

*Something about Lie-Detectors*

## ***Something about Lie-Detectors***

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## **ABSTRACT**

Whereas some of the English speaking Countries use *Lie-Detectors*, other Nations (such as the *Wisest* and *Sagest* Italy) do not! This article, very briefly, shows why *Lie-Detectors* should not be trusted. *Exempli gratia*, they could be perilous and dangerous instruments during police enquires and/or any other investigation of Truth.

In other word, *Lie Detectors* could not be more trustable then Medieval “*Trial of Ordeal*” and/or *Judicium Dei*!! Why? Read the article and get the answer by Yourself!

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“And after all, what is a lie? Tis but  
The truth in masquerade; and I defy  
Historians, heroes, lawyers, priests to put  
A fact without some leaven of a lie.  
The very shadow of true truth would shut  
Up annals, revelations, poesy,  
And prophecy ...  
...  
Praised be all liars and all lies!”

Lord Byron, *Don Juan*

**Introduction: lies and human ability to recognise them.**

It is believed that abilities to recognize lies have been developed from the earliest human history. They were supposed necessary skills for human survivor (Swanson C. R., Chamelin N. C. and Territo L., 1996). Nevertheless, the *homo sapiens sapiens* does not seem to have succeed in this “adaptation”! Their abilities to identify lies are not higher than chance (Ekman and O’ Sullivan, 1991). Indeed, even though most people believe to be able to recognize deceiving, very few of them (independently by their professions and experiences) are able to perform

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better than chance (Bartol C. R. and Bartol A. M., 2004; Kraut and Poe, 1980; De Paulo and Pfeifer, 1986). In some empirical cases, *data* showed performances lower than chance (Porter S., Woodworth M. and Birt A. R., 2000).

Only the U. S. *secret agents* of *Central Intelligence Agency* (C.I.A.) have performed better than chance. They had a score of 64% in deceptions' identification (Ekman P. and O'Sullivan M., 1991). In other words, they are wrong one third of the cases!! Good job (!), considering the consequences of their actions!

The ability of human beings to read the verbal and not verbal communication of the others was the first kind of *lie detector*. It was believed (from the *Ancient Time*) that: when a person lies, he/she is nervous for his/her sense of guilty. Hence, liars manifest *physiological arousal* and *behaviours* such as: looking down; avoid gazing at the eyes of accusers; moving their "big toe in circle"; getting dry their mouths (Swanson C. R., Chamelin N. C. and Territo L., 1996; Segrave K., 2004). According to Segrave (2004), *Vedas* have described some of these clues since *Antiquity*. More recent studies (from: psychology; ethology; physiology) seem to have confirmed the tendency of the human beings to express their deceiving with some verbal and not verbal signs.

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Ekman, O'Sullivan, Friesen and Scherer (1991) suggest that the combination of the verbal and facial clues allowed performances of 86% in lie detector. But, this study has not been confirmed by others literature!

The failing to detect lies (using the verbal and not verbal clues) is originated, according to Vrij A. (2000), from observers' will, as they "*do not want* to detect lies". I do not believe this is the reason. I consider reason: the *unreliable nature* of these signs. They could be, simply, neutral expressions of emotional states that can: be originated by different sources; indicate opposite feelings. Thus, any associations between these signs and lies ...: could be arbitrary; and follow observers' expectances. Furthermore, human beings react differently each other's. So, it is not possible to individuate *behavioural patterns* able to indicate lying. Evidences are given by the study of: Akehurst *et. al.* (1996); Kapardis (2005). According to the latter, people are more accurate in recognition their own *lying patters of behaviours* rather than others. This implies the existence of different patters of behaviour from person to person.

There are a lot of evidences about the unreliable nature of these indicators. For instance: the eye blinking, considered a deception – indicator (Kapardis, 2005; Bartol C. R. and Bartol A. M., 2004), has not been confirmed by other studies (Mehrabian, 1971). Then, the avoidance

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of looking at the other people's eyes does not mean necessary: lying. It can also indicate politeness (e.g. staring is considered aggressive behaviour). Next, it could indicate simply: shyness; etc... .

Further, some authors (Swanson C. R., Chamelin N. C. and Territo L., 1996) consider "opening wider the eyes" like a clue of deceiving. But, this sign can, on the other hand, simply indicate: a state of surprise; and/or the wish to "see clearer" (Eibel-Eibelfeldt, 1993).

