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ANDRZEJ FRYCZ MODRZEWSKI KRAKOW UNIVERSITY

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"Soviet polygraph": metamorphoses and historical facts

Vitalii Shapovalov*

Abstract

This article explores the historical development of polygraphy in the Soviet Union, with particular attention to the activities of KGB's Laboratory No. 30. Drawing on declassified materials, eyewitness accounts, and professional reflections by former KGB personnel, the study reconstructs the evolution of Soviet polygraph practices from the late 1960s to the 1980s. It examines early scientific contributions, the influence of American methodologies, the adaptation of foreign technologies, and the creation of Soviet testing procedures such as the Mixed-Type Test. The article also highlights how Soviet ideological constraints shaped both the official discourse and cinematic portrayals of polygraphy. Special attention is given to the field practices of Laboratory No. 30, including unconventional assignments related to paranormal phenomena. The study concludes that, despite efforts to replicate or adapt Western polygraph techniques, Soviet developments did not result in uniquely innovative methods or technologies. These findings provide a contextual foundation for understanding contemporary polygraph practices in the post-Soviet space, particularly in Ukraine and russia.

Key words: Soviet polygraphy, Laboratory No. 30, KGB, lie detection, Mixed-Type Test, countermeasures, psychological diagnostics, parapsychology, USSR, intelligence services, polygraph history

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Gaining a thorough understanding of any professional field requires exploring its stages of development and the impact of key historical events on its formation. This approach is relevant to the study of polygraphy. Awareness of historical facts helps to prevent the spread of misunderstandings and can also challenge myths that have deliberately been created about the origins of the field, its methods, and the technical requirements for polygraph devices.

From the 1990s until the start of russia's* hybrid war against Ukraine and the annexation of Ukrainian territories in 2014, the development of polygraph examination in Ukraine was strongly influenced by russian specialists and training institutions. This influence was largely due to the geographical proximity of the two countries, the similarity of their languages, and the long-standing cultural and professional connections dating back to the Soviet period. Many Ukrainian polygraph examiners received their training in russia – particularly in institutions founded by former employees of the 30th KGB Laboratory.** Some studied at the Institute of Criminalistics of the Centre for Special Technology of the Federal Security Service of the russian Federation, while others were trained in the so-called "Krasnodar School", where the "Varlamov Method" was used.

Another factor that contributed to the influence of russian polygraphy was the early availability of specialist literature published in russia, beginning in the early 2000s. At that time, Ukraine was just starting to develop its own body of professional knowledge in the area, so russian publications became the main source of information for Ukrainian practitioners. Russian polygraph specialists – especially those from KGB's Laboratory No. 30 – were often considered holders of exclusive or "secret" knowledge. Their work became the subject of many stories and claims about unique methods and technologies.

However, a closer examination of available sources on russian polygraphy reveals a more complex picture. This article presents a chronological overview of historical facts gathered from publications, interviews, and seminar recordings featuring employees of KGB Laboratory No. 30. The aim is to provide readers with a clearer understanding of the true origins of russian polygraphy, to trace how Soviet specialists attempted to build an understanding of American polygraph technology based on

* Following the illegal and unprovoked russian invasion of Ukraine, it has become customary in Ukrainian writing to render "russia" and "russian" in lowercase. As the author has chosen to follow this practice, both the editors and proofreaders respect his decision."

** A covert KGB laboratory specialised in the development of poisons and biochemical substances for use in espionage and assassinations

limited information, and how they later presented their adaptations and copies of Western methods as original developments with "no global equivalents".

Pioneering Figures in the History of the Polygraph

The development of any scientific field typically begins with pioneers – individuals who propose bold hypotheses and work persistently to support them with empirical evidence. This pattern holds true for the field of lie detection. In the United States, early innovators such as William Marston, John Larson, and Leonard Keeler played a foundational role in shaping the trajectory of this emerging discipline. In the newly established Soviet Union, a comparable figure was Alexander Luria.

Alexander Luria (16 July 1902 –14 August 1977) was a Soviet psychologist and founder of the field of neuropsychology

Alexander Luria (16 July 1902 – 14 August 1977) was a Soviet psychologist who is widely recognised as one of the founders of neuropsychology. Early in his career, he worked in the experimental psychology laboratory at the Moscow Provincial Prosecutor's Office. There, he refined the associative method, which was widely used in experimental psychology at the time, and applied it to detect concealed information in individuals suspected of committing serious crimes (Kuznetsov, Petryuk, 2013: 97–103).

One of Luria's key contributions was the development of the "Combined Motor Method", a technique aimed at identifying suppressed emotional and cognitive

processes. This research gained international recognition and was published in the United States in 1932 under the title *The Nature of Human Conflicts*. The publication established Luria's reputation as one of the leading psychologists of Soviet russia. In 1937, he submitted a russian-language manuscript of his work and successfully earned his doctorate after defending it at the University of Tbilisi. It is worth noting that his manuscript had not been published in russian until 2002 (Luria, 1932).

Despite his scientific achievements, Luria did not receive the recognition he deserved within the USSR. His work faced significant criticism from officials in various branches of the Soviet government. For instance, Andrei Vyshinsky, who served as Prosecutor General from 1935 to 1939, described the use of psychological diagnostics in the judicial system as absurd and a serious violation of human rights (Mrakobesie). This position should be understood in the context of the time, when extrajudicial bodies known as "Troikas" were operating, and their methods were arguably much less humane than psychological assessments.*

In the years that followed, all attempts to develop and implement Luria's methods further in criminal investigations were dismissed as pseudoscientific. As a result, the application of these techniques in investigative practice was effectively blocked. Soviet criminology textbooks, up to the late 1980s, consistently portrayed lie detector tests as pseudoscientific tools used in capitalist societies to suppress the progressive working class.**

Early Research on the "Lie Detector". Issue within the KGB***

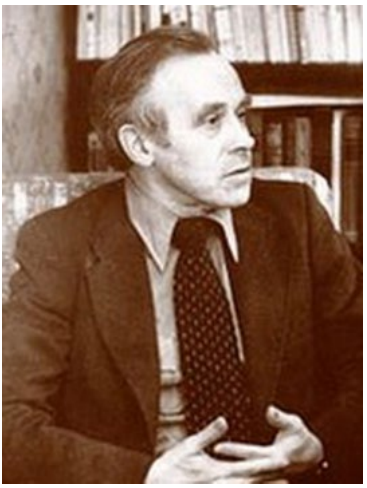
According to published accounts and interviews with former KGB personnel, the attitude of the Soviet leadership toward the use of the polygraph – or "lie detector" – began to shift following a series of operational failures involving intelligence agents from the German Democratic Republic (GDR). These agents, despite being

* The NKVD Troika or Special Troika (russian: *особая тройка*, russian: *особая тройка*) – in Soviet history – the People's Commissariat of Internal Affairs (NKVD, which would later become the beginning of the KGB), consisting of three officials who sentenced people after a simplified, expedited investigation and without a public trial. These three members were judges and jurors, although they did not themselves carry out the sentences they passed. These commissions were used as an instrument of extrajudicial punishment, introduced to supplement the Soviet legal system with means for quick and secret execution or imprisonment (NKVD_troika)

** Forty Years Ago, the KGB of the USSR Approved the Use of the Polygraph: An Interview with Yuri Kholodny, https://rg.ru/2015/06/25/holodnij.html (accessed: 26.05.2025).

*** The Committee for State Security.

highly trained, were exposed using polygraph testing. The GDR intelligence service informed the KGB about these incidents, prompting the Soviet leadership to reconsider its stance on the polygraph. As a result, by the late 1960s, the KGB had authorised the initiation of experimental research into the potential applications of polygraph technology.



Pavel Simonov (20 April 1926 – 6 July 2002) Soviet and russian psychophysiologist, biophysicist, and psychologist. Academician of the russian Academy of Sciences, Doctor of Medical Sciences, Professor

To conduct this research, a specialised group was established under the leadership of Colonel V. Naumov, an Honoured State Security Officer and Candidate of Medical Sciences. The head of the project was Albina Zanicheva and Senior Lieutenant Vladimir Noskov joined the team later to assist with experimental procedures. The research was carried out by KGB personnel at a Ministry of Defence research institute under strict secrecy and with scientific supervision provided by Professor Pavel Simonov (Kholodny, 2015).

Due to prohibitions on polygraph research within the USSR, there was a significant shortage of appropriate equipment. From the 1950s– to the 70s, polygraphs were manufactured exclusively in the United States, and export restrictions were in place, prohibiting their sale to Eastern Bloc countries. Nonetheless, intelligence agencies in countries such as the GDR, Yugoslavia, Poland, Hungary, and Bulgaria managed to acquire and use American-made polygraphs. By the late 1960s, the KGB had also succeeded in obtaining several such devices, apparently through circumvention of the embargo (Alekseev 2016; Korovin 2017; Kholodny 2015).

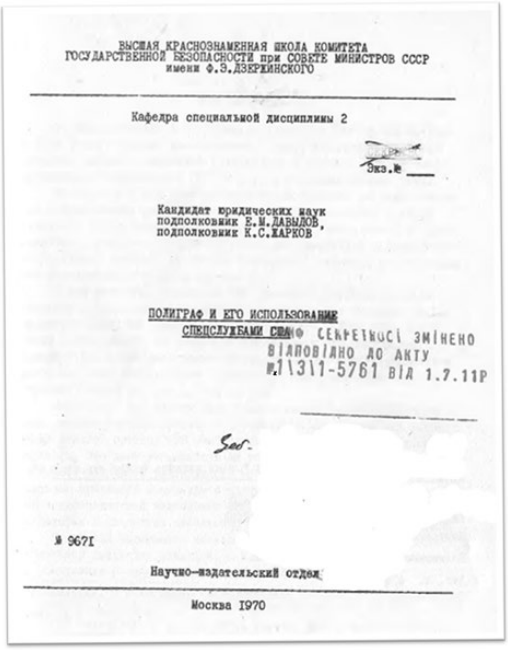
As noted by Yuri Kholodny in his article "For the 40th Anniversary of the Use of the Polygraph in russia", the initial experiments conducted by the Naumov–Zanicheva group revealed that conventional polygraphs, while suitable for field applications, were insufficient for scientific purposes. Specifically, they lacked the precision necessary for accurately measuring physiological indicators such as respiratory patterns, cardiovascular activity, and skin conductance. To address these limitations, researchers began using a stationary encephalograph of French manufacture, which was adapted with additional units and sensors for polygraph-related testing (see Figure 1). The author of the article suggests that the use of the French encephalograph might have been prompted by a shortage or lack of suitable equipment.

Figure 1. Experiments on detecting hidden information (Moscow, late 1960s) (Kholodny, 2015)

As Yuri Kholodny observed, the shortage of necessary equipment was eventually resolved. New polygraph devices produced by Associated Research Inc. and Stoelting became available to Soviet specialists. One of these polygraphs was transferred to the Central Research Institute of Special Equipment within the Operational and Technical Directorate of the KGB. Under the leadership of Captain Yuri Azarov, a Candidate of Technical Sciences and head of one of the institute's laboratories, work began on studying and developing technical tools designed to detect concealed information in individuals. These studies also involved the participation of Leonid Alekseev.

In addition to operational applications, the clinical polygraph began to be used by the Medical Directorate for psychological research, particularly in the context of personnel selection. Vladimir Noskov and Boris Huseynov contributed notably to this research (Kholodny 2015).

It is worth mentioning that as early as 1970, a classified booklet titled "The Polygraph and Its Use by U.S. Intelligence Services" was published for KGB personnel. This publication, marked "for official use only," reflects the growing institutional interest in the topic during that period (Davydov, Zharkov, 1970: 79).



ВЫСШАЯ КРАСНОЗНАМЕННАЯ ШКОЛА КОМИТЕТА
ГОСУДАРСТВЕННОЙ БЕЗОПАСНОСТИ при СОВЕТЕ МИНИСТРОВ СССР
имени Ф.Э.ДЗЕРЖИНСКОГО

Кафедра специальной дисциплины 2

Экз.№ ___

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подполковник К.С.ЖАРКОВ

ПОЛИГРАФ И ЕГО ИСПОЛЬЗОВАНИЕ
СПЕЦСЛУЖБАМИ США

ГРИФ СЕКРЕТНОСТІ ЗМІНЕНО
ВІДПОВІДНО ДО АКТУ
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Москва 1970

Although published before the establishment of the KGB's specialised Laboratory No. 30 in 1975 – which would later focus specifically on polygraph-related issues – it already contained a range of relevant information. The booklet outlined the technical features of polygraphs available at the time, provided a general overview of procedures for conducting polygraph examinations, and briefly described the Peak of Tension (POT) technique and the Backster Method. These descriptions, however, were rather superficial, suggesting that there was limited understanding at the time of the underlying evaluation systems and the role of comparison questions.

The booklet also included a short section on countermeasures, offering recommendations for agents who might be required to undergo a polygraph examination. Overall, the content of this classified publication indicates that, by the late 1960s and early 70s, KGB personnel had already developed a basic awareness of polygraph technologies and methodologies used in the United States.

The Polygraph in Soviet Cinema of the 1960s

While the research group led by V. Naumov and A. Zanicheva was actively studying the application of the polygraph within the KGB (c. 1969), the production of the psychological spy film *The Secret Agent's Blunder* was also underway. The film explores the story of a professional intelligence officer Mikhail Tuliev, son of a russian emigrant. The film's creatives approached the Soviet KGB with a request for technical consultation for a scene involving a polygraph examination of a Soviet intelligence officer, portrayed by the well-known Soviet actor Mikhail Nozhkin. The KGB provided expert guidance to ensure the portrayal of the polygraph procedure was as accurate and authentic as possible within the cinematic context (see Figure 2).

Figure 2. *The Secret Agent's Blunder*, scene with the polygraphs
(Clip from *The Secret Agent's Blunder*, 1968)

The polygraph-related episode in the film served a clear propagandistic function. It was intended to convey the message that the use of the "lie detector" was sceptically looked down upon in the USSR and at the same time to promote the idea that a strong-willed, ideologically committed Soviet patriot could easily deceive such a "pseudoscientific device".

The polygraph examination, as depicted in the film, was significantly distorted. To reinforce the image of the fearless Soviet intelligence officer, the protagonist engages in bold behaviour prior to the test – he touches the equipment without permission and makes sarcastic remarks directed at the team of examiners and escorts. In actual polygraph procedures, such behaviour would likely hinder the accuracy and reliability of the results.

To represent the polygraph device visually, the filmmakers used a modified piano crafted by a set designer. Ultimately, following the screenwriters' intentions and supporting the broader ideological narrative promoted by Soviet propaganda, the protagonist "successfully deceives" the polygraph before our eyes.

Establishment of Specialised Laboratory No. 30 within the KGB

It is difficult to determine with certainty what factors played the decisive role in the establishment of a specialised laboratory focused on polygraph research within the KGB. According to former employees of Laboratory No. 30, as reflected in their published articles and interviews, the creation of this unit was a complex and challenging process. One of the main obstacles was the deeply rooted scepticism toward polygraph use that had taken hold in Soviet legal and psychological sciences over the years.

Accounts provided by former KGB personnel differ slightly in details. However, it is likely that each version highlights particular events or perspectives which, collectively, contributed to the eventual establishment of the laboratory.

Yuri Kholodny. Since 1975, member of staff of the KGB Laboratory No. 30, later in the FSB of russia. Until 2008, he was the head of one of the departments of the Institute of Forensic Science of the Centre for Special Equipment of the russian FSB, colonel, candidate of psychological sciences (1990), doctor of law (2002), professor of the Department of Forensic Science of the Academy of the FSB of russia (2003)

Thus, in his article "On the 40th Anniversary of the Use of the Polygraph in russia," Yuri Kholodny refers to Professor Pavel Simonov's report of 26 June 1972 entitled "On the Current State of Lie Detection in the United States of America and the Expediency of Certain Measures". In the document, submitted to KGB Chairman Yuri Andropov, Professor Simonov provided a brief overview of how the polygraph was used in the United States and concluded:

> The facts show that the method of objectively recording involuntary emotional reactions continues to be developed and applied in the US. This gives reason to consider it advisable (...) to establish a dedicated laboratory within the KGB system to study this method (...) taking into account recent advances in psychophysiology, electronics, and computer technology.

