

To Use or Not to Use? Revisiting And Rethinking the Use of Polygraph and Psychophysiological Assessments in the Law Enforcement Setting



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Submission: May 12, 2023; **Published:** May 16, 2023

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Keywords: Psychophysiological assessments; Hypothesizing; Physiological arousal; Biosignals; Deceitfulness; Blood pressure; Skin conductance

Abbreviations: EPPA: Employee Polygraph Protection Act; CQT: Control Question Technique; GKT: Guilty Knowledge Test; ERP: Event-Related Potential; CIT: Concealed Information Test; FNIRS: Functional Near-Infrared Spectroscopy; SCR: Skin Conductance Response; HR: Heart Rate; RT: Reaction Time

The Knowledge Gap: Incongruence Between Words and Actions

Dating back to the alluring invention of “lie detector” – a polygraph machine – by William Marston more than a hundred years ago in 1915 [1], debate on the validity and utility of polygraph has never extinguished. Beyond that, criticisms on the dubious accuracy of polygraph have spilled over to other psychophysiological measures. Particularly, the potential use of psychophysiological assessments in recruitment has been strongly against by the academia. Their use has been controversial due to pronounced practical and theoretical issues that remain unresolved in the pre-employment screening context [2]. In fact, the National Research Council reported in 2003 that there would be a strong risk to adopt pre-employment polygraph screening because it might erroneously exclude a large number of otherwise suitable candidates (National Research Council, 2003). A relatively recent study conducted by White [2] also concluded that the sole reliance on polygraph results as a pass/fail criterion for recruitment could be a misguided practice [2].

However, despite the “demonization” of polygraph and other kinds of psychophysiological measures, there have been exemptions in practice. Specifically, the prohibition on polygraph tests for pre- and post-employment purposes have been exempted

for certain government postings, pharmaceutical companies, and national defence and security personnel in the United States after the National Academy of Sciences was asked by the U.S. Department of Energy to conduct a scientific review on polygraphy in 2001 [3,4]. In fact, the use of polygraph has continued in the United States and in at least 69 other countries [3,5] as documented, in which mostly for forensic investigations [6-8], and sometimes for personnel selection and employee vetting in national security agencies [3,9]. Given such observed incongruence between words and actions, there exists a knowledge gap that might worth a revisit of the utility of psychophysiological assessments.

Development of Psychophysiological Assessments

In essence, we need to refresh ourselves with the development of polygraph and psychophysiological measures. In general, four major subtypes of psychophysiological measures have been used for assessing deception and integrity-related issues in the workplace, including biosignals, pupillometry (pupil diameter changes), brain fingerprinting, and general physiological arousal [10]. Notably, both biosignals and pupillometry have been related to the use of polygraphy, which was a popular integrity testing apparatus before the enforcement of the federal Employee Polygraph Protection Act (EPPA) in 1988 [11]. Depending on

the subtypes of psychophysiological measures, biosignals and pupillometry are used in conjunction with the polygraphy instrument to display outputs of physiological arousal changes on a continuous-feed chart, or other digitalized formats nowadays. Both measures operate on the notion of detecting “fears”. In line with the assumption of polygraphs in hypothesizing “fear” as an index of “deceitfulness”, both measures focus on recording autonomic nervous systems responses that are assumed to be associated with deception, rather than detecting lies per se. In other words, when someone is lying, detectable changes in physiological arousal levels would be detected, possibly indicating “deceitfulness” [1,12]. For biosignals, an individual who shows increases in heart rate, blood pressure, skin conductance, and respiratory rate while also shows decreases in skin resistance, respiratory depth, and skin temperature, would be assessed as being “aroused” and deceitful [10]. For pupillometry, an increase in pupil size is expected to correlate with deception [10]. In practice, both measures are used in conjunction with the Control Question Technique (CQT) and/or Guilty Knowledge Test (GKT). The CQT postulates an index of “deception” as the difference in physiological responses to “neutral” questions and “target” questions. The GKT uses the extent of physiological variation in responses as the “deception” index when an individual is asked seemingly indirect questions to which only a “guilty” individual would see the relevance and possess the “hidden” knowledge [10].

The assessment of brain fingerprinting was pioneered by a neuroscientist who proposed an index of “deception” as the increase in the P300 waveform amplitude and time-shift of the event-related potential (ERP) [13]. In principle, when someone sees a familiar or image, object or scene related to an “offence”, this P300 component would increase after 300 milliseconds and would be indicative of higher level cognitive processing. Applying this to the detection of deception, the presentation of pictures associated with the “offence” by flashing them on a computer screen would trigger the increase of P300 brain wave and indicate a sign of deception [14]. The fourth subtype of general physiological arousal measure uses “hyporeactivity” (chronic under-arousal) as an index of “deception”. This perspective is substantiated by the biological predisposition model on delinquency [15] and psychopathy [16,17]. According to this measure and perspective, “hyporeactivity” is observed and measured immediately following the presentation of a sudden “orienting” stimuli [18].

To Use or Not to Use? This is the Question

Over the years, the queries about polygraph and other psychophysiological measures have never ceased. The American Psychological Association stated that [19]: “Most psychologists agree that there is little evidence that polygraph tests can accurately detect lies.” In parallel, newer empirical evidence that provided support to psychophysiological measures has also been growing. For example, Selle and Shakhar [20] revealed a

new perspective called response fractionation that highlighted different physiological measures reflected different underlying mechanisms to explain for the differential physiological and behavioural responses to detect concealed knowledge in the concealed information test (CIT). Likewise, there were also findings that indicated the combination of brain imaging data from functional near-infrared spectroscopy (fNIRS) associated with skin conductance response (SCR), heart rate (HR), and reaction time (RT), could improve the efficiency of deception detection [21].

Given all these important yet contradictory findings, there is still a long way to conclude on the topic. Nevertheless, as a scientist-practitioner, it might warrant a revisit of these psychophysiological assessments and rethink about “to use or not to use” in this professional arena.

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DOI: [10.19080/PBSIJ.2023.20.556045](https://doi.org/10.19080/PBSIJ.2023.20.556045)

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