veracity: Liars & truth tellers
- Coaching: Naïve & coached

DVs:
- Total score: Number of correct items
- Semantic switches: Alterations between correct/incorrect

Forced choice test:
- 20 questions (counterbalanced)
- Position of correct answer alternative alternated horizontally

## Procedure

Step 1:
Mock crime (VR exploration or terrorist house)/ Filler task (VR real estate agent)
- Memory performance in liars was excellent.

Step 2: Coaching instruction
*"… They expect liars to deliberately pick the incorrect answers, to appear innocent. However, this is exactly how they identify liars. Innocent suspects are expected to actually score within levels of chance."*

Step 3: Forced Choice Test

Step 4: Strategies
Measured through self report with question:
*"What did you do to appear innocent on the lie detection test?"*

## Example VR mock crime
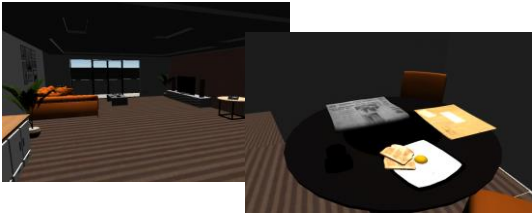


## Results
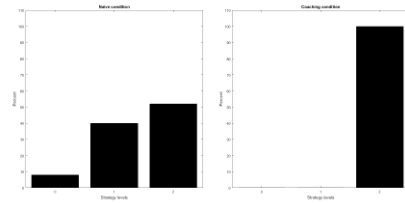


## Results

*Percentages of detected liars per strategy level using total score criterion*

| Strategy level | Detected in % | N |
|---|---|---|
| Naïve | | |
| 0 | 0 | 2 |
| 1 | 90 | 10 |
| 2 | 21 | 13 |
| Coaching | | |
| 0 | - | - |
| 1 | - | - |
| 2 | 8 | 26 |

## Results

Area Under the Curve (AUC) for test criteria

| | d | AUC | 95% CI |
|---|---|---|---|
| Naïve | | | |
| Total score | - | .69* | [.52 .85] |
| Semantic switches[1] | - | .72** | [.57 .86] |
| Coached | | | |
| Total score | -0.02 | .53 | [.37 .69] |
| Semantic switches[2] | -0.46 | .69* | [.55 .84] |

Notes: * p < .05; ** p < 0.001; [1] lower scores indicate deception; [2] higher scores indicate deception

## Results
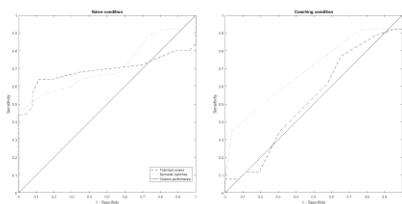


## Conclusions

Level 2 strategies can be detected using Semantic switches.

## Issues & research interests

**1. Detection Accuracy**

## Detection accuracy

New criteria:
- Semantic switches
- Reaction time
- Mouse movements

Prevalence of Strategies

## Issues & research interests

1. Detection Accuracy
**2. Test construction**

## Test construction

How to pick incorrect filler items?
- Equal plausibility (Doob & Kirshenbau, 1973)

Reduce amount of evidence required

## Issues & research interests

1. Detection Accuracy
2. Test construction
**3. Test conclusion**

## Test conclusion

| **Decision rule** | vs | **Expert evaluation** |
|---|---|---|
| Normative | | Holistic |
| Arbitrary | | Objective? |
| Generalizable? | | Human vs machine? |

## Issues & research interests

1. Detection Accuracy
2. Test construction
3. Judgement
4. **Application**

## Application

+ Cheap

+ Fast (~5 minutes)

+ Compatible with CIT

+ Adds incremental validity to CIT assessment (Meijer et al., 2007)

## Application

| Case specific | Screening tool |
|---|---|
| Crime specific information | General knowledge (e.g. skill) |
| Expert evaluation | Automatised evaluation |

## Issues & research interests

1. Detection Accuracy
2. Test construction
3. Judgement
4. Application
5. **Post-test effects**

## Post-test effects

Exposure of intimate crime information?

Test-retest effects?

Impact?

## Thank you for your attention!

Questions?

Robin Orthey
robin.orthey@port.ac.uk

# References

- Carmerer, C. F., Ho, T., & Chong, J. (2004). A cognitive hierarchy model of games. The Quarterly Journal of Economics, 119(3), 861–898. DOI:10.1162/0033553041502225.
- Denney, R.L. (1996). Symptom validity testing of remote memory in a criminal forensic setting. Archives of Clinical Neuropsychology, 11(7), 589-603. DOI: 10.1093/arclin/11.7.589.
- Doob, A. N., & Kirshenbaum, H. M. (1973). Bias in police lineups—Partial remembering. *Journal of Police Science and Administration*, 1, 287–293.
- Falk, R., & Konold, C. (1997). Making sense of Randomness: Implicit encoding as a basis for Judgement. *Psychological Review, 104(2), 301 – 318*.
- Jelicic, M., Merckelbach, H., & van Bergen, S. (2004). Symptom validity testing of feigned amnesia for a mock crime. *Archives of Clinical Neuropsychology, 19(4), 525 – 531.* DOI: 10.1016/j.acn.2003.07.004
- Meijer, E.H., Smulders, F. T. H., Johnston, J. E., & Merckelbach, H. (2007=. Combining skin conductance and forced choice in the detection of concealed information. *Psychophysiology, 44(5), 814 – 822*.
- Nickerson, R.S. (2002). The production and preception of randomness. *Psychological Review, 109(2), 330 – 357.* DOI: 10.1037//0033-295X.109.2.330
- Orthey, R., Vrij, A., Leal, S., & Blank, H. (2017). Strategies and misdirection in forced choice performance testing in deception detection. *Applied Cognitive Psychology, 31, 139 – 145.* DOI: 10.1002/acp.3310
- Pankratz, L., Fausti, S. A., & Peed, S. (1975). A forced-choice technique to evaluate deafness in the hysterical or malingering patient. Journal of Consulting and Clinical Psychology, 43(3), 421–422. DOI:10.1037/h0076722.
- Shaw, D. J., Vrij, A., Mann, S., Leal, S., & Hillman, J. (2012). The guilty adjustment: Response trends on the symptom validity test. Legal and Criminological Psychology. DOI:10.1111/j.2044-8333.2012.02070.x.
- Verschuere, B., Meijer, E., & Crombez, G. (2008). Symptom validity testing for the detection of simulated amnesia: Not robust to coaching. *Psychology, Crime & Law, 14(6), 523 – 528.* DOI: 10.1080/10683160801955183