According to Simonov, such a laboratory should include psychophysiological researchers experienced in instrumental measurement of physiological responses, as well as an engineer to handle the equipment, a computer specialist, and a programmer (Kholodny, 2015).

Leonid Alekseev. Employed in special psychophysiological research laboratories of the KGB in 1968–85

In a 2016 lecture, Leonid Alekseev offered another perspective on the origins of the laboratory dedicated to polygraph research. He recalled:

> Azarov has this box and he doesn't know what to do with it. In the end, he comes to Andropov* and declares that we have a contactless polygraph, why do we need to invent a polygraph, since there are American ones, he went and bought them through a third country,

* Yuri Andropov (2 [15] June 1914 – 9 February 1984) was a Soviet party leader and statesman. He was the head of the KGB in 1967–82.

> and we have a contactless one, what are we going to do? And Andropov gives the order to create a special laboratory for psychophysiological research, the same "thirty", from which our team came (Alekseev 2016).

Despite ideological resistance, on 25 June 1975, KGB Chairman Yuri Andropov signed the order "On the Creation of Laboratory No. 30 (Applied Psychophysiology) within the KGB under the Council of Ministers of the USSR, and on the Approval of the Temporary Regulations on Laboratory No. 30." The newly formed laboratory was tasked with conducting scientific and applied research related to the polygraph, developing methods to counteract polygraph testing, and, eventually, exploring topics related to parapsychology and paranormal phenomena (Korovin 2017; Kholodny 1994; Kholodny 2015a).

Yuriy Azarov. The first head of the special laboratory of applied psychophysiology (Laboratory No. 30) of the KGB

Laboratory No. 30 of the KGB was composed of a core team of specialists. It was headed by Yuri Azarov, with Volodymyr Noskov serving as his deputy. Senior researchers included V. Naumov and Albina Zanicheva. Leonid Alekseev and Yuri Kholodny also joined the group.

This is what Leonid Alekseev recalled in a 2016 lecture:

> I want to say that in those years, working in the 25th, 30th laboratory, these were the years of the rampant science, because no money was spared in the "Brezhnev times".* We went to

* The Brezhnev era is a period in the history of the Soviet Union when the country was led by Leonid Ilyich Brezhnev. He served as General Secretary of the Central Committee of the CPSU

the shops then and saw nothing, and money for the "defence"* was given in any amount you wanted. We bought everything. The most interesting thing is that we sat in the "Leninka" (library)** for months, read books, wrote reports. But the point is that once I visited "Leninka", I dug up a book called Truth and Deception by Reed and Inbau (...) It describes all the signs of neurobehavioural states, that is, these are the changes in breathing that occur, which you need to pay attention to, GSR, heart, etc. And this book fell into the hands of Azarov, and in fact, this served as an impetus for developing these methods in our country (Alekseev 2016).

Valery Korovin. In 1979–95, employee of the KGB and later the FSB, special laboratory for psychophysiological research, lieutenant colonel

In turn, Valery Korovin recalls that:

In this laboratory, before my arrival (1979), a methodology for training in countering the polygraph had already been practically developed by Albina Aleksandrovna Zanicheva, Boris Ivanovich Huseynov, and Vladimir Konstantinovich Noskov. At the time when I arrived, Zanicheva, Noskov, Yuri Ivanovich Kholodny, and Boris Ivanovich Huseynov had already been working there (...) they were already conducting not only experimental research, but

from 1964 to 1982. This period was characterised by a certain stability in the economy and foreign policy, but also by stagnation, particularly in culture, science, and public life. This period is also popularly called "Stagnation" due to the lack of significant changes and reforms.

* The word "defence" is often used figuratively to refer to the defence-industrial complex, that is, the sector of the economy engaged in the production of weapons, military equipment, and other products used to defend the country.

** "Leninka" is the unofficial name of the russian State Library (RSL), formerly known as the Lenin Library. It is one of the largest libraries in the world, founded in 1862. From 1925 to 1992, it bore the name of Lenin, and is now known as the russian State Library.

also the first real practical tests related to solving certain intelligence and counterintelligence tasks (Vystuplenie Korovina NSHDL, 30th laboratory, America, Korovin 2018).

Equipment of Specialised Laboratory No. 30

Soviet specialists were unable to acquire polygraphs manufactured in the United States legally due to the embargo. Nevertheless, devices eventually reached the staff of Laboratory No. 30 through indirect channels – acquired via agents operating in Europe and other countries where polygraph technology was in use. Additionally, to address the shortage of necessary equipment and meet the laboratory's operational needs, KGB specialists adapted electroencephalographs produced in France and Italy for use in polygraph research.

According to Yuri Kholodny, by the late 1970s, computers had also been employed to process and quantify the data recorded during polygraph examinations (see: Figure 3).

Figure 3. Computing complex for processing polygraph testing data (Laboratory No. 30, late 1970s)

Yuri Kholodny also notes that as early as 1986, a significant breakthrough occurred in the development of new devices. In the span of just one year, a computing complex – essentially a prototype of a computerised polygraph – was created. It may be worth noting that the monitor for this system was adapted from a domestic television set, the Yunist (see: Figure 4).

However, considering the level of computer development in the 1970s and 80s – particularly in the USSR – it is difficult to assess how effective and reliable the research and development efforts truly were. Open-source information about the equipment used in Laboratory No. 30 most often references foreign technology. Relevant arguments on this topic are outlined below.

As Yuri Kholodny notes, to expand the laboratory's technical capabilities (Kholodny 2015a), portable encephalographs produced by the Italian company Biomedica, known for their high reliability, were acquired and subsequently adapted for use in polygraph research. In an interview for the Next Level programme, Valery Korovin recalls:

> Our craftsmen converted a foreign, Italian-made electroencephalograph into a polygraph, and so our first polygraph based on the Italian electroencephalograph was born. Our conversion was complete. But, back in the period when there were no computers or languages, the brilliant Yuri Kostyantynovich Azarov immediately set the task for the technicians to create a device that would not only record physiological reactions and processes, but also measure them (Korovin 2017).

Figure 4. Working with a prototype of a computer polygraph (Moscow, 1987. The "subject" is B. Fedorov, an employee of laboratory No. 30, while Y. Kholodny is operating the device)

Polygraph techniques in Laboratory No. 30

The staff of Laboratory No. 30 developed their own methods, including the "Mixed-Type Test", "Assessment of the Significance of Versions", and the "Methodology of Situationally Significant Stimuli".

As Leonid Alekseev recalled in his lecture (2016):

> And we, working in the 30th laboratory, used elementary techniques that we found in this book (Truth and Deception). In particular, we tried to create our own questionnaire format,

> there was such a period, it was called "Mixed-type question test". In general, it had a fairly simple appearance. We believed that questions should be asked in triads, that is, the test should have several such triads (three, four), and in each triad there had to be a "neutral", a "control", and a "verification" question, [that's why] this was a mixed-type test. We used such a test, and in principle everything worked out for us. That is, we somehow thoughtlessly, perhaps, not fully understanding what we were doing, still performing our work, orders, and working on counteraction – preparing our employees to pass polygraph tests abroad, and run the verification of our agents, which means, the work was moving." (Alekseev 2016)

The "Mixed-Type Test" (MTT) mentioned by Leonid Alekseev was developed by KGB specialists in the late 1970s, based on the principles of the zone comparison test. This test bears some resemblance to certain modern tests employing comparison questions but differs significantly in key aspects. Its format consisted of an equal number of neutral, control (an analogue of comparison questions – VS), and verification (an analogue of relevant questions – VS) questions organised into two or three triads. The test always concluded with a control question, referred to by the developers as a "control question outside the research topic". This question was posed in one of two versions: "In this test, did you lie to at least one question?" or "When answering the questions of this test, did you lie to me at least once?".*

The MTT allowed the use of any type of control questions, while the verification questions generally focused on a single topic. The number of test presentations ranged from three to six (Ogloblin 2004: 464).

The assessment of the significance of the test questions for the examinee was determined by comparing their physiological reactions to these questions with the strongest reaction elicited by the control question.

Example of the "Mixed Type Test" MTT (three triads)

0. (N) Is your full name Kalinin Viktor Sergeevich?

1. (N) Were you born and raised in Petropavlovsk-Kamchatsky?

2. (C) Have you ever participated in a conspiracy to steal government vehicles?

* This type of question is not considered a comparison question in valid modern methods. In the tradition of conducting a test of relevant / neutral questions (Relevant / Irrelevant Screening Test), this type of question was called "overall truth question", that is, "a question of general truth", and was used to register the general ability of the subject to respond. But it should be noted that the responses to these questions were not compared with the responses to the relevant questions in order to prepare a categorical conclusion about truth or deception.

3. (R) Do you know for certain that after the robbery from the jewellery store, one of its participants was killed by X.?

4. (N) Did you work at a private car service in Irkutsk?

5. (C) Did you participate in the contract theft of a red "ten" with a state license plate?

6. (R) Regarding the aforementioned murder, do you know for sure that it took place?

7. (N) Are you currently serving a sentence in institution No. ...?

8. (C) Have you ever been involved in the illegal trade in gold products?

9. (R) Did you personally witness the murder of one of the participants in the theft?

10. (N) In establishment No. ..., do you work in logging?

11. (C) When answering these questions, have you lied to me at least once?

Obviously, the construction of both control questions and verification (relevant) questions in this test looks quite strange, especially against the background of US methods of the time.

Field Practice of Laboratory No. 30 Staff

Since its establishment, Laboratory No. 30 continuously expanded both the number of polygraph examinations conducted and the geographical scope of their application. According to the information provided by Y. Kholodny, the laboratory staff first conducted research using a polygraph in Georgia and Latvia in 1976, in Armenia and Ukraine in 1978, and in the early 1980s in Kazakhstan, Kyrgyzstan and other republics. In 1977, the laboratory staff first conducted testing using a polygraph outside the USSR, and later such work continued in the territories of European, Asian, and African countries. At that time, the function of polygraph examiners was performed by Yuri Azarov, Albina Zanicheva, Volodymyr Noskov, Yuri Kholodny, Boris Huseynov, Valery Korovin, and B. Fedorov. Although the volume and geography of polygraph application were increasing, the needs of the state security agencies, taking into account rotation, were met by a group of only five or six specialists (Kholodny 2015).

The field practice of the staff of Laboratory No. 30 also includes the study of paranormal phenomena. One such case is known from Yuri Kholodny's article "The Mysterious Sphere in the Basements of the Lubyanka"* (Kholodny 1994) and his speech at a meeting entitled "From the Experience of Studying Anomalous Phenomena. Siegel's Readings. No. 49" (Kholodny 2015a).

The author of the article considers it appropriate to provide a brief description of this story not only because it is an interesting historical fact from the life of the employees of Laboratory No. 30, but also because it reflects the workload on the specialists of this laboratory, especially when the limited number of its personell is considered. The story itself looks highly incredible, but it is recorded from a speech by a famous employee and later head of KGB Laboratory No. 30, Yuri Kholodny.

"Operation Sphere"

According to the information provided by Yuri Kholodny in his speech at the conference The End of the 20th Century. From the Experience of Studying Anomalous Phenomena. Zygel's Readings. No. 49 and the article "The Mysterious Sphere in the Basements of the Lubyanka", the Military-Industrial Commission of the Presidium of the Council of Ministers of the USSR** received information that some "researchers" brought to Moscow an unknown object in the shape of a ball, found during clay mining at a depth of 8 meters in Western Ukraine in 1975. The "researchers" in possession of the "Sphere" suggested that this object was a container with antimatter, and concluded that an alien vehicle visited the earth in prehistoric times about 10 million years ago. These "researchers" also claimed that if the "Sphere" was handled carelessly, then only a crater could remain from the city of Moscow. As Yuri Kholodny explains in his speech, this was the reason why state security officers were involved in the study of this object. It is important that the "Sphere" had to be found and intercepted before the start of the 26th Congress of the Communist Party, which was to begin on 23 February 1981. Already on 20 February, the "Sphere" was seized by employees of the cen-

* The State Security Service Building on Lubyanka was the main building of the state security agencies of the RSFSR and the USSR from 1919 to 1991. It is now part of the complex of buildings of the Federal Security Service of russia on Lubyanka Square.

** The Commission of the Presidium of the Council of Ministers of the USSR on Military-Industrial Issues (MIC of the Republic of the USSR) was a permanent special body established under the Presidium of the Council of Ministers of the USSR in 1957 to coordinate the activities of the USSR defense industry.

tral apparatus and the Moscow department of the KGB from the famous Moscow parapsychologist Alexander Geyev, who had built this "Sphere" into a homemade device for obtaining unknown "cosmic energy".

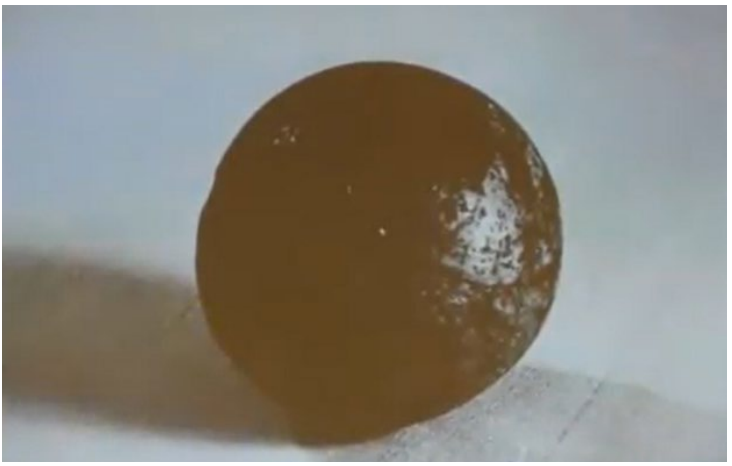

Figure 5. Photo of "Sphere" from the presentation by Yuri Kholodny

KGB officers began to study the "Sphere" in the laboratory and found out that it consisted of dark glass with a high content of strontium and no antimatter. And that could have been the end of it, but the leadership of the military-industrial commission set the task of finding out what kind of object it was and where it came from. Yuri Kholodny was instructed to go on a business trip to western Ukraine where "Sphere" was found. He arrived in the city of Lviv and, thanks to the advice of one of the local operatives of the KGB, turned to the Museum of Ethnography and Handicrafts of the Academy of Sciences of the Ukrainian SSR, where glass expert Faina Petryakov worked. Seeing the fragments of the "Sphere" that Yuri Kholodny brought, she immediately reported that it was a Halo. Halo was an object popular among Ukrainian peasants from the 17th to the 19th centuries, as it was used for ironing fabrics. When put into boiling water, Halo accumulated thermal energy, and could then be rolled into the sleeves to smooth out the Ukrainian *vyshyvanka* embroidered shirts.* Halos were made in the *gutah*: glass workshops, common in the forested areas of Ukraine in the past. The unusual chemical composition of Halo was explained by the fact that it was made from the remains of poor-quality glass. Since the glass-making furnace in the *gutah* worked for several days, sodium as a light element and an integral component of any glass went with good products,

* Vyshyvanka is the name of a folk Ukrainian shirt decorated with ornamented embroidery.

and, gradually burning out in the furnace, its concentration in the alloy decreased. In a similar way, the percentage composition of the heavy element – strontium – that accumulated in the slag formations of the melt increased. According to the materials received during the business trip, Yuri Kholodny prepared a final report for the leadership in Moscow and the case with "Sphere" was closed.

Figure 6. Yuri Kholodny reporting at The End of the 20th Century. russia. From the Experience of Studying Anomalous Phenomena. Siegel Readings. No. 49

As Yuri Kholodny explained in his speech, alluding to the investigation into "Sphere" from Ukraine:

> I want to disappoint you right away that the KGB never had any top-secret laboratory that was engaged in parapsychological research, the development of some kind of weapon, and so on. The main direction of the laboratory's work was the development of lie detection methods. But we read about it in the newspapers, had fun, watched how they imagined us to be big, that we had a real crowd of people there, a lot of equipment. In fact, we were a small group of officers who were still being taken away from their main work, they still had to do this...