More, the higher pitch of voice, considered a good indicator for lying (Kapardis, 2005), correlates also with intimate relation (Eibl-Eibelfeldt, 1993).

Although Vrij (2000) thinks that "some behaviour are more likely to occur when people are lying", I believe they caused by different factors (of opposite nature) that do not allow any trustable use.

One of these opposite factors can be: **both** the fear of the deceiver **and** the fear of the innocent to be involved in an unpleasant situation (Swanson C. R. Chamelin N. C. and Territo L., 1996). This is as the *emotional and physiological arousal* is "the same" for *every feeling*.

Thus, I agree with Kapardis (2005) that human beings are not good lie detectors.

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Consequently, we are going to focus on the “technological” lie detectors: voice lie detectors (psychological stress evaluator); and polygraph.

**Technology employed in the recognition of deceiver: voice lie detectors; polygraph.**

*Psychological Stress Evaluator (PSE)*

According with Kapardis (2005) and Bartol C. R. and Bartol A. M. (2004), *Psychological Stress Evaluator* (PSE) is based on some assumptions. One of these is that: physiological stress produces changes in the voice of liars. Hence, the *Psychological Stress Evaluator* attempts to identify low frequency changes in the voice to recognize the presence of a higher stress. The “micro-tremor in the vocal muscles” is used like indicator. Although the PSE could be employed in a wide range of application (Kapardis, 2005; Segrave K., 2004), different studies report it does not perform better than chance (Kapardis, 2005; Bartol C. R. and Bartol A. M., 2004).

The changes in the voice, indeed, are not characteristic features of lying. They follow a wide range of emotions (Lykken D. T., 1988; Eibl-Eibesfeldt I., 1993). For instance, they can be produced by: the



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uncomfortable feeling caused by a “particular question”; and/or by the person who makes the question; and/or by the situation itself.

In these cases, one can result “liar” even telling the truth.

*Polygraph*

A better instrument, with less application than PSE, is the polygraph.

The polygraph attempts to recognize those physiological changes linked with offenders’ fear to be identified like liar (Howitt D., 2002).

*Many* items are measured (*poly* = many; *graph* = measures). They are: respiration; heart rates; blood pressure; electro-derma response.

According to Bartol C. R. and Bartol A. M. (2004), Kapardis A. (2005), Raskin D. C. (1989) and Vrij A. (2000), there are different techniques: the *relevant – irrelevant technique* (R-I); the *control question test* (CQT); the *guilty knowledge test* or *Information Test* (GKT)<sup>1</sup>.

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<sup>1</sup> Other methods exist, even if they are less used, such as: *relevant – relevant procedure* (Bartol C. R. and Bartol A. M., 2004); the *directed lie control test* (Ruskin D. C., 1989). The former was an attempt to resolve some weakness of the R-I method; the second one has been the attempt to resolve some problems of the CQT.

### Relevant – irrelevant technique (R-I)

The *R-I method* assumes that: *the fear to be identified like liar* produces more *physiological responses* to *relevant questions* than the *irrelevant ones* (Bartol C. R. and Bartol A. M., 2004). This assumption does not always work. A strong emotional response (to the relevant questions) can be given by: both liars; and truthful people (Bartol C. R. and Bartol A. M., 2004; Gale A., 1988). It can follow “the simple fact that innocent” people are “anxious about the outcome”. So, they produce positive responses to the relevant questions (Kapardis A., 2000). Moreover, the literature indicates that R-I has not met an acceptable internal and external validity (Ruskin D. C., 1989).

### Control question test (CQT)

The *CQT method* applies three types of questions: *neutral questions*; *relevant questions*; *control questions* (Bartol C. R. and Bartol A. M., 2004; Ruskin D. C., 1989; Vrij, 2000). The *control questions* are the key feature of this test. The *physiological reactions*, exhibited during the control questions<sup>2</sup>, are confronted with subjects’ reactions exhibited during relevant questions (Ruskin D. C., 1989; Vrij A., 2000).

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<sup>2</sup> Such as: denying a behaviour that likely every people do.