According to the information provided by Yuri Kholodny, a very small team was supposed to conduct field research at long distances in the countries that were part of the USSR, while also engaging in scientific methodological and research work, developing devices and measures to counter the polygraph, and as mentioned ear-

lier, in addition to the polygraph, the employees of Laboratory No. 30 were also supposed to study paranormal phenomena. Such a number of tasks and the workload on the laboratory specialists calls into question their effectiveness in any of the above areas.

Based on the available materials, there is no substantial evidence to suggest that KGB officers developed polygraph methods, devices, or technologies that were truly unique or without analogues elsewhere in the world. Even modern russian computer-based polygraphs generally adhere to the standard configuration of sensors, often lack validated computer algorithms for data analysis, and, in some cases, developers have entirely abandoned the use of the cardio cuff.

An analysis of historical data suggests that the current level of expertise among russian security service personnel in the field of polygraphy should be neither overestimated nor underestimated. Following the dissolution of the USSR in 1991, russian specialists gained the opportunity to travel abroad, invite foreign polygraph examiners to russia, and engage in open professional dialogue. These developments undoubtedly contributed to a better understanding of polygraph methodologies originally developed in the United States.

In contrast, the field practice of Ukrainian polygraph examiners has revealed new trends since the onset of russia's full-scale military invasion of Ukraine. Notably, there has been a documented increase in the use of countermeasures during polygraph examinations. These cases often demonstrate a subject's awareness not only of the testing methodology but also of specific techniques employed both prior to and during the examination.

Accordingly, it is imperative for all practitioners to remain vigilant, enhance their ability to detect and prevent countermeasures, and continuously advance their professional qualifications.

References

Alexander Luria, *Wikipedia*, https://en.wikipedia.org/wiki/Alexander_Luria (accessed: 26.05.2025).

Alekseev, L.G. (2016), *History of the 25th and 30th laboratories of the KGB. Courses promotions qualifications.*

Davydov, E.M. & Zharkov, K.S. (1970), *The polygraph and its use by the US special services*. Higher committee's red label school State Security at the Council of Ministers of the USSR named after F.E. Dzerzhinsky, Special Department disciplines 2, Scientific and Publishing Department.

Clip from *The Secret Agent's Blunder* (1968) [in russia: Ошибка Резидента. *Soviet-movies*, 13.05.2011], https://www.youtube.com/watch?v=Ix5UvgN0Js8 (accessed: 26.05.2025).

Kholodny, Y.I. (1994), Mysterious layer in the basements of Lubyanka. *Interesting Newspaper*, (10)14, https://www.sceptik.net/ufo/lubanka.htm (accessed: 26.05.2025).

Kholodny, Y.I. (2015), To the 40th anniversary of polygraph application in russia. *Herald of the Academy of the Investigative Committee of the russian federation*, (4).

Kholodny, Y.I. (2015a), The end of the 20th century. russia. From the experience of studying abnormal phenomena. Zigelevsky Readings, (49) [in russia: Ю. Холодный (КГБ/ФСБ). Из опыта изучения аномальных явлений | 49 Зигелевские чтения. *Музей уфологии*, 25.11.2019], https://youtu.be/-JWAdPNhWTY?t=8 (accessed: 26.05.2025).

Korovin, V.V. (2017), "Secrets of the KGB: Lie detector", *Next Level programme* [in russia: Тайны КГБ: детектор лжи • полковник ФСБ в отставке Валерий Коровин. *Мужские Игрушки*, 20.02.2017], https://www.youtube.com/watch?v=CJ9UWtxoe2w&pp=ygUPI9Cx0LDRgtGO0YjQuNC9 (accessed: 26.05.2025).

Korovin V.V. (2018), Vystuplenie Korovina NSHDL, 30th Laboratory, America. Comments on the performance by A.B. Pelenitsyna at the ECP-12 (2018) [in russia: Выступление Коровина НШДЛ, 30я лаборатория, Америка Средний. *Сергей Поповичев*, 5.12.2018], https://youtu.be/lqfcNng1NCI (accessed: 26.05.2025).

Kuznetsov, V.N. & Petryuk, P.T. (2013), A word about Academic Alexandre Romanovich Luria (on the 110th anniversary of his birth). *Mental Health*, (1), 97–103, [in russia: В.Н. Кузнецов, П.Т. Петрюк, Слово об академике Александре Романовиче Лурии (к 110-летию со дня рождения). *Психічне здоров'я*, 2013, вип. 1, с. 97–103], http://www.psychiatry.ua/articles/paper422.htm (accessed: 26.05.2025).

Luria, A.R. (1932), *The nature of human conflicts – or emotion, conflict, and will: An objective study of disorganization and control of human behaviour*. Liveright Publishers.

Mrakobesie, [in russia: Мракобесие»: почему в СССР отказались от применения детектора лжи. *Русская семерка*, 21.04.2024], https://russian7.ru/post/mrakobesie-pochemu-v-sssr-otkazalis (accessed: 26.05.2025).

NKVD troika. *Wikipedia*, https://en.wikipedia.org/wiki/NKVD_troika (accessed: 26.05.2025).

Ogloblin, S.I. & Molchanov, A.Yu. (2004). *Instrumental detection of lies: Academic course*. Nuance.

Yuri Kholodny, [in russia: А. Корольков, М. Фалалеев, 40 лет назад дали "зеленый свет" применению полиграфа в КГБ СССР. *Редакция «Российской газеты»*, 25.06.2015], https://rg.ru/2015/06/25/holodnij.html (accessed: 26.05.2025).

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Recognition of emotions by analysing facial expressions with FaceReader (Noldus) vs detection of deception by polygraph examination. A pilot study

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Abstract

FaceReader is a software package designed by the Dutch company Noldus (established and managed by Professor Lucas Noldus) for the automatic recognition and analysis of facial expression. The package was described in European Polygraph in 2022 with respect to its potential applicability for the detection of deception (see Widacki et al. 2022: 37–51). This article discusses the results of a pilot study aimed at testing whether the analysis of facial expression can be successfully used for the detection of deception, discovering what emotions are triggered by critical questions in tests during polygraph examinations, and what physiological reactions to these emotions can be observed and recorded in such an examination. The latter

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question is of particular importance for a better understanding of the psychophysiological essence of detection of deception and necessary for refining its methodology, especially with respect to improving the detection of attempts to manipulate or distort the recordings and counteracting them effectively.

This pilot study allowed a number of cautious conclusions to be drawn that nonetheless require further investigation, primarily by testing with a larger sample. It has also allowed us to gain experience that will help improve the protocol for organising such experiments.

Key words: FaceReader, detection of deception, facial expressions, microexpression, emotions

1. Introduction

Polygraph examination, like all instrumental methods for the detection of deception, records physiological changes considered to be correlated with the changes in bodily activity stimulated by the test questions (Widacki, 2018: 427). This observed change in the activity of the human body is not only the result of the emotions triggered by the questions, as believed by Münsterberg (Münsterberg, 1898; Widacki, 2021; Burtt, 1965), and as is often assumed today for the sake of simplification (see: Widacki, 2018: 427). It also results from the subject's cognitive effort of self-control caused by the eagerness to conceal the lie (Widacki, Dukała, 2015; Widacki, 2018, 2021). However, it cannot be ruled out that what we see here is yet another factor, operating in parallel or jointly with the emotion and the aforementioned cognitive effort, that could be the desire to supress some memories or relive them, as well as the cognitive effort of recalling, associating, etc. Thus, both the external (test questions, circumstances of examination) and aforementioned internal factors influence the observed and recorded physiological changes. Together they form the reaction to the test questions that provide the activating stimulus.

At least three fundamental motivation–emotion theories have been developed while attempting to understand the phenomenon of triggering psychophysiological reaction(s) eventually recorded by the polygraph during the examination, by the critical questions in the text (Mitrofan et al., 1992):

1) **Theory of conditioned response**. The theory argues that the physiological response is nothing but the consequence of an emotional activation caused by a conditioned stimulus. When a given stimulus is associated with a strong emotion, a broad response will be expected.

2) **Conflict theory**. According to this theory, both the motivation to lie and the desire to tell the truth are found in the physiological area. The more intensive the conflict, the broader the response.

3) **Theory of punishment**. According this theory, the physiological area during the stimulation is activated by the fear of consequences of potential detection. (Mitrofan et. al., 1992).

Three additional theories were formulated more recently (Lascu, 2021: 37–45):

1) **Theory of presumption of guilt**. The theory argues that the psychophysiological reaction will be highlighted in the relevant question, due to fact that the subject is aware of their guilt.

2) **Focus attention** theory. According this theory, the psycho-physiological response to a stimulus reflects the degree to which the stimulus was expected.

3) **Theory of dichotomisation**. This theory distinguishes two distinct categories of stimuli, namely the relevant and the irrelevant. Subjects who have information about the criminal act for which they are being investigated will focus on only one aspect of the presented stimulus, at the same time ignoring its other aspects that inform the investigator about the degree of the subject's stimulation (Lascu, 2021).

Other theories have also been proposed, for example, the **"analytical theory"** (Scientific Analytic) Theory of Polygraph Testing (Nelson, 2016) which is intended to explain the phenomenon of the psychophysiological reaction to the test questions.

This theory rejects the hypothesis that reactions are caused by fear, anger, sadness, or any other single emotion or any other single psychological process, as well as the hypothesis that emotions with different content can trigger different physiological reactions that are observed and recorded during a polygraph examination.

The experiment we conducted demonstrates that the emotions elicited by the successive questions were individual for every subject. This is aligned with common life experience which shows us that some people may experience a sense of joy by cheating somebody else, but there are also those whose emotions triggered by cheating are different, for example, fear or shame. The reaction depends on many factors, such as personality type, accepted values, as well as a plethora of external circumstances.

Should only the emotional realm be studied in subjects, it has to be remembered that emotions never occur in isolation, in an elemental, static form, but are fragments of a continuous process of interacting with our environment, by receiving, identifying, and reacting to external stimuli (Cannon, 1932: 227; Łosiak, 2007: 25 and ff). Moreover, being elements of a continuous process, some emotions may transform into others, superimpose themselves, etc. The rate of these transitions depends both on the rate of change of the stimuli, or solely on their intensity, and also quite likely also on the type of personality (degree of emotional lability), and the current psychophysiological condition of the subject, among other factors. Moreover, individual emotions may also enter into various interactions, which is why the so-called "primary emotions" listed by multiple authors are more of a theoretical construct than actual entities (see: Scherer, 2005, 2012).

For practical purposes, i.e. the detection of deception, the reasons for the physiological reaction triggered by a test question and subsequently recorded by the polygraph during examination remain largely irrelevant (Nelson, 2016). It is enough that – with the risk of an error rate not exceeding that in the majority of identification methods used routinely for investigative purposes (and later accepted as evidence in court) – this method allows a lie to be detected (Widacki, 1977; Widacki & Horvath, 1978), i.e. to determine whether the subject answers the critical questions in the test truthfully or deceptively. Deception is considered to cover both deliberate lies and concealing the fact of having some information. The effectiveness of such a method for detecting deception has been supported by over a century of practical application and numerous experimental studies (Widacki, 1977).

However, it makes sense to understand more deeply the mechanism of the psychophysiological detection of deception, i.e. to identify what actual reactions are triggered by the question in the polygraph test, or, in other words, what is correlated with the physiological reaction recorded during a polygraph examination. Besides the purely cognitive, the reasons are also scientific and practical, for the study can help discover mechanisms of deliberate interference with the recordings, as well as contribute to the discovery and counteracting of such attempts. It can also be useful for conducting the pre-test interview and thus contribute both to enhancing the psychophysiological techniques of detecting deception and interpreting its recordings.

As mentioned above, all that a polygraph recording reflects is the intensity of stimulation caused by a test question. It provides no information about the other two components of emotional state (level of body/bodily activation): namely, the valence or the content of the arousal.

The content of stimulation (the quality of the emotion experienced) is what the subject is actually experiencing and what psychologists usually boil down to the primary emotions of happiness, anger, fear, surprise, sadness, disdain, disgust, interest, revulsion, and shame (Ekman, Friesen, 1978; Hjortsjö, 1970; Tomkins 1999, 2008; Izard, 1977, 1994; Izard, Rosen, 1998).

It is generally accepted (see above) that the content of responses stimulated by test questions during a polygraph examination are primarily (though not solely!) fear (or anxiety) of the negative consequences of detecting a lie, the "subject's cognitive effort of self-control during examination", and possibly also other factors (see above) (Widacki, Dukała, 2015; Widacki, 2021: 58).

Other physiological correlates of the general activation level of the body, of which only some are recorded by a classical polygraph, include expressive behaviours such as pantomimic and expressive facial movements. These have been excessively discussed in the literature (Woodworth, Schlosberg, 1966).

In the light of current scientific understanding, which validates many centuries of common-sense observations, it is beyond any doubt that the expressive movements of the face (facial expressions) are correlated with experiences (emotions). So by watching the facial expressions, it is possible to draw conclusions about the experiences of the person whose facial expressions are being observed, particularly the emotions they are currently experiencing.

FaceReader from Noldus (see: Widacki, Wójcik, Szuba-Boroń, 2022) is a software package for the automatic recognition and analysis of facial expression, particularly of the six primary emotions: happiness, sadness, anger, surprise, fear, and disgust. In addition, the software includes "neutral emotions" (Widacki, Wójcik, Szuba-Boroń, 2022).

2. The goal of the experiment

The experiment was intended to provide information about the emotional content underlying the subjects' reactions during a polygraph examination aimed at lie detection. Is it obviously the fear (anxiety) of the negative consequences of the detection of the lie, as is usually assumed – next to the incontrovertible cognitive effort of the subject concerning self-control during the examination (see above) – or perhaps another emotion?

Another goal of the experiment was to test whether Noldus's FaceReader, a system for the analysis of facial expressions (including what is known as micro-expressions) (Ekman, Friesen, 1978) allows lies to be detected (hidden information) at a level not inferior to that of a classical polygraph examination. If this were to be the case, we would be dealing with another method of instrumental lie detection, all the more useful as it does not require sensors to be attached to the subject and therefore theoretically allows remote tests to be conducted, even without the subject's consent or awareness.

3. The Study Group

The study group consisted of six female postgraduate students in the fields of criminology, social rehabilitation, and public administration, all of whom volunteered to take part in the research. The participants' ages ranged from 20 to 40 (average: 26.6). None of the participants reported any health-related complaints on the day of the study. According to their own declarations, none had ever sought the assistance of a psychologist or psychiatrist.

They were initially informed that the experiment would involve an attempt to detect deception using two independent methods: one being a classic polygraph examination, the other – analysis of facial expression captured on video and evaluated by the FaceReader software developed by Noldus.

All participants declared that they had heard of polygraph examinations (lie detection), but had no knowledge of the procedure, even at the basic, textbook level.

All subjects reported experiencing stress related to their participation in the experiment, which they attributed to curiosity and excitement about the study itself, their participation in it, and anticipation of the result. Asked to rate this stress on a scale from 1 to 10, their responses ranged from 3 to 10 (average: 6.33). They were

also asked to assess their self-perceived ability to conceal their lies, in particular by controlling their facial expressions. This too was rated on a 1–10 scale, and the participants rated their ability between 5 and 9 (average: 7.5). Thus, they believed that they were, on the whole, successful in managing their facial cues and masking deception. The participants' self-assessment results are presented in Table 1.1.

Table 1.1

Subject ID	Stress self-assessment	Self-assessment of the ability to conceal lies by managing facial cues
KSW0617A1	5	6
KSW0617A2	3	5
KSW0618A3	6	9
KSW0618A4	10	9
KSW0624A5	5	8
KSW0624A6	8	8

Source: own materials.

4. Organisation of the Experiment

Each subject was interviewed individually. During this pre-test conversation, she was told whether she would play the role of a "guilty" or an "innocent" subject in the experiment. Two subjects were assigned the role of the "guilty" and four were assigned the role of "innocent" individuals.

The "guilty" subject was instructed to go to the library, locate a damaged book on a designated shelf, and retrieve three banknotes hidden between its pages: one PLN 50 note, one PLN 20 note, and one PLN 10 note, totalling PLN 80 (approx. USD 20). She was to look for and page through the book and extract the money discreetly, making sure no one else saw her doing this. The banknotes were to be taken and concealed on her person, while the book was to be returned to the shelf without drawing attention. She was to deny any involvement during the examination. She was instructed to claim she knew nothing about any money, was unaware of how much there was, or where exactly it had been hidden. She was also informed that if her deception was not detected during the polygraph examination, she would be allowed to keep the PLN 80. If it was detected, she would have to return the money.

The "innocent" subjects were informed that this was the role they had been assigned for the purposes of the experiment. During the examination, they were to answer all questions truthfully. They were given no information about the particulars of the experiment, in particular, they did not know who had been assigned the "guilty" role, where the "guilty" individual was supposed to take the book with the banknotes from, what the banknotes were, or their denominations.

This setup was designed to recreate a situation emotionally and motivationally analogous to that experienced by subjects in real-life investigative contexts.

The examinations were conducted in a professional polygraph laboratory using a Lafayette LX-5000 computerised polygraph and a Logitech HD 1080 camera.

They were conducted by two experts: a professional polygraph examiner (a certified member of the American Polygraph Association) and a licensed psychologist and psychotherapist. Neither examiner knew which role had been assigned to which subject, so they did not know which subject was playing the role of "guilty" or "innocent".

Peak of Tension (POT) tests were selected for the examination, based on the assumption that Control Question Techniques (CQT) are of limited utility in experimental conditions. In such settings, it is extremely difficult to construct a control question whose gravity (emotional significance) would not exceed that of the relevant question.

Each subject had administered stimulation tests of the "concealed number" and "mother's name" (Widacki, 1981: 67–68) type administered, followed by diagnostic POT tests concerning the book and the money. Some diagnostic tests were repeated in some cases. A total of 54 tests were conducted, each containing one relevant question.

Each of the six subjects underwent the same four stimulation tests ("number" and "mother's name") and POT (Peak of Tension) type diagnostic tests concerning the recorded number (7 questions), the subject's mother's name (8 questions) (e.g. Karolina; Natalia; Patrycja; Iza; Kamila; Barbara), the location of the hidden money (6 questions), and the value of money hidden (6 questions). The latter were repeated in some cases. Each of the tests included a single "relevant question". In total, the subjects were asked 347 questions, including 54 relevant

questions. In the stimulation tests, the relevant item was the subject's mother's name, which she attempted to conceal from the examiner. In the number test, the subject selected a number in secret, without the examiner's knowledge. In the tests concerning the location and amount of the hidden money, the relevant question was question number 4 or 5. The "guilty" subjects had previously been instructed to lie when answering that question.

5. Results

The results obtained by each subject are presented in the tables below, which include the intensity of responses to the relevant question in each subtest and the final conclusion of the polygraph examination based on the overall test result.

The examinations are incomplete in some tables (with only two tests present instead of three). This was caused by technical issues related to the high processing power required by the FaceReader software, which in some cases failed to save recordings due to errors.

Table 2.1 Results of the polygraph and FaceReader analysis for subject KSW0617A1

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
1	1			0.15		0.02	0.01		0.13	
	2			0.09		0.24	0.06		0.15	
	3			0.15		0.2	0.06		0.05	
	4			0.42		0.18	0.08		0.05	
	5			0.09		0.11	0.08		0.1	
	6			0.4		0.12	0.05		0.13	
	7			0.14		0.14	0.05		0.05	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
2	1					0.15				
	2					0.18				
	3					0.15				
	4					0.11				
	5				0.02	0.18	0.01			
	6					0.11				
	7					0.11				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
3	1				0.01	0.16				
	2			0.03		0.2				
	3				0.01	0.15				
	4				0.01	0.2				
	5				0.01	0.2				
	6			0.5	0.01	0.2	0.01	0.02	0.01	
	7				0.01	0.2	0.01		0.02	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
1	1			0.09	0.05					Question 5 (Karolina)
	2			0.4						
	3			0.26						
	4			0.4						
	5			0.47						
	6			0.2	0.05					
	7			0.05	0.04	0.11	0.04			
	8			0.04	0.04	0.1	0.03			

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
2	1				0.03	0.1	0.01			
	2			0.01	0.01	0.06	0.01			
	3			0.15	0.05	0.04				
	4			0.02	0.05	0.05				
	5			0.03	0.05	0.1				
	6				0.03	0.03				
	7				0.08	0.03				
	8				0.02	0.05				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
1	1				0.09	0.11				
	2				0.05	0.01	0.01			
	3				0.05	0.06				
	4				0.03	0.08	0.01			
	5				0.07	0.06				
	6				0.05	0.11				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
2	1				0.01	0.17	0.01			
	2			0.25		0.28	0.01			
	3			0.2		0.06			0.02	Question 4 (book)
	4				0.02	0.15				
	5					0.23				
	6					0.2				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
3	1				0.01	0.1	0.01			
	2				0.01	0.03				
	3					0.18	0.03			
	4					0.18	0.01			
	5					0.11				
	6					0.1				

Source: own materials.

In the first case (Table 2.1), the polygrapher correctly identified the number selected by the subject but incorrectly identified the subject's mother's name and wrongly assessed her knowledge regarding the location of the hidden sum of money, concluding that she possessed such knowledge, when in fact she was an "innocent" person. The subsequent test concerning the amount of hidden money could not be recorded in the FaceReader software due to technical issues and was therefore not conducted.

Table 2.2. Results of the polygraph and FaceReader analysis for subject KSW0617A2

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
1	1					0.1	0.01			
	2		0.02			0.04	0.02		0.07	
	3					0.18	0.02		0.06	
	4					0.13	0.01			
	5					0.3	0.01			
	6					0.11				
	7					0.28	0.01			
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
2	1					0.23				
	2					0.23			0.01	
	3					0.24				
	4					0.25				Question 5 (number 5)
	5					0.25				
	6					0.24				
	7					0.23				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
3	1					0.21				
	2					0.23	0.01			
	3					0.23	0.01			
	4					0.23				
	5					0.2				
	6					0.24	0.01			
	7					0.2	0.01			

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
4	1					0.17			0.08	
	2					0.14			0.04	
	3					0.15			0.12	
	4					0.15				
	5					0.2				
	6					0.15				
	7					0.14				
	8					0.14				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
5	1					0.25				
	2					0.18				
	3					0.13				
	4					0.2				
	5					0.19				
	6		0.8					0.59		
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
6	1					0.25				
	2					0.2				
	3					0.2				
	4					0.2				
	5					0.26				
	6			0.18		0.23				
	7					0.2				
	8					0.23				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
7	1					0.15				
	2					0.22				
	3					0.21				
	4					0.22				
	5					0.22				
	6					0.18				

Question 4 (Natalia)

Question 4 book

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
8	1					0.19				
	2					0.2				
	3			0.18		0.2				
	4					0.22				
	5					0.2				
	6					0.19				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
9	1					0.2				
	2					0.18				
	3					0.11				
	4					0.2				
	5					0.19				
	6					0.15				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
10	1					0.18				no indication
	2					0.21				
	3					0.19				
	4					0.2				
	5					0.16				
	6					0.23				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
11	1					0.15	0.02			
	2					0.21	0.01			
	3					0.2	0.01			
	4					0.16	0.01			
	5					0.14	0.01			
	6					0.16	0.01			
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
12	1			0.07		0.2				
	2					0.15				
	3			0.19		0.16				
	4			0.42		0.16				
	5					0.16				
	6					0.2				

Source: own materials.

In the second case (Table 2.2), the polygrapher correctly identified the number in the concealed number test, correctly identified the subject's mother's name, and, in the tests concerning taking money from the book and the amount of money taken, did not detect any knowledge of the critical event so he classified the subject as "innocent".

Table 2.3 Results of the polygraph and FaceReader analysis for subject KSW0618A3

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
1	1				0.01	0.4	0.09			
	2					0.31	0.09			
	3					0.51	0.09			
	4					0.6	0.13			
	5					0.45	0.09			
	6					0.7	0.22			
	7					0.7	0.24			
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
2	1					0.12			0.32	Question 5
	2					0.13			0.33	
	3					0.15			0.05	
	4					0.19			0.5	
	5					0.15			0.15	
	6					0.18			0.35	
	7					0.19			0.25	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
3	1					0.24			0.5	
	2					0.22			0.39	
	3					0.23			0.73	
	4					0.21			0.98	
	5					0.39			0.03	
	6					0.24			0.28	
	7					0.3			0.26	

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
4	1		0.05			0.04			0.34	
	2		0.01			0.1			0.2	
	3					0.13			0.2	
	4					0.21			0.12	
	5					0.1			0.15	
	6					0.16			0.1	
	7					0.2			0.08	
	8					0.27			0.1	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	Question 6 (PATRYCJA)
5	1		0.01			0.16			0.15	
	2					0.23			0.1	
	3			0.1		0.3			0.7	
	4					0.25			0.72	
	5					0.2			0.32	
	6					0.26			0.28	
	7					0.25			0.71	
						0.24			0.7	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
6	1		0.02			0.03			0.27	
	2		0.01			0.12			0.21	
	3					0.21			0.19	
	4		0.01			0.22	0.01		0.2	
	5					0.24			0.2	
	6					0.24			0.17	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	Question 4 (book)
7	1					0.24			0.13	
	2					0.28			0.1	
	3					0.26			0.13	
	4					0.27			0.08	
	5			0.12		0.25			0.78	
	6					0.2			0.82	

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
8	1					0.15	0.01		0.24	
	2		0.01			0.02			0.25	
	3					0.15	0.01		0.2	
	4					0.21	0.01		0.1	
	5					0.22			0.1	
	6					0.16			0.16	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
9	1		0.02			0.16			0.25	Question 3 (PLN80)
	2					0.22			0.8	
	3					0.25			0.45	
	4					0.27			0.3	
	5					0.3			0.56	
	6					0.25			0.5	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
10	1		0.05			0.22			0.2	
	2					0.25			0.08	
	3					0.26			0.04	
	4					0.27			0.08	
	5					0.28			0.09	
	6					0.3			0.09	

Source: own materials.

In the third case (Table 2.3), the polygrapher correctly identified the number selected by the subject in the concealed number test, correctly identified the mother's name, and, in the tests concerning taking money from the book and the amount taken, correctly determined the subject's knowledge of the act and therefore classified her as "guilty".

Table 2.4. Results of the polygraph and FaceReader analysis for subject KSW0618A4

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
1	1					0.11	0.02			
	2					0.22	0.08			
	3					0.1	0.01			
	4					0.11	0.03			
	5					0.04	0.01			
	6			0.15		0.1	0.03			
	7			0.2		0.09	0.083			
	8					0.2	0.03			Question 5 (IZA)
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
2	1					0.23	0.05			
	2			0.02		0.15	0.05			
	3			0.15		0.15	0.07			
	4			0.23		0.08	0.1			
	5			0.1		0.19	0.06			
	6			0.25		0.15	0.02			
	7			0.09		0.15	0.05			
	8			0.06		0.11	0.04			
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
3	1			0.01		0.18	0.05			
	2			0.09		0.11	0.03			
	3			0.11		0.22	0.04			
	4			0.01		0.11	0.04			
	5			0.07		0.08	0.03			
	6			0.09		0.08	0.01			
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	no indication
4	1					0.09				
	2					0.18	0.02			
	3			0.08		0.07	0.01			
	4			0.13		0.04	0.01			
	5			0.09		0.04	0.02			
	6			0.23		0.01	0.01			

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
5	1			0.02		0.13	0.01			
	2					0.1	0.05			
	3			0.1		0.1	0.01			
	4			0.2		0.05				
	5			0.2		0.1	0.03			
	6			0.05		0.05	0.01			
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	no indication
6	1			0.01		0.1	0.01			
	2			0.02		0.08	0.01			
	3			0.2		0.11				
	4			0.2		0.05				
	5			0.08		0.02				
	6			0.09		0.01				

Source: own materials.

In the fourth case (Table 2.4), the polygrapher correctly identified the mother's name and in the tests concerning taking money from the book and the amount taken, correctly found no indication of the subject's knowledge of the act and therefore classified her as "innocent".

Table 2.5. Results of the polygraph and FaceReader analysis for subject KSW0618A5

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
1	1					0.02			0.05	
	2					0.01			0.15	
	3					0.01			0.09	
	4		0.67			0.2	0.17			Question 4 (KAMILA)
	5					0.01			0.11	
	6					0.08			0.6	
	7					0.02			0.35	

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
2	1		0.22			0.2	0.02		0.1	
	2					0.25			0.7	
	3					0.27			0.4	
	4					0.25	0.02		0.09	
	5					0.3	0.01		0.09	
	6					0.2			0.55	
	7					0.22			0.35	Question 4 (KAMILA)
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
3	1					0.2			0.25	
	2			0.05		0.05	0.01		0.05	
	3					0.17			0.07	
	4					0.26	0.02			
	5					0.18	0.01		0.01	
	6					0.2			0.02	
	7					0.21			0.18	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
4	1					0.19	0.03			no indication
	2					0.16	0.02			
	3			0.02		0.15	0.01			
	4			0.01		0.22	0.01			
	5					0.23			0.03	
	6					0.22			0.1	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
5	1					0.25			0.2	
	2					0.2			0.05	
	3					0.17			0.15	
	4					0.11			0.12	
	5					0.29			0.01	
	6					0.22			0.11	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
6	1					0.55			0.02	
	2					0.25			0.01	
	3					0.2			0.01	
	4					0.28			0.01	
	5					0.25			0.01	
	6					0.23			0.01	

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
7	1					0.23			0.6	no indication
	2					0.27			0.03	
	3					0.28			0.02	
	4					0.21			0.04	
	5					0.25			0.12	
	6					0.22			0.03	
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
8	1					0.25			0.02	
	2					0.2			0.01	
	3					0.18				
	4					0.23				
	5					0.28				
	6					0.09				

Source: own materials.

In the fifth case (Table 2.5), the polygrapher correctly identified the mother's name and, in the tests concerning taking money from the book and the amount taken, did not detect any such knowledge on the part of the subject so correctly classified her as "innocent".

Table 2.6. Results of the polygraph and FaceReader analysis for subject KSW0618A6

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
1	1					0.01			0.08	Question 4
	2					0.02				
	3					0.01				
	4			0.01		0.01				
	5					0.12				
	6					0.09				
	7					0.05				

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
2	1					0.2				
	2			0.01		0.15				
	3					0.2				
	4					0.22				
	5					0.27				
	6			0.01		0.15				
	7					0.21				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	Question 4
3	1					0.27				
	2					0.29	0.01			
	3					0.28				
	4					0.3				
	5					0.28				
	6					0.33				
	7					0.4				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
4	1					0.22				
	2			0.08		0.24	0.01		0.21	
	3					0.25				
	4					0.25				
	5					0.37				
	6					0.25				
	7					0.28				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	Question 5 (BARBARA)
5	1					0.25				
	2					0.22				
	3					0.3				
	4					0.23				
	5					0.28				
	6					0.25	0.01			
	7					0.29				

Test No.	Identified Emotions and Corresponding Numerical Values									Conclusion of the polygraph examination
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
6	1					0.16				Question 4 (book)
	2			0.01		0.25				
	3			0.05		0.23				
	4					0.19				
	5					0.25				
	6					0.55				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
7	1					0.22				
	2					0.16	0.01			
	3					0.24				
	4					0.23				
	5					0.25				
	6			0.05		0.27				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
8	1					0.3				Question 3 (PLN80)
	2					0.3				
	3					0.35	0.01			
	4			0.01		0.34	0.01			
	5					0.2				
	6					0.28				
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
9	1			0.1		0.2				
	2					0.1				
	3			0.01		0.23				
	4			0.01		0.18				
	5			0.15		0.25	0.03			
	6			0.01		0.1	0.01			
	QUESTION	NEUTRAL	HAPPY	SAD	ANGRY	SURPRISED	SCARED	DISGUSTED	CONTEMPT	
10	1			0.01		0.25				
	2			0.05		0.18				
	3			0.02		0.2				
	4			0.05		0.2				
	5			0.01		0.2				
	6					0.25				

Source: own materials.