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This method has several problems. The difficulty to construct control questions “that will elicit stronger physiological responses in the innocent than relevant question about the crime” (Bartol C. R. and Bartol A. M., 2004; Ruskin D. C., 1989; Vrij, 2000). The increase of emotional arousal in innocent subjects that can be caused by different reasons, not related to the sense of guilty (Vrij A., 2000). The weakness of its theoretical foundation and logical rationale (Ben-Shakher G., 2002). The inadequate standardization (Ben-Shakher G., 2002). The lack of physiological responses’ objective quantification (Ben-Shakher G., 2002). The problem of contamination from *not - physiological responses* (Ben-Shakher G., 2002). The examinees’ belief about the infallibility of the test (Vrij A., 2000). In absence of this latter, the *physiological reactions* can be inappropriate to the outcome of a reliable test.

Guilty knowledge test or Information Test (GKT)

The GKT is considered one of the best methods for detecting lying (Bartol C. R. and Bartol A. M., 2004; Ben-Shakher G. and Elaad E., 2002), even though little work has been done for its implementation (Ben-Shakher G. and Elaad E., 2002). According to Ruskin D. C. (1989),

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Vrij A. (2000), Kapardis A. (2005), the questions<sup>3</sup> are constructed using *unknown material* about the *scene of crime*. This material can be known only by: examiners; people present at the criminal scene. The test has the form of a multiple-choice test. Its aim is not to discover deception, but presence of “guilty knowledge”. The guilty knowledge is detected observing strong physiological reactions with alternatives related to the crime scene.

One of the best discriminator, between the presence of guilty knowledge and its absence, appears to be the electro dermal responses (Kapardis A. 2005; Raskin D. C., 1989).

According to Ben-Shakher G. and Elaad E. (2002), this method can resolve different problems that rose with the formers’.

First of all, it applies standard procedure. Thus, all the examinees go through some experiences. Second of all, the risk of results’ bias with not-physiological information is decreased. Next, its “accuracy can be estimated from laboratory studies”. Finally, the risk of false positive is reduced.

Although these positive elements support the GKT, this method has also several limitations: the availability of enough items (unknown about the

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<sup>3</sup> Used in this method.

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crime) to use in the questions (Bartol C. R. and Bartol A. M., 2004); the fact that details used by examiners was not perceived by guilty subjects (Vrij A., 2000). The examinees could also forget details (Vrij A., 2000). Then, there are few trained polygraphers, as this method is not included in most of the training programs (Bartol C. R. and Bartol A. M., 2004). Further, the limit number of real crimes in which can be used (Kapardis A., 2005; Vrij A., 2000). Moreover, the main limit of this method is its feature of recognising only guilty knowledge. Hence, offenders can always say they were present to criminal scenes like witness but they were not the offender (Vrij A., 2000). Also, innocent eyes-witness (who denied their presence to avoid to be involved) could be considered offenders (Vrij A., 2000).

As a consequence, I firmly disagree with Kapardis (2005) and Ben-Shakher G. and Elaad E. (2002) when they affirm the CKT able to protect “innocent suspects from being falsely classified as guilty”!?!?!?

*Bias factors operating with every method*

Independently by methods, a wide range of factors can also bias polygraph results. They are: the experience of examiners (Kapardis A., 2005); the talent of examinees in lying (Kapardis A. 2005); the use of

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countermeasures by examinees (Vrij A., 2000; Gudjonsson G. H., 1988; Ben-Shakher G. and Elaad E., 2002; Honts C. R. and Amato S. L., 2002)<sup>4</sup>; the *confirmation bias*, e.g. when examiners know examinees to be suspects (Howitt D., 2002).

In addition, the *theoretical foundations* and *assumptions*, on which the polygraph tests are based, have received strong radical critics (Ney T., 1988; Lykken D. T., 1988). Ney T. (1988), after having identified polygraph testing's four assumptions<sup>5</sup>, concludes these are false. The reasons are: people may control their physiological reactions; “specific emotional *stimuli* cannot predict emotion” as we cannot know how the individual cognition evaluates an “emotional stimulus”; “relationship between the different parameters of emotion is ... weak”; “individual

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<sup>4</sup> Even if some authors does not believe in the effectiveness of the countermeasures used to bias the polygraph (tongue biting; foot tensing; counting sheep or backwards); others studies show that people trained in using countermeasures can be able to beat the polygraph test (Vrij A. 2000). Honts C. R. and Amato S. L. (2002) reports, for instance, how the different countermeasures work with the different methods (R-I, CQT and GKT).