In the sixth case (Table 2.6), the polygrapher correctly identified the number in the concealed number test, correctly identified the mother's name, and, in the tests concerning taking money from the book and the amount taken, correctly determined the subject's knowledge of the act, and consequently classified her as "guilty".

In five cases, the polygraph examination correctly classified the subjects as either "guilty" or "innocent"; in one case it incorrectly identified an "innocent" subject as "guilty". So, the accuracy of the polygraph results obtained in this experiment – 83.3% – corresponds to the typical accuracy rates observed in experimental polygraph studies and was therefore consistent with expectations.

6. Discussion of Results

It should be noted that the polygraph examination in this study only served as support for Noldus FaceReader. The starting assumption was that polygraph examination has an established diagnostic value and follows a rigorous methodology. The goal of the experiment was to compare the results of the polygraph examination with those obtained via the FaceReader software. The FaceReader examinations were conducted in an identical manner to that used in polygraph examinations, the sole difference being that Noldus FaceReader evaluated only facial expressions.

Following the software instructions, we measured the intensity of basic emotions predefined by the system: neutral, happy, sad, angry, surprised, scared, disgusted, and contemptuous. The intensity of a given emotion was defined by the amplitude of the curve generated by the software from the moment the question (stimulus) was asked to the moment the subject responded. The values representing the amplitude have been rounded to 0.01 in the tables presented above.

Regardless of the question type (number, mother's name, location of the hidden money or its value) all subjects – both "guilty" and "innocent" – demonstrated a consistent increase in the channel that FaceReader defines as "surprised" throughout the test. This was the only emotional response demonstrated by all subjects. The second most frequent emotion was fear ("scared"), which appeared when responding to certain stimuli. The third was "sadness", which was present in a handful of cases. There were no confirmed cases of the subjects exhibiting "disgusted" or "happy" emotions in response to any of the relevant questions.

Other emotional reactions appeared sporadically, in response to irrelevant questions.

An interesting case arose while examining the first subject, who was the only one to display emotional responses categorised as "anger" in response to questions. This was also the only case in which the polygrapher delivered incorrect results in nearly all the tests. Despite all the efforts taken, including an additional introspective interview with the subject, the reasons for these atypical reactions could not be determined.

Nor could any significant differences be observed, whether in type or intensity, between the emotional reactions of the subjects who concealed their guilt ("guilty") and those who were uninvolved ("innocent").

7. Conclusions

Based on this experiment, it can be concluded that the emotional response to the critical questions asked during the polygraph examination most frequently detected and recorded by the FaceReader software, was that of surprise. This emotion was elicited in every subject, in every test, and in nearly every question with the exception of the first "name" test performed by subject KSW0617A1. The second emotion that FaceReader most frequently recorded was fear ("scared"), which was observed in 28 of the 54 tests. The third emotion, still significant in terms of occurrence, was "sadness", which was recorded in 27 of the 54 tests conducted.

However, in most cases, the peak intensity of emotional response was recorded for questions situated midway through the test. In the name test, for example, three of the names placed in the middle of the test sequence – one correct, and two incorrect – were those entered by the subject.

The basic emotions identified by the FaceReader software in response to critical questions are summarised in the table below:

Indicated primary emotion	Total number of questions	Percentage (%)
Surprise	53	98%
Sadness	27	50%
Fear	28	52%
Happiness	2	3,7 %

(Where 100% = 54 questions)

It follows that in a laboratory setting, the strongest and most frequent basic emotion triggered by a critical question is surprise. However, this emotion does not typically appear in isolation, but rather in conjunction with other basic emotions, most notably fear (scared) and sadness (sad). In principle no other basic emotions occur in this context. Happiness was recorded in response to only two critical questions (3.7%) and occasionally appeared in reactions to irrelevant questions.

It cannot be ruled out that the cognitive process and the examination itself, which were a truth/lie-verification procedure, trigger only these "negative emotions".

Based on the results from FaceReader, which analyses facial expressions and identifies the corresponding emotional states, our study did not manage to distinguish between truthful and deceptive subjects. Their responses demonstrated no differences in the quality (type) or intensity (intensity) of emotion. The polygraph examination operating under the same experimental conditions succeeded in differentiating between liars and truth-tellers, yielding a diagnostic accuracy rate of 83.5%.

Assuming that FaceReader reliably identifies emotions based on its analysis of facial expressions, a number of preliminary and cautious conclusions may be drawn.

Above all, it appears that the emotional response experienced by a subject of a polygraph test triggered by the perception of and response to a critical question cannot be reduced to any single basic emotion (such as sadness, happiness, anger, surprise, fear, disgust, or contempt) or to a simple combination of two such emotions. Theoretically, a more far-reaching conclusion is also possible, namely that the emotion experienced is not, in fact, the crucial component of the subject's physiological reaction to test questions in a polygraph examination, and that other –less commonly appreciated – elements play a decisive role, such as the subject's cognitive effort related to self-control, mental associations, and memories.

This hypothesis, however, requires further research, certainly involving a significantly larger sample size.

References

Burtt, H.E. (1965), *Psychologia stosowana*, Warszawa: PWN.

Cannon, W. (1932), *The wisdom of the body*, Northon & Comp. Inc.

Ekman, P. & Friesen, W.V. (1978), *Facial Action Coding System: A Technique for the Measurement of Facial Movement*. Consulting Psychologists Press, Palo Alto, CA.

Hjortsjö, C.-H. (1970), *Man's Face and Mimic Language*, translated by W.F. Salisbury. Lund, Sweden: Studentlitteratur.

Izard, C.D. & Rosen, J.B. (1998), Brain system, emotions and psychology. Contemporary, *Psychology: A Journal of Reviews*, *43*, 101–103.

Izard, C.E. (1977), *Human Emotions*. New York: Plenum Press.

Izard, C.E. (1994), Innate and universal facial expressions: Evidence from developmental and cross-cultural research, *Psychological Bulletin*, *115*, 2, 288–299.

Lascu, L.A. (2021), The polygraph examination from legal perspective, *International Journal of Juridical Sciences*, *15*, 2, https://doi.org/10.15837/aijjs.v15i2.4656.

Łosiak, W. (2007), *Psychologia emocji*, Warszawa: Wydawnictwa Akademickie i Profesjonalne.

Mitrofan, N., Zdrenghea, V. & Butoi, T. (1992), *Legal psychology*, Bucuresti: Publishing House Sansa.

Münsterberg, (1898), *On the witness stand*.

Nelson, R. (2016), Scientific (Analytic) Theory of Polygraph Testing, *APA Magazine*, *49* (5), 69–82.

Scherer, K.R. (2005), What are emotions? And how cant hey measured? *Social Sciences Information*, *44*, 4, 695–729.

Scherer, K.R. (1994), Emotions serves to decouple stimulus and response, in: Ekman P. & Davidson R. (eds.), *The nature of emotion: Fundamentals questions*, New York–Oxford: Oxford University Press, pp. 127–130.

Tomkins, S.S. (1999), *Communicating emotions*, Cambridge–London: Cambridge University Press.

Tomkins, S.S. (2008), *Affect imagery consciousness*, Springer Publ. Comp.

Widacki, J. & Horvath, F. (1978), An experimental investigation of the relative validity and utility of the polygraph technique and three other common methods of criminal identification, *Journal of Forensic Sciences*, *23*, 3, 596–601.

Widacki, J. (1977), *Wartość diagostyczna badania poligraficznego i jej znaczenie kryminalistyczne*, Kraków: Wyd. UJ.

Widacki, J. (1981), *Wprowadzenie do badań poligraficznych*, Warszawa: Wydawnictwo MSW, pp. 67–68.

Widacki, J. (2018), *Identyfikacja przez badanie tzw. śladów emocjonalnych* [in] *Kryminalistyka*, J. Widacki (ed.) 4th edition, Warszawa: C.H. Beck.

Widacki J. (2021), *History of Polygraph Examination*, Warszawa: Polskie Towarzystwo Kryminalistyczne.

Widacki, J. & Dukała, K. (2015), Lie detection – of what?, *Problemy kryminalistyki*, *287*, 1, 61–74.

Widacki, J., Wójcik, B. & Szuba-Boroń, A. (2022), Attempt at Detection of Deception Based on Records of Physiological Reactions Remotely Captured with FaceReader Software. Part 1, *European Polygraph*, *16*, 2(56), 37–51.

Woodworth, R.S. & Schlosberg, H. (1966), *Psychologia eksperymentalna*, vol. I, 2nd Polish edition, Warszawa: PWN.

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You really don't recognise him? The eye-tracker as a forensic tool for concealed knowledge detection

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Abstract

The Concealed Information Test (CIT), a well-established tool in forensic investigations, has thus far been utilised to measure autonomic nervous system (ANS) changes associated with concealed information. While previous studies have explored the integration of eye-tracking technology in face recognition, the specific application of CIT within a mock crime scenario remains relatively uncharted territory. In this study, we aim to broaden the scope of eye-tracking applications using a mock crime scenario, as well as a machine learning classification method to detect hidden crime-related information.

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Of the four faces displayed as stimuli, the 'guilty' group volunteers in the test were able to recognise one as they had previously seen it in the context of the mock crime, whereas the 'innocent' group volunteers were all unfamiliar with all four faces. We chose heatmaps depicting the fixation count and fixation durations as the input data for classification. The results obtained with features extracted using ResNet50 and the Support Vector Machine algorithm yielded promising outcomes, achieving an accuracy level of 84.62% for heat maps created using fixation count. These findings suggest the potential development of an innovative tool capable of objectively determining whether an examined person recognises individuals presented in photos, even when denying familiarity with those individuals. The integration of eye-tracking technology and machine learning holds promise for enhancing the accuracy and efficacy of concealed information detection in forensic contexts.

Key words: Concealed Information Test, eye-tracker

Introduction

The detection of concealed crime knowledge in the forensic field can be carried out using a polygraph which measures Autonomic Nervous System (ANS) responses (e.g., changes in breathing, electrodermal, and cardiovascular activity) during the Concealed Information Test (CIT). This method allows for detection of hidden knowledge by measuring responses to stimuli of different meanings. According to CIT theory, only knowledgeable individuals react differently to crime-related items called relevant stimuli (e.g., a stolen ring) presented together with unfamiliar items (e.g., other pieces of jewellery). These temporal changes in physiological reactivity to relevant items reflect the psychological cognitive process of orienting response, caused by the guilty person's attention shifting to the significant items they recognise from committing the crime (Klein Selle, 2022). Additionally, the intention to conceal crime knowledge is associated with an inhibition process involving the examinee's attempt to control their own behaviour (Klein Selle, 2018). Through CIT research, it has been determined that a knowledgeable examinee shows both arousal in electrodermal activity in response to relevant item, and a decrease in heartbeat and breathing rates.

Based on a well-established theoretical foundation, the CIT paradigm offers a framework for detecting crime-related memories using other tools, such as an eye-tracker, which appears to overcome several shortcomings of the polygraph. One of these issues concerns the vulnerability of ANS measures to countermeasures, which can reduce the identification rate of guilty subjects from 80% to 40% when mental countermeasures are used, and down to 10% when physical countermeasures are applied (Honts, 1996).

Current research has shown that eye-tracking, when applied to uncover hidden memories, is a useful method that is resistant to countermeasures (Lancry-Dayan, 2018). Additionally, the incorporation of eye-tracking into the CIT procedure creates the possibility of a fully automatic, contactless memory detection test based on specific gaze behaviour patterns. Considering that such solutions are currently unavailable commercially, the development of this highly effective forensic tool could represent a breakthrough discovery, significantly supporting the daily work of the police or border guard authorities.

To investigate this idea we examined the usefulness of heat maps—one of the eye-tracking data visualisation tools—and a simple machine learning algorithm to detect concealed information by classifying gaze patterns presented in the form of heat maps.

Whereas most studies (Delmas, 2023) using eye-trackers and the CIT focus solely on tasks related to remembering stimuli (e.g., photos, cards, or objects, without the direct involvement of participants in activities resembling those that are penalised), our data were recorded during an experimental design based on a mock theft scenario. The selected experimental design was intended to increase the ecological validity of the study, so, to date, we are among the few researchers who have used an eye-tracker with the CIT in a mock crime scenario.

Related work

An eye tracker can be used in three ways in forensic credibility assessment: during interrogation (Speth, 2021), in the analysis of eye movement during reading activity, or in tests based on recognition of familiar information. The second approach, which is already commercially available, can achieve an accuracy of over 80% (Kircher, 2016).

The latter still requires extensive research to simplify the procedure while achieving high effectiveness. In recent years, several studies that examined the relationship between stimuli recognition and oculomotor features have provided useful to developing the effective CIT protocol. The most important findings showed that:

– eye movements and the human memory system are strongly related (eyes move not only to receive sensory visual information, but also to bring to mind information stored in the memory) (Brockmole, 2005);

- gaze behaviour changes significantly when individuals follow different tasks (Yarbus, 1967);
- gaze is directed towards personally meaningful information (during free viewing of familiar and unfamiliar items, visual attention is directed towards the familiar ones) (Ryan, 2007);
- gaze can be modified to support the observer's goal (Welchman, 2003).

Furthermore, the results of eye-tracking face recognition research seem particularly interesting when considering their implementation in the security field to identify concealed criminal associations. Eye-tracking studies have demonstrated that it is possible to detect recognition of familiar faces, such as criminal associates, when individuals attempt to deny knowing them (fewer fixations and longer fixation durations during face viewing) (Millen, 2019).

It is already known that the face is a particular stimulus analysed and remembered in a certain way depending on the time of face presentation (Iskra, 2016). Additionally, face perception may involve different cognitive processes compared to object or scene perception. When viewing face images, longer fixation durations were recorded than when viewing other types of image content (e.g., a nature scene) (Guo, 2005). Facial features such as the eyes, nose, and mouth provide important information for face recognition.

Further studies have shown that various conditions in CIT experiments with face stimuli elicited different changes in gaze behaviour. The concealed knowledge of familiar faces during free viewing in the experiment with the visual detection task (Nahari, 2019) and the recognition task (Schwedes, 2011) caused the participants to preferentially direct their gaze toward known faces. The analysis indicated an increase in the number of fixations, visits, and the average duration of fixation (Otsuka, 2019). However, when participants took part in a short-term memory task (STM-CIT) (Lancry-Dayan, 2018), which required prior encoding of faces, their gaze towards known faces showed only a brief preference. Subsequently, they stopped focusing on the known stimuli.

These studies deserve particular attention, as in ocular-based CIT involving the simultaneous presentation of crime-related and crime-unrelated items, the location-by-location dynamics of the examinee's visual attention can be monitored (Schwedes, 2011). Moreover, the STM-CIT paradigm is resistant to countermeas-

ures—which is supposed to reflect the interplay between task demands and the ability to voluntarily control gaze behaviour—and also leads to the maximisation of differences between responses to relevant and irrelevant items.

Contrary to the modest accuracy of the classic version of CIT with sequential presentation of stimuli (above 63%), the average efficiency of memory detection in STM-CIT with simultaneous stimuli presentation is 89% (Lancry-Dayan, 2018). It is worth emphasising that multiple-stimuli display in CIT is an interesting solution, made possible only through eye-tracker measurement.

Materials and Methods

This research study received approval from the ethics committee at AGH University of Kraków. Before giving their consent to participate in the study, each participant was briefed on the research procedure. The research sample consisted of 39 volunteers, most of whom were AGH students and employees. Participants' ages ranged from 19 to 60 years (M = 28.05, SD = 9.5) with 56% identified as female, and 44% as male.

Each participant was randomly assigned to the control or experimental group, while maintaining a similar number of individuals in both groups (20 "guilty" and 19 "innocent" participants). All participants in the experiment were motivated by a non-monetary reward instead of the standard procedure, which typically employs money as the motivating factor. The chosen reward consisted of a guided visit to one of limited-access laboratories at AGH, a unique opportunity not available to everyone, as well as the opportunity to participate in a true polygraph test with CIT after an eye-tracking examination. This type of reward is expected to enhance intrinsic motivation by offering an exclusive and meaningful experience.

The motivation of participants was monitored using a six-point scale to gauge their self-reported adherence to instructions (1 = not motivated at all, 6 = very motivated). Those in the "guilty" group were instructed to conceal their recognition of key items, while those in the "innocent" group were directed to prove their innocence by cooperating with the examiner during the tests. The average motivation score was 5.05 for the "guilty" group and 5.0 for the control group. This slight numerical difference was statistically insignificant, indicating that the perceived level of involvement was comparable between the two groups.

Study protocol

The study consisted of two stages. The first involved simulating a crime, while the second stage encompassed an eye-tracking CIT with a visual stimulus in the form of the victim's face. The simulated crime scenario consisted of several steps. Following instructions from the study coordinator, participants in the "guilty" group were asked to secretly steal a test exam from an assistant professor's laptop in his office. They accessed the room by using a key hidden in the assistant's coat, which was placed in a specific location at the university as described in the instructions. A photograph of the assistant—whom they were directed to "rob"—was displayed in the office on the front page of the folder that participants were told to open in order to retrieve the password necessary to access the exam paper. To avoid leaving any traces that could lead to their identification, they were instructed to wear a black cap and latex gloves, both provided to them in an envelope along with the mock crime instructions. The entire mock crime phase lasted an average 15–20 minutes per participant. The individual steps were designed to increase the participants' engagement in the study, and more closely replicate in-field conditions. Innocent participants were unaware of the details of the mock theft details or its course and they did not have the opportunity to see the face of the assistant professor. So in their instructions they were simply asked to take a test to confirm their lack of knowledge regarding the crime. All participants were advised to remain in character throughout the tests and not to disclose to anyone which group they had been assigned to. In addition, the challenge for those in the "guilty" group was to try to outsmart the eye-tracking device by concealing any familiarity with the details of the mock crime, although no specific instructions were provided for doing so.

The Concealed Information Test with an eye tracker incorporated the simultaneous presentation of visual stimuli. Participants viewed a slide containing four faces_one depicting the assistant's face from the theft simulation, while the other three serving as control stimuli, as shown in Fig. 1. It is important to note that all facial images used in the experiment were sourced from the Chicago Face Database (Ma, 2015). Before presenting the slide, a short video featuring an AI-generated avatar was shown on the screen in front of the participants. The avatar asked the participants the following question: "Do you know who uses the room that was broken into?". Following the video, a fixation cross was displayed on the screen to compel participants to focus on the centre, thereby preventing any disturbance to measurements during the stimulus presentation. The decision to use prepared footage instead of having the investigator ask the questions directly was intended to ensure consistent test conditions across all participants.

Fig. 1. Visual stimulus used in the study (face of the "robbed" assistant in the top left corner)

Eye tracking examination set up

Eye movements were recorded using the Tobii Pro Fusion desktop eye-tracker and Tobii Pro Lab software, with visual stimuli displayed on a 27-inch Full HD monitor at 60 frames per second. The screen was positioned at a distance of 70 cm from the participant. This setup facilitated straightforward data collection, analysis, and aggregation of eye-related metrics for further examination and visualisation. The eye-tracker was positioned below the computer screen to ensure an unobstructed view for participants.

Data analysis

In order to automatically classify participants into two groups—"guilty" and "innocent"—heat maps generated using the Tobii Pro Lab software were used. A heat map is a graphical representation of data in which values in a matrix are represented as colours. The purpose of a heat map is to visualise the magnitude of a phenomenon as a colour scale that ranges from cool to warm, with warmer colours indicating higher values and cooler colours indicating lower values. For the heatmap generation, we selected two parameters commonly used to describe fixations in the participants' visual pathways: fixation duration and the number of fixations. Only fixation characteristics were selected as the discriminative parameters in this study, rather than other eye-tracking metrics such as pupil dilation used in previous CIT studies, due to the known temporal delay in pupil responses relative to the eliciting

stimulus (Partala, 2003). As a result, the spatial locations indicated on the heatmaps—which reflect gaze distribution—would not accurately correspond to the moments when pupil diameter changes occurred. Therefore, fixation-based metrics offer a more precise spatial representation of attention and cognitive processing during the test. Using heat maps, we were able to present the magnitude of these parameters while maintaining spatial information corresponding to gaze tracking, and thus to displayed stimuli. Examples of a heat maps for 'guilty' and 'innocent' participant used in our study are shown in Fig. 2 and Fig. 3. Following the standard image classification pipeline, our next step was feature extraction. For this purpose, the ResNet50 model (He, 2016), pre-trained on ImageNet and available in the torchvision library, was employed. ResNet, initially designed for image classification, can be repurposed for feature extraction. To do so, the final fully connected (classification) layer must be removed and the images fed through the intermediate, pre-trained convolutional layers. By utilising the output from these layers, one can extract rich, hierarchical feature representations of the images. Before the feature extraction process, each image, containing a full slide with 4 stimuli, was resised to 224×224 pixels upon loading to serve as the input to the aforementioned network. This process yielded an image representation in the form of a vector with a length of 512.

The subsequent classification step involved the use of a simple machine learning classifier, specifically, the Support Vector Machine (SVM). Given the small size of the test sample, leave-one-out cross-validation was employed to evaluate the model performance and ensure its generalisability. This technique assesses the reliability of the classifier by systematically leaving out one observation from the dataset, training the model on the remaining data, and then testing it on the excluded observation. The Support Vector Machine can be used with a number of different kernels (i.e., a function that transforms input data into a higher-dimensional space), each with its unique set of parameters. To identify the optimal configuration, a comprehensive grid search approach was adopted. The tuned parameters included the 'C' value, which controls the trade-off between achieving a low error on the training data and minimising the model complexity, and 'gamma', which defines the influence of a single training example. Additionally, the kernel type (e.g., 'linear', 'poly', 'rbf', 'sigmoid') was selected to find the best decision boundary for the classification task. The same classification procedure was applied to heatmaps generated using both fixation parameters.

Tab. 1. Parameters used in Grid Search

parameter name	**parameter range**
kernel type	'linear', 'poly', 'rbf', 'sigmoid'
C	21 logarithmically spaced values ranging from 10^{-10} to 10^{10}
gamma	21 logarithmically spaced values ranging from 10^{-10} to 10^{10}, 'scale', 'auto'
degree	2,3,4,5
coef0	0,0.1,0.5,1,2

Fig. 2. Example of a generated heatmap depicting spatial distribution in the number of fixations for participant in the 'innocent' group

Fig. 3. Example of a generated heatmap depicting spatial distribution in the number of fixations for participant in the "guilty" group

Results

Durations of fixations

After conducting a thorough grid search, the sigmoid kernel with a C parameter of 10 was identified as the optimal choice. The model demonstrated an overall accuracy of 77%, successfully classifying 30 out of 39 participants. Among the participants, the model correctly identified 16 out of 20 deceptive participants, resulting in a sensitivity of 80%. It accurately identified 14 out of 19 truthful participants, achieving a specificity of approximately 74%. However, the model also encountered misclassifications, namely, it incorrectly classified 5 "innocent" participants as deceptive and failed to identify 4 "guilty" participants. These findings are visually represented in Fig. 4.

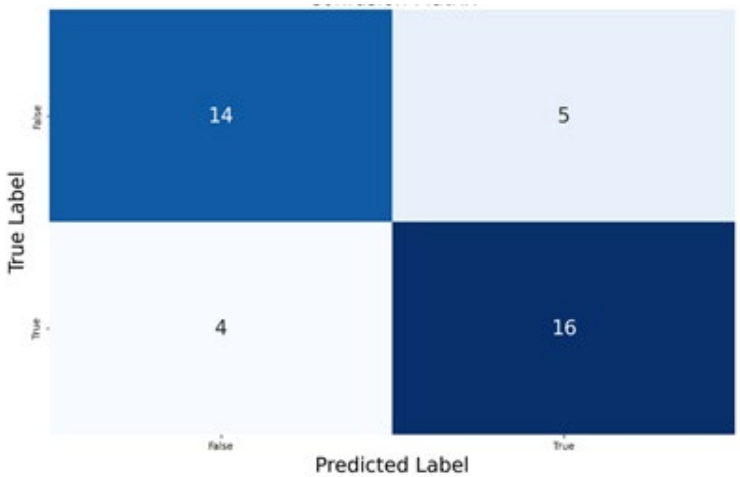

Fig. 4. Confusion matrix for a SVM classification of guilty and innocent participants using fixation duration

Number of fixations

For heatmaps generated using the number of fixations, the outcome of the grid search process was the selection of sigmoid kernel with the C parameter set to 100. The application of this approach resulted in an accuracy level of 84.62%, corresponding to the correct classification of 33 out of 39 study participants. Among the remaining 6 participants, 2 "guilty" individuals were not correctly identified, while 4 "innocent" participants were misclassified as deceptive. Thus, the classification model demonstrated a sensitivity of 90% (correctly identifying deceptive participants) and a specificity of approximately 78.9% (correctly identifying truthful par-

ticipants) based on true positive (18), true negative (15), false positive (4), and false negative (2) classifications, as seen in Fig. 5.

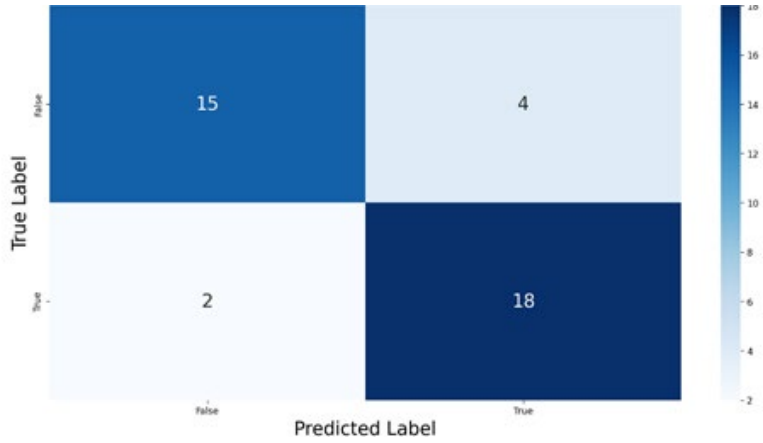

Fig. 5. Confusion matrix for a SVM classification of guilty and innocent participants using number of fixations

The results obtained using SVM trained on heatmaps representing fixation duration and fixations count are higher than those reported for traditional CIT using sequential stimulus presentation. However, better classification results were achieved using the fixation count as a feature rather than their duration. Additionally, it is important to note that similar SVM model parameters were identified as optimal in both cases.

Discussion

Face recognition during the process of identification can have important influences for the work of security institutions. A police lineup, border control, or the interviewing of a person suspected of cooperating with an organised crime group are just a few examples where an automatic, fully independent tool can be indispensable for detecting concealed knowledge.

Contrary to previous research, the current study explored the use of eye-tracker in a mock crime scenario to detect face recognition by the examined individuals. Relevant knowledge is typically acquired as a crime is committed, so it was justified to use a mock crime scenario instead of a memorisation task (such as STM-CIT).

The context in which one learns the relevant crime details during a mock crime is distinct from the context of learning stimuli presented on a computer-screen. Therefore, we assumed that under mock theft conditions, it might be easier to learn and remember crime details or recall the learning context in order to distinguish between familiar and unfamiliar faces.

The second advantage of our experiment is the use of the new version of the CIT procedure with simultaneous stimuli presentation. The aim of this modification was the reduction of the participants' task to merely the free viewing of facial stimuli presented on the screen without additional tasks such as a short-term memory or visual detection task. Previous studies (Delmas, 2023, Nahari, 2019, Lancry-Dayan, 2019) investigating the CIT effect demonstrated high accuracy, but the CIT versions employed were more complex and involved additional tasks with a different degree of difficulty.

In the present study, the CIT phase involved displays comprising only two kinds of stimuli: relevant (one familiar face) and irrelevant items (three unfamiliar faces). This aligns with the practice used in traditional polygraph examinations. The current study did not include the third type of stimulus—referred to as "target" (familiar but not crime related)—which is often used in the "oddball" variant of the CIT.

The version of the CIT presented here, despite its modification, yielded results similar to those obtained by other authors (Lancry-Dayan, 2018). This supports the conclusion that different experimental tasks can achieve high detection accuracy, provided they are specifically designed to reveal familiarity-induced modulation of eye movements (Nahari, 2019).

Furthermore, we found that the CIT protocol with simultaneous photo presentation was effective in detecting knowledge of familiar individuals, even when participants were instructed to conceal this familiarity. Further research is needed to investigate how the voluntary control of gaze interacts with task demands when participants are instructed on how to use countermeasures to mask their familiarity with the person being presented.

Furthermore, although the present study did not specifically focus on evaluating the efficacy of the protocol against countermeasures, we observed that it is feasible for the test administrator to detect whether a participant is cooperating, as some individuals exhibited non-compliant behaviour by fixating solely on the centre of the slide rather than directing their gaze toward the presented stimuli, as illustrated in Fig. 5.

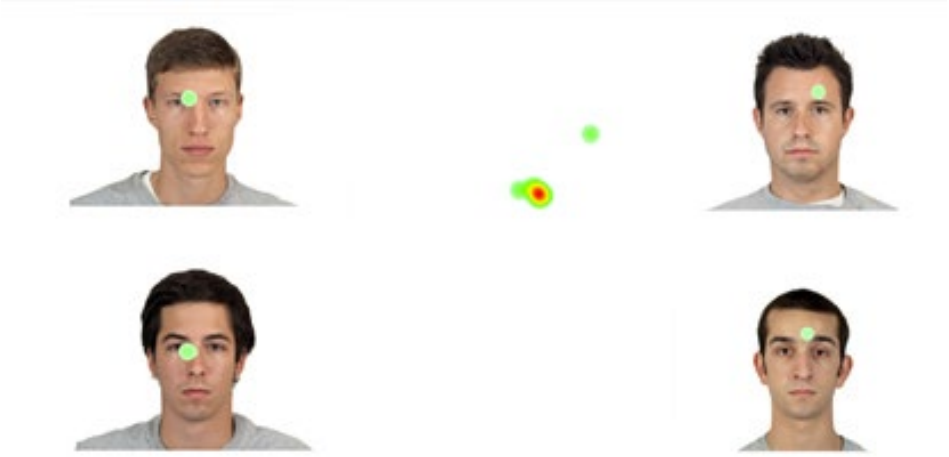

Fig. 6. Example of non-cooperative gaze behaviour during CIT
(most of the fixation were constructed to the centre of the slide)

Conclusions

To sum up, our research demonstrated the potential of eye-tracker heat map analysis combined with a machine learning algorithm in the CIT, revealing an accuracy of 84.62% when using heatmaps generated with the number of fixations. This makes the method a promising alternative to traditional autonomic-CIT.

However, several limitations of this research should be noted. Firstly, the sample size was relatively small. Secondly, the study was conducted in a laboratory setting where participants faced no real consequences based on the test outcomes. Moreover, future research should investigate additional factors that may influence the sensitivity of eye-tracker examination with CIT, such as individual psychological characteristics and the use of countermeasures. Additionally, in future work, we plan to focus on increasing the sample size and exploring the use of additional types of stimuli beyond facial images. This will help assess the generalisability of the method and its applicability across different contexts of concealed information detection.

If further research yields promising results, it could support the development of an objective tool capable of detecting whether an examined individual recognises a person presented in photographs even if they deny it. This could be useful in identifying criminal connections between individuals who act together in a terror-

ist group for example. To the best of the authors' knowledge, lie detection tests using eye-tracking technology are currently commercially available only for reading-based activities, whereas experimental CIT based on eye movement analysis may offer higher forensic value and investigative utility.

References

Brockmole J.R. & Irwin D.E. (2005), Eye movements and the integration of visual memory and visual perceprion, *Preception&psychophysics*

Delmas H., Ciocan C., Novopashyna M. & Paeye C. (2023), Resistance of a short-term memory concealed information test with famous faces to countermeasures, *Memory & Cognition,* Springer Science and Business Media LLC.

Guo K., Mahmoodi S., Robertson R.G. & Young M. P. (2005), Longer fixation duration while viewing face images. *Experimental Brain Research*, 171(1).