<sup>5</sup> The four assumptions are: the human beings cannot control their physiological reactions and behaviours; “specific emotions can be predicted by specific stimuli”; “there are specific relationships between parameters of behaviour”; there are no differences in the response of people (Ney T. 1988).

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may vary between themselves across a number of parameters of emotion”.

Lykken D. T. (1988) argues that the human beings are not “equipped with a distinctive physiological responses that” they emit when they lie. A thesis confirmed by Bull R. M. (1988), who states that does not exist such thing as special physiological responses produced by people when they lie.

Another problem (few considered by the literature) is the inability of the polygraph to distinguish between *lies* and *false memory*. In this case, people can result truthful even if they tell something that is not true. The lies-detector “measures” what people “feel” to be true, not what is objective true.

The large amounts of mistakes made by polygraph tests (*false positive*; *false negative*) confirm the reasons (*supra* illustrated) of the critics’ good foundation. According to Carroll D. (1988), false positives are more than false negatives.

The reliability of the laboratory studies emphasized by some writers (such as: Ben-Shakher G. and Elaad E., 2002) was criticized by Howitt (2002).

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The latter argues laboratory studies not a good instrument to verify the accuracy of polygraph. The examinees are set in different emotional contexts respect those of real criminal investigations. Failing the set – up laboratory polygraph test does not imply anything. Failing a polygraph examination during a police investigation can have serious consequences even if one is innocent.

People, without a strong alibi, prefer confessing false crime rather than to defend their innocence. If they confess a false crime, they have more soft criminal consequences than defending their innocence. Moreover, a good legal defence needs economic resources than not everyone can have.

I disagree with psychologists that believe false confessions (made after a positive polygraph) to be consequences of doubts about memories (Vrij A., 2000). They could be, more likely, a *rational choice* caused by a *Legal System* that gives too importance to *Psychology*! It is better for an innocent (without a good alibi) confessing false crimes rather than challenging polygraph results in the Court. The latter choice will lead to stronger criminal consequences!!



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*Brainwaves analysis of guilty knowledge & functional magnetic imaging (fMRI)*

A possible solution, at these lacks of accuracy, can be seen in the *brainwaves analysis of guilty knowledge*. According to Kapardis (2005), this method is characterised by detecting P3 or P300 brainwaves. They are supposed to be event-related waves evocated by uncommon *stimuli* with special significance for people. These waves are assumed to detect guilty knowledge with a better accuracy then CKT.

Using *functional magnetic imaging* (fMRI), it is possible to individuate areas of the brain that are used when people pay attention and try to control errors (*anterior cingulated gyrus* and *prefrontal cortex*).

This system is believed to guarantee a higher accuracy, and at least to exclude countermeasures bias (Kapardis A., 2005).

Personally, I think that these *beliefs* (like always happened) follow newer methods' enthusiasm! First of all, it is too early to express any kind of appreciation on these methodologies. They are not been used a lot. Only after some real applications in legal settings, we could “appreciate” both the weaknesses and strengths of these methods. Second of all, the *neurosciences* are a *perilous field*! Indeed, the images and brain area activations could be determined always by different processes and

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*functions* (e.g. Benso F., 2013). In other word, it is always the REALITY (the *material facts*) to give *meaning* to the images of *neurosciences*, not *vice versa*!! Third, the *data* in *neurosciences* are mediated by computer' *software*. They cannot be trusted so much. They are not always able to reflect REALITY.

Anyways, at the end, remember: “everything has its abuse as well as it is use” (Bernard Show).

## **Conclusion**

Although the mankind have been attempting to find a system able to discriminate between true and lie since Antiquity (Segrave K., 2005), human beings have not succeeded in this research. The results are contradictory. The degree of errors is still elevated. The literature is divided into two “parties”. One is for a sceptic idea about lie detectors (Nye T., 1988; Carrol D., 1988; Lykken D. T. 1988; etc...); the other one supports them, despite of their weakness (Barland G. H., 1988; OTA, 1993; etc...).

Whereas polygraphs had a wide use in USA, some European States do not allow lie detectors: **both** in criminal setting during the investigation **and** in front of Courts. Polygraphs are not also allowed in labour

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personnel selection. These decisions have been made: due the high degree of inaccuracy; and, due ethics issues.

All in all, “a lie detector does work as long as the subject believes it works. A good examiner scares the crap out of you. It’s theatre” (Leonard Saxe)<sup>6</sup>.

**But, *Truth* and *Justice* should not be the outcome of *theatrical representations!!***

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<sup>6</sup> This quotation has been reported by Segrave K. (2005).

## **Bibliography**

Bartol C. R. and Bartol A. M. (2004), *Psychology and Law – Theory, Research, and Application*, USA: Thomson

Ben-Shakhar G. and Elaad E. (2002), The Guilty Knowledge Test (GKT) as an Application of Psychophysiology: Future Prospects and Obstacles, in Kleiner M. (ed) (2002), *Handbook of Polygraph Testing*, UK: Academic Press

Ben-Shakhar G. (2002), A Critical Review of the Control Questions Test (CQT) in Kleiner M. (ed) (2002), *Handbook of Polygraph Testing*, UK: Academic Press

Benso F. (2013), *Lecture's Notes*, Genoa University, Italy (Università di Genova, Italia). Not published.

Bull R. H. (1988), What is the lie-detection test? in Gale A. (ed), *The Polygraph Test – Lies, Truth and Science*, UK: Sage Publications

Carroll D. (1988), How accurate is polygraph lie detection? in Gale A. (ed), *The Polygraph Test – Lies, Truth and Science*, UK: Sage Publications

*Something about Lie-Detectors*

De Paulo B. M. and Pfeifer R. L. (1986), On the job experience and skill at detecting deception, in *Journal of applied social psychology*, 16, 249-267.

Eibl-Eibelfeldt I. (1993), *Etologia Umana – Le Basi Biologiche e Culturali Del Comportamento*, Torino: Bollati Boringhieri

Ekman and O' Sullivan, (1991), Who can catch a liar?, *American Psychologist*, 46, 913 – 920.

Gale A. (ed) (1988), *The Polygraph Test – Lies, Truth and Science*, UK: Sage

Publications

Gudjonsson G. H. (1988), How to defeat the polygraph tests, in Gale A. (ed), *The Polygraph Test – Lies, Truth and Science*, UK: Sage

Publications

Kapardis A. (2005), *Psychology and Law – A Critical Introduction*, Cambridge: Cambridge University Press

Kleiner M. (ed) (2002), *Handbook of Polygraph Testing*, UK: Academic Press

Kraut R. E. and Poe D. (1980) On the line: The deception judgments of customs inspectors and laymen, in *Journal of Personality and Social Psychology*, 39, 784 – 798.

*Something about Lie-Detectors*

Honts C. R. and Amato S. L. (2002), Countermeasures, in Kleiner M. (ed) (2002), *Handbook of Polygraph Testing*, UK: Academic Press

Larson J. A. (1969), *Lying and Its Detection – A Study of Deception and Deception Tests*, New Jersey: Patterson Smith

Lykken D. T. (1988), The case against polygraph testing, in Gale A. (ed), *The Polygraph Test – Lies, Truth and Science*, UK: Sage Publications

Mehrabian A. (1971), Nonverbal betrayal of feeling, in *Journal of Experimental Research in Personality*, 5, 64-73.

Mischell W. (1968), *Personality and Assessment*. New York: Wiley

Mischell W. (1976), *Introduction to Personality*. New York: Holt Rinehart and Winston

Ney T. (1988), Expressing your emotions and controlling feelings in Gale A. (ed), *The Polygraph Test – Lies, Truth and Science*, UK: Sage Publications

Office of Technology Assessment (Congress of United States) (1993), *Scientific Validity of Polygraph Testing – A research review and evaluation – A Technical Memorandum*, Washington: U.S. Government Printing Office

*Something about Lie-Detectors*

Porter S., Woodworth M. and Birt A. R., (2000), Truth, lies and video tape: An investigation of the ability of federal probation officers to detect deception in *Law and Human Behavior*, 24, 643 – 658.

Ruskin D. C. (1988), Does science support polygraph testing? in Gale A. (ed), *The Polygraph Test – Lies, Truth and Science*, UK: Sage Publications

Ruskin D. C. (1989), *Psychological Methods in Criminal Investigation and Evidence*, New York: Springer Publishing Company

Segrave K. (2004), *Lie Detectors – A Social History*, USA: McFarland and Company

Swanson C. R., Chamelin N. C. and Territo L. (1996), *Criminal Investigation*, USA: The McGraw-Hill Companies

Vrij A. (2000), *Detecting Lies and Deceit – The psychology of lying and the Implications for Professional Practice*, USA: John Wiley and Sons