He K., Zhang X., Ren S. & Sun J. (2016), Deep Residual Learning for Image Recognition. *2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*.

Honts C.R., Devitt M.K., Winbush M. & Kircher J.C. (1996), Mental and physical countermeasures reduce the accuracy of the concealed knowledge test.

Iskra A. & Tomc H.G. (2016), Eye-tracking analysis of face observing and face recognition. *Journal of Graphic Engineering and Design*, 7(1).

Kircher J.C. & Raskin D.C. (2016), Laboratory and Field Research on the Ocular-motor Deception Test. *European Polygraph, 4(38)*

Klein Selle N. & Ben-Shakhar G. (2022), A new theoretical perspective on concealed information detection. *Psychophysiology*, 60(3).

Klein Selle N., Verschuere B., Ben-Shakhar G. (2018). Concealed Information Test, *Detecting Concealed Information and Deception*. Elsevier.

Lancry-Dayan O.C., Nahari T., Ben-Shakhar G. & Pertzov Y. (2018), Do you know him? Gaze dynamics toward familiar faces on a Concealed Information Test. *Journal of Applied Research in Memory and Cognition*, 7(2).

Ma D.S., Correll J. & Wittenbrink B. (2015), The Chicago face database: A free stimulus set of faces and norming data, *Behavior Research Methods*, 47.

Millen, A.E. & Hancock, P.J. (2019), Eye see through you! Eye tracking unmasks concealed face recognition despite countermeasures. *Cognitive Research: Principles and Implications*, *4*.

Nahari T., Lancry-Dayan O., Ben-Shakhar G. & Pertzov Y. (2019), Detecting concealed familiarity using eye movements: the role of task demands, *Cognitive Research: Principles and Implications*, 4(1).

Otsuka T., Mizutani M. & Yamada F. (2019), Selective attention, not cognitive load, elicited fewer eyeblinks in a concealed information test, *Biological Psychology*, 142.

Partala, T., & Surakka, V. (2003), Pupil size variation as an indication of affective processing. *International Journal of Human-Computer Studies*, *59*(1–2), 185–198.

Ryan J.D., Hannula D.E. & Cohen N.J. (2007), The obligatory effects of memory on eye movements. *Memory*, 15(5).

Schwedes C. & Wentura D. (2011), The revealing glance: Eye gaze behavior to concealed information, *Memory & Cognition*, 40(4).

Speth J., Vance N., Czajka A., Bowyer, K.W., Wright D. & Flynn P. (2021), Deception Detection and Remote Physiological Monitoring: A Dataset and Baseline Experimental Results, *2021 IEEE International Joint Conference on Biometrics (IJCB)*.

Welchman A.E. & Harris J.M. (2003), Task demands and binocular eye movements, *Journal of Vision*.

Yarbus A.L. (1967), Eye Movements During Perception of Complex Objects. *Eye Movements and Vision,* Springer.

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"Believe your chart but don't ignore your nose"

John Reid*

Tuvya T. Amsel**

The intuitive mind is a sacred gift and the rational mind is a faithful servant.
We have created a society that honors the servant and has forgotten the gift.
Albert Einstein

Abstract

Contrary to the past when in addition to chart analysis out of chart information such as: case data, examinees behavior clues, and alike, were factored into the decision-making process of a polygraph test conclusion, today's approach render the decision based ONLY on numerical scoring analysis i.e., quantifying numerically the differences in the physiological responses between the relevant question and the comparison question. This article suggests that due to test's complexity along with the numerical analysis inherent weaknesses, that affect the decisions outcomes examiners should engage their intuition, which was found to be an accumulated subconscious information gained over life experience, as a quality observer mean in their decision-making process.

Key words: numerical analysis, numerical approach, test data analysis, intuition, inherent weaknesses, non polygraphic information, out of chart information, in chart information, thin slices

* Victor Cohen (Reid's student during 1958) quotes Reid.

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Polygraph examiners were often criticized for rendering their decision more on out of chart information rather than on the examinees' physical responses as displayed on the polygraph charts. Regardless of the claim validity, until 1961 it has some merit because, until then, examiners rendered their decision practicing the "Clinical Approach" (also known as "Global Evaluation or Global Analysis") which considered, in addition to the visual inspection of the polygraph charts, out of chart information such as: case data, examinee's behavior symptoms, etc. John Reid In addition to the introduction of the "comparative response" polygraph test question in 1947, the question type that is the cornerstone of the Comparison Question Technique (CQT), formulated the "Reid Technique"* which is not another polygraph test format but, it is a detailed test protocol that compile: The case data, case officer/investigator opinion and view, examinee's behavior symptoms as observed by the receptionist prior of entering the examination room (subject to a defined list of verbal and nonverbal cues), examinee's additional information regarding the case under investigation as well as examinee's background and views, examinee's behavior symptoms as observed by the examiner during the pretest (subject to a defined list of verbal and nonverbal cues), a structured test procedure, a structured test questionnaire, and chart analysis in addition to the examiners' profile and examination room. But in 1961 Cleve Backster introduced the "Numerical Analysis" method which rendered the polygraph test decision based **exclusively** on quantifying numerically the differences in the physiological responses between the relevant question and the comparison questions in a structured test (ZOC). Hence, creating a methodological objective quantification method allegedly free of examiners subjective bias. The method, which ignored any out of chart information became later known as the "Numerical Approach".

Despite the "numerical approach" advantage in 1984 more than twenty years after the numerical approach was introduced Wygant wrote: "... there are still many who believe that scoring is an unnecessary waste of time. Moreover, some have expressed the concern that scoring is a crutch for examiners who lack the courage to make a decision based upon their own best judgment ... What is it intended to accomplish ... Stripping away all of the misplaced concern that scoring requires examiners to relinquish personal judgment to an unthinking system of numbers, we must recognize that numerical scoring of polygraph charts is nothing more than a record

* For further reading of the "Reid Technique" go to: Reid, J.E & Inbau F.E., (1977), Truth and Deception The polygraph ("lie-detector") technique", The Williams & Wilkins Company, Baltimore. Prof. Frank Horvath's presentation "The Reid Polygraph Technique", 48th Annual APA Seminar, Orlando, FL, September 12, 2013 and Polygraph (March 1982) 11(1).

keeping system. At its heart, ... numerical scoring is simply a means for an examiner to keep track of what he observes on the charts, so that by the time he has gotten to the end of the last chart he has a means of recalling what judgments he made at the beginning of the first chart. It is a method of imposing uniformity of chart interpretation from the beginning to the end of an examination, and of preventing excessive reliance on isolated responses." (Wygant,1984: 263).

But accumulated body of research gradually changed the attitude. Such were for example: Raskin et al. (1978) that concluded that (23) (Raskin, Barland, Podlesny 1978): "The results of this project clearly indicate that numerical scoring of polygraph charts produces higher rates of accuracy and reliability of chart interpretation than other methods of chart interpretation.... The usefulness of behavioral cues was investigated ... The results were not supportive of the claims that behavioral observations are effective in assessing truth and deception. Similar results were obtained in Experiment II, and they showed that decisions based on behavioral cues produced more that 50% incorrect designations of innocent subjects as deceptive. Unfortunately, many examiners are taught to place great emphasis on gestures, verbal behavior, and mannerisms in arriving at a decision. At this time the evidence does not support such procedures, and examiners should restrict their basis for decisions to the physiological recordings on the polygraph charts". Szucko & Kleinmuntz (1981: 92-104) concluded that (92): "This study focuses on clinicians' interpretations of polygraph protocols and shows that clinicians perform less accurately than statistical analyses. Statistics outperformed human judges because they used information optimally and applied decision rules consistently, while clinicians tended to add error variance to their protocol interpretations. Unfortunately, current empirical evidence suggests that the prospects for improving clinicians' consistencies are not very promising: the authors therefore recommend the possibility of applying statistical methods to interpreting polygraph data."

In spite of the unwelcome beginning the numerical approach gained more and more support. The manner in which the pendulum turned so extremely in favor of the numerical approach is being expressed in section 1.8 of the "Test Data Analysis: Numerical Evaluation Scoring System Pamphlet" (NCfCA 2017: 6) of the US National Center for Credibility Assessment (NCCA – the Federal Polygraph School) that states: "There is an **axiom in PDD and that axiom is** ... "Believe in your charts!" i.e., "Numerical Evaluation Scoring System"

The introduction of computerized polygraph instruments with its' various automated chart analysis programs such as the: Poly Score, OSS, ESS, and etc., created

a reality in were additional in chart and out of chart information was ignored and later abandoned. Current perspective and nowadays new reality of "believing your chart" is being interpreted by examiners as concentrating **ONLY and EXCLUSIVLY** on tallied numbers and calculated totals while totaly ignore: additional in chart information, charts' inherited weaknesses, out of chart information. And the examiners' intuition a.k.a. nose / guts is considered a banned practice.

The aim of the polygraph examiner's is to render a decision on whether the examinee is truthful or deceptive in their answers to the relevant questions. Can we base this significant decision solely on numerical calculation while ignoring the examiners proficiency which is an outcome of their gained knowledge, experience, observation and discretion compiled into a virtue named "INTUITION"? In 1982 Reid asked: "Are we less professional if we do take them (out of charts information) into account before submitting our final report? My answer is that we are less professional if we do not take behavior symptoms into account. Anyone who is in the business of examining another human being and knowing the fallacies of human nature, in order to be reasonably accurate must include all the information he is capable of collecting and that includes his observations of the subject's behavior." (Reid 1982: 37-45). But if the readers dismiss Reid for being old school read what a prominent researcher such as Ray Nelson who is a leading researcher in developing and improving various automated numerical scoring algorithms (OSS 3, ESS, Ipsative-Z) have to say about the examiner unique human proficiencies and importance alongside the automated numerical scoring. In his latest publication (Nelson 2024) he wrote: "Examiners possess a wealth of experience and expertise that algorithms alone cannot replicate. Their nuanced understanding of the examinee's behavior, context, and other variables can provide crucial insights that algorithms may overlook. Therefore, the correct integration of human expertise with automated or autonomous data analysis methods may entail polygraph professionals serving in the role of quality assurance supervisor, monitoring the algorithms and their outputs... Through active supervision of the algorithm, they can identify potential anomalies or irregularities in the data that warrant further investigation. Additionally, human examiners play a critical role in interpreting the results within the broader context of the examination. They consider factors that algorithms may not fully comprehend, such as the examination target issues, question formulation, and information discussed or reviewed during the polygraph interview, in addition to examining an examinee's functional or physiological anomalies. Furthermore, polygraph examiners play a critical role as a safeguard against algorithmic bias, ensuring that the technology remains impartial and free from any potential prejudices that might

arise from the incorrect use of testing or analysis methods. This oversight is pivotal in upholding the ethical integrity of the polygraph testing process. In essence, while algorithms are valuable tools, the role of the examiner as a knowledgeable and responsible overseer ensures that the human element remains at the core of the process. This balance between automation and expertise is foundational in achieving accurate and ethical polygraph examination results."

So, considering the fact that examiners' decisions are strictly based on "numerical analysis" in spite of not producing 100% accuracy, it is suggested, to let some room for intuition (gut feeling /hunch /nose). Contrary to the common labeling of intuition as being non-scientific / metaphysical / parapsychological / paranormal phenomenon it was established scientifically that intuition is actually a subconsciously gained knowledge based on past experience combined with current additional cues and signals producing an independent opinion isolated from our conscious awareness. Intuition will never overrule chart analysis which will always have the power of veto, but intuition can serve as a semaphore signaling the examiner to take a second look and reanalyze the different elements of the test prior of rendering a decision.

Polygraph charts inherited weaknesses

The "Comparison Question Technique (CQT)" polygraph test is a complex process. The complexity of the test requires the examiners' inter-personal communication skills, the examiners' ability to successfully navigate between being focused and strive on the task ahead while being sensitive and reduce the examinees tension, nervousness and anxiety and deal with it, confronting or avoiding contaminating factors*, weighing the Relevant Issue Gravity (RIG) affect (Ginton 2009), the ability to phrase clinically precise relevant question that are not open to rationalization or misinterpretation, gain the examinees' trust in the effectiveness of the process, instrument and examiner's professionalism and objectivity, implementing the right test format and conducting a proper test. Last but not least is phrasing the proper comparison question. The CQT complexity is best demonstrated in the phrasing of the comparison question. Follows Krapohl and Shaw (2015) guide: "Probable-lie comparison (PLC) ... questions that are too weak or too strong can affect the numerical scores. and consequently, the ability to arrive at a definitive and accurate decision. Comparison questions operate on what might be called the "Goldilocks Principle" because they must not be "too hot" nor "too cold" but "just right" They must be carefully chosen and introduced to each examinee to achieve

* For an overview read Amsel, 2016: 151–157.

high accuracy. Shortcuts in PLC development and execution may lead to decrements in accuracy." So, not "too hot" or not "too cold" but "just right" is left to the examiners' discretion based on their ability to sense the examinees and assess the PLC efficiency. And how do we know that we were successful? And the "directed lie comparison question" is not any different because examiners will never know if the examinees just followed the instructions to lie without having any emotional attachment to the lie or not.

So, although the responses displayed on polygraph charts (the "OUTPUT"), are the physical manifestation of the examinees' cognition i.e., a psychological process. The process might significantly be affected by the variety of these described factors (the INPUT) apart of the examinees' veracity. Or in computer programmers' words: GIGO which stand for: "Garbage In, Garbage Out" meaning that regardless of how accurate a program's logic is, and how accurate are the analysis algorithm, the results will be incorrect if the input is invalid i.e., **the output quality of a system usually can't be any better than the quality of its' inputs**. "The solution is not just spending time on an application's algorithms which produces the output, but more important to spend time on validating the input and/or ensuring that the right sort of data goes into the system"[*].

Weaknesses of the common probabilistic models adopted for the Numerical Analysis

Numerical analysis is indeed an objective method of establishing the examinee's veracity. It is methodical and technical and less effected by human biases, yet when it is based on probabilistic models it comes with typical, sometimes inherent limitations that preclude their capability of being perfectly accurate in their outcome. The following are two of such existing limitations:

- **Base Rate issue**

The numerical scoring focuses on the results of the specific case and fail to factor in earlier measured probability data of such cases and/or individuals i.e., "base rate", pertinent information that may affect the rate of specific outcomes. Also, the probabilistic models used in the field assume base rate of 50% truthful and 50% lying examinee, which is far from representing the actual population from which the spe-

[*] R. Awati, *Garbage in, garbage out (GIGO)*, TechTarget, https://www.techtarget.com/searchsoftwarequality/definition/garbage-in-garbage-out (accessed: March 3, 2024, 18:48).

cific examinee is taken. See Ginton (2022) analysis concerning this issue in real life polygraph testing.

• **Prototype model vs. actual examinee discrepancy**

Apart from the problem of base rate, there is also a concern to what degree can one be assured that the specific examinee in the specific circumstances of the actual test resembles the common examinee prototype and the range of circumstances that comprised the database for estimating the validity of the test format and analysis that was used by the examiner. These limitations are inherent in the statistical paradigms used for assessing the validity of the test format.

In chart additional information

There is no doubt that examiners should render their decision based on chart analysis in spite of its' inherited weakness and in spite of the weaknesses of the common probabilistic models adopted for the numerical analysis. But chart analysis does not mean that the examiners ought to confine themselves strictly to the numerical scoring analysis and overlook additional in chart information. In addition to the measurement of the physiological response differences between the relevant and the comparison questions, information such as: chart clarity, erratic/nervous or calm responses, stability, and etc., should be considered. And of more importance consistency.

Consistency

Validated test formats require repetition of the test questions for at least three times. The logic behind repetitions is that they tend to nullify chance effects and leave the effects that bear consistency. But take the following test data analysis for example: most versions of numerical scoring will render an inconclusive result if the grand total of three to five charts, is ±3. Thus, for instance, if the first chart results in -2, second chart +1 and third charts +1 it totals zero which is a perfect inconclusive. Running two additional charts of +1 each, still leaves the grand total inconclusive. Looking at this from the consistency perspective, show that four charts have pointed in the same direction and only one to the opposite side. So, although not statistically significant under the traditional alfa of 0.05, it strengthens the confidence that the direction of the result is correct and is not a matter of pure chance of random fluctuations. The importance of the consistency factor was demonstrated by Gin-

ton (2013) showing that relying on the consistency factor gives as accurate results and sometimes even more accurate than the numerical analysis per-se.

Sharing intuition in the decision-making process

The Cambridge Dictionary define "Gut Feeling"* as: "a strong belief about someone or something that cannot completely be explained" and "Intuition"**: as: "an ability to understand or know something immediately based on your feelings rather than facts". The instant connotation of gut feeling and intuition is of being a non-scientific / metaphysical / parapsychological paranormal phenomenon. However, researches, portrait a different perspective. In her 2022 book "Switch Craft: The Hidden Power of Mental Agility" Prof. Elaine Fox, a cognitive psychologist by training who founded and directed the Oxford Centre for Emotions & Affective Neuroscience (OCEAN) at the University of Oxford and now is the Head of the School of Psychology at the University of Adelaide, Australia, describes intuition as a very real process where the brain makes use of past experiences, along with signals and cues from the environment, to help us make a decision. This decision happens so quickly that it doesn't register with our conscious mind. In other words, intuition is no psychic parapsychological hocus pocus but rather a decision-making process in where subconsciously knowledge gained through past experience combined with current additional cues and signals make an independent decision which is isolated from our conscious awareness. Furthermore Hurteau et al. (2020) emphasis that intuition is developed through a long, complex, and demanding process in which reflective analysis of experiments, successes, and failures, trial and error play an essential role. Furthermore Prof. Gerd Gigerenzer vice president of the European Research Council (ERC) and the ex-director of Max Planck Institute for Human Development, and the director of the Harding Center at the University of Potsdam propose in his book "The Intelligence of Intuition" that intuition is a form of unconscious intelligence based on experience. His conclusion is based on scientific studies which shows that intuition is not an irrational impulse but rather based on smart heuristics.

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* *Gut feeling/reaction*, Cambridge University Press & Assessment, https://dictionary.cambridge.org/dictionary/english/gut-feeling-reaction?q=gut+feeling%2Freaction (accessed: March 3, 2024, 16:33).

** *Intuition*, Cambridge University Press & Assessment, https://dictionary.cambridge.org/dictionary/english/intuition (accessed: March 3, 2024, 16:35).

Intuition and Detection of Deception

As described, research clearly promotes the use of intuition in the decision-making process. It was found to be an effective tool in the process that improve decisions. Furthermore, some prominent researchers conclude that **intuition can significantly improve humans' detection of deception abilities:**

- DePaulo et al. (2003) found that while direct cues (e.g., various verbal and non-verbal indicators) tend to yield small effects, cues that are assessed more "subjectively" (e.g., vocal immediacy, facial pleasantness, or level of narrative detail) showed significantly greater discrimination.
- DePaulo et al. (2004) concluded that:" ... studies suggest that asking participants to render more holistic or "indirect" judgments regarding a sender can better discriminate truths vs. lies when compared with direct assessments of veracity"
- Albrechtsen et al. (2009) conducted two experiments and reported that: "... both experiments converge to suggest that intuitive processing can significantly improve deception detection performance".
- Ten Brinke et al. (2014) conclude that: "... conscious judgments of veracity are only slightly more accurate than chance. However, findings in forensic psychology, neuroscience, and primatology suggest that lies can be accurately detected when less-conscious mental processes i.e., intuitive are used. In two experiments, we demonstrated that indirect measures of deception detection are significantly more accurate than direct measures".
- Stel et al. (2020) concluded that: "... deliberative conscious information processing hinders the ability to detect deception, while intuitive information processing is beneficial, at least when it comes to detecting the truth."

An additional consideration: Evidence Based Practice

The APA take pride in being "Dedicated to the use of evidence-based scientific methods for credibility assessment"*. The "evidence-based-practice" was introduced as a medical diagnosis decision-making model by Sackett et al. (1996). The model combined three different elements: 1. "Individual clinical expertise, i.e.,

* American Polygraph Association, https://www.polygraph.org (accessed: March 4, 15:42).

the proficiency and judgment that individual clinicians acquire through clinical experience and clinical practice. 2. Patients' predicaments, rights, and preferences in making clinical decisions about their care. 3. Best available external clinically relevant research...." (p. 71). The "evidence-based-practice" considers **the practitioners' proficiency and judgment** which are based on his clinical experience and practice i.e., intuition, as a key component in the decision-making process. Why should we as evidence-based practitioners ignore it?

Conformation bias

One of the strongest arguments against importing out of chart information into the decision-making process is the "conformation bias" which defined by the American Psychological Association[*] as: "the tendency to gather evidence that confirms preexisting expectations, typically by emphasizing or pursuing supporting evidence while dismissing or failing to seek contradictory evidence." While the risk of the confirmatory bias exists, to a lesser degree, in the test data analysis as well (either by overlooking or overweighting or underweighting data) it is hypothesized of an increased affect upon importing out of chart data. Elaad & al. (1994) found that: "Prior expectations affected the examiners' judgments when the polygraph charts did not include clear indications of guilt or innocence, but when the objective physiological evidence included strong indications which clearly contradicted the examiner's expectations, judgments were not affected by these expectations." Although Krapohl & Dutton (2018) found that: "on average, polygraph scores and decisions were shifted in the direction of the biasing information. The shift was evident for both clear and ambiguous data. Not all scorers were affected by the biasing information." They concluded that: "The two studies taken together support the conclusion that when the polygraph data are unclear scorers appeared to be affected by expectations". These researches indicate that prior expectations and/or prior information may affect the examiners' decision making.

Nevertheless, it should be accentuated that these researchers examined the impact of prior expectations and/or prior information on examiners **who evaluated charts blindly and not on the examiners that conducted the actual test**. In other words, their intuition was not engaged in the decision-making process which might have assisted and/or rejected or zeroed the prior expectations. The assumption that if it effects blind chart evaluator it will obviously effect examiners was rejected in Elaad

[*] *Confirmation bias*, APA Dictionary of Psychology, https://dictionary.apa.org/confirmation-bias (accessed: April 23, 2024, 20:40).

& al. (1998) research that concluded that: "No relationship was found between the final judgment of the examiners and their prior expectations." In Wicklander et al. (1975) research six polygraph examiners achieve an average accuracy of 88.33% correctly identifying the 20 verified truthful and deceptive subjects based only upon global chart evaluation. Two months later they were asked to analyze the same charts but this time they have received additional information such as: case data, examinees' personal background, verbal and nonverbal cues as has been displayed in the actual tests and the relevant questions which increased their decisions to an accuracy average of 92.5%.

Since it is a fact that whether we like it or not confirmatory bias exist in any inter-personal engagement and in any human activity. The practical concern is not its existence but rather **to what degree it affects the outcome? What is the magnitude of its' effect**[*] (Ginton 2019)**?** Does it have a small effect or a medium effect or a large effect? Does it affect all examiners or only few examiners? Does it play a role in specific cases or circumstances and/or etc.? As long as the magnitude effect is unknown its' existence should serve (as in traffic) as a "Warning Sign" to the examiner to be cautious, to be alert as with other sensitive issues. But it undoubtedly cannot be argued as a reason to undermine the CQT as claimed by some respectful professors. Because as Hitchens razor states: "What can be asserted without evidence can be dismissed without evidence." And why should we ignore the fact that: "It is biased to claim that bias has only negative effect, in many instances it has positive effect."

Blink: The Power of Thinking Without Thinking (Gladwell 2007)

In the ongoing pursuit to reach accurate test decisions the profession focused on validated test procedures i.e., test protocols, test formats, and test data analysis abandoning practices which were unvalidated or unsupported by research. What we witness nowadays is examiners that base their decision **ONLY** on numerical calculation or even worst only on computerized algorithms, in spite of their inherited weakness, resulting in false results or high rate of inconclusive results. This paper recommends using the examiners' intuition as a mean of quality observer signaling the examiners to take a second look into the different segments of the test.

[*] Ginton (2019) showed that, from an applied perspective rather than a basic science one, based on the current research concerning polygraphs, the estimated rate of tests to be affected by prior expectations of the kind used in the research is only about 3% of the total volume of specific polygraph tests.

The instant connotation of intuition is of being a non-scientific parapsychological, paranormal phenomenon and, it is not considered to be a valid mean of decision-making tool or aide. But current researches prove the opposite. Intuition is a subconscious process utilizing our past experience and knowledge to process surrounding stimuli faster than our conscious mind. And "thin slices" of information demonstrates this capability.

The term "Thin Slices" was coined by Harvard psychologists Ambady & Rosenthal (1992) and it refers to the procedure of making an instant judgment about an individual with minimal amounts of information and within a minimal amount of time based on the individual's thin slices of expressive behavior. Research participants were asked to watched either a 3 or a 4- or a five-seconds video segments of a target (teacher or university professor) entering the class and evaluate the target's internal state, personality, or other social attributes. The participants' evaluation was compared to evaluation made by observers of the full video (5 or more minutes) or end of semester's student evaluation. Research has found that brief judgments based on thin-slicing are similar to those judgments based on much more information. Judgments based on thin-slicing can be as accurate, or even more so, than judgments based on much more information. As accurate as the observer are they are not able to report the factors that influence their judgments probably because intuition is a subliminal perception. Their accuracy refers to: trust, nervousness, expressiveness, and more. Furthermore Ambady (2010) suggested: "that brief, evaluative, thin slice judgments are made relatively intuitively ... such judgments are efficient and can be processed in parallel with other cognitive tasks: Introducing a parallel distraction task demanding attentional resources did not dilute the accuracy of judgments.... such judgments are more accurate ... when they are made without deliberation".

The decisions that polygraph examiners make has a significant influence on an examinee's life. Therefore, examiners have a tremendous responsibility to avoid giving a false result. Being aware of the practice's weaknesses require examiners to be very cautious when rendering a decision. Chart analysis including numerical scoring and additional in chart information should be pivotal to the decision-making process but examiners intuition, which is based on the examiner's prior experience as well as the current cues that have been collected during the examination process, should also be considered as a type of quality observer.

Reference

Albrechtsen, J.S., Meissner, C.A. & Susa, K.J. (2009), Can intuition improve deception detection erformance? *Journal of Experimental Social Psychology, 45*(4), 1052–1055, https://doi.org/10.1016/j.jesp.2009.05.017

Ambady, N. (2010), The Perils of Pondering: Intuition and Thin Slice Judgments, *Psychological Inquiry* 21(4):271–278.

Ambady, N. & Rosenthal, R. (1992), Thin slices of expressive behavior as predictors of interpersonal consequences: A meta-analysis. *Psychological Bulletin, 111*(2), 256–274.

Amsel, T. (2016), Polygraph Examinations Contaminating Factors, *European Polygraph*, 4(38), 151–157.

DePaulo, B.M. & Morris, W.L. (2004), Discerning lies from truths: Behavioral cues to deception and the indirect pathway of intuition. In Pär-Anders Granhag & Leif (Eds.), The detection of deception in forensic contexts (pp. 15–40). New York: Cambridge University Press.

DePaulo, B.M., Lindsay, J.J., Malone, B.E., Muhlenbruck, L., Charlton, K. & Cooper, H. (2003), Cues to deception. *Psychological Bulletin*, 129, 74–118.

Elaad, E., Ginton, A. & Ben-Shakhar, G. (1994), The effects of prior expectations and outcome knowledge on polygraph examiners' decisions. *Journal of Behavioral Decision Making*, 7(4), 279–292, https://doi.org/10.1002/bdm.3960070405

Elaad, E., Ginton, A. & Ben-Shakhar, G. (1998), The role of prior expectations on polygraph examiners' decisions, *Psychology, Crime and Law*, 4(1), 1–16.

Fox, E. (2022), Switch Craft: The Hidden Power of Mental Agility, HarperOne, HarperCollins Publisher, NY.

Gigerenzer, G. (2023), The Intelligence of Intuition, Cambridge University Press, Cambridge, UK.

Ginton A., (2009), Relevant Issue Gravity (RIG) Strength – A new concept in PDD that reframes the notion of Psychological Set and the role of attention in CQT polygraph examinations. *Polygraph*, 38 (3), 204–217.

Ginton, A. (2013), The Importance of the Consistency Factor in CQT and Other Polygraph Tests. *Polygraph,* 42, 146–162.

Ginton, A., (2019), Basic vs. Applied Psychology perspectives lead to different implications from the same data; reevaluating the impact of prior expectations on polygraph outcomes, *Social Sciences & Humanities Open,* Volume 1, Issue 1, 2019, 100005.

Ginton A. (2022), Calculating the Base Rate in Polygraph Populations and the Posterior Confidence in the Obtained Results in the Comparison Question Test, Built upon the Proportion of Outcomes: The Case of Israel Police. *Journal of Police and Criminal Psychology* (2022), http://doi.org/10.1007/s11896-022-09526-6

Gladwell, M. (2007), Blink: The Power of Thinking Without Thinking, Little, Brown & Co., NY

Hurteau, M., Rahmanian, J., Houle, S. & Marchand, M.-P. (2020), The Role of Intuition in Evaluative Judgment and Decision. *American Journal of Evaluation*, 41(3), 326–338.

Krapohl D.J. & Shaw P.K. (2015), *Fundamentals of Polygraph Practice*, Academic Press, USA.

Krapohl, D.J. & Dutton, D.W. (2018), Believing is seeing: The influence of expectations on blind scoring of polygraph data. *Polygraph and Forensic Credibility Assessment*, 47(2), 91–107.

Matte, J.A. (1996), *Forensic Psychophysiology Using the Polygraph*, J.A.M Publication, NY, 42–43.

National Center for Credibility Assessment (NCfCA 2017) PDD 503-ANALYSIS II, (August 2017) Test Data Analysis: Numerical Evaluation Scoring System Pamphlet, Aug 2017 p. 6.

Nelson, R. (2024), Practical Polygraph Integrating Automated Data Analysis Algorithms with Human Expert Decision Making, *APA Magazine*, 57 (1), 40–43.

Raskin, C.D., Barland, GH. & Podlesny, J.A. (1978), Validity and Reliability of Detection of Deception, National Institute of Law Enforcement and Criminal Justice, Law Enforcement Assistance Administration, U. S. Department of Justice.

Reid, J. (1982), Behavior symptoms of polygraph subjects, *Polygraph*, 11(1) 37–45.

Reid, J.E & Inbau, F.E. (1977), Truth and Deception The polygraph ("lie-detector") technique", The Williams & Wilkins Company, Baltimore. Prof. Frank Horvath's presentation "The Reid Polygraph Technique", 48th Annual APA Seminar, Orlando, FL, September 12, 2013 and Polygraph (March 1982) 11(1).

Sackett D.L., Rosenberg W.C., Muir Gray J.A., Haynes R.B. & Richardson W.S. (1996), Evidence based medicine: what it is and what it isn't. *BMJ, 3*12, 71–72.

Stel, M., Schwarz, A., Van Dijk, E. & Van Knippenberg, A. (2020), The Limits of Conscious Deception Detection: When Reliance on False Deception Cues Contributes to Inaccurate Judgments, *Frontiers in Psychology*,11.

Szucko, J.J. & Kleinmuntz, B. (1981), Statistical versus clinical lie detection, *Polygraph*, 10(2), 92–104.

Ten Brinke, L., Stimson, D. & Carney, D.R. (2014), Some Evidence for Unconscious Lie Detection, *Psychological Science* 25(5), http://doi.org/10.1177/0956797614524421

United States Government (2011), Federal Psychophysiological Detection of Deception Examiner handbook. *Polygraph*. 40(1), 1–66, p. 33.

Wicklander, D.E. & Hunter, F.L. (1975), The Influence of auxiliary source of information in polygraph diagnosis", *Journal of Police Science & Administration*, 3 (4), 405–409.

Wygant, R.J. (1984), Rationale for scoring, *Polygraph*, 13(3), 263–266.

Confirmation bias, APA Dictionary of Psychology, https://dictionary.apa.org/confirmation-bias (accessed: April 23, 2024, 20:40).

Gut feeling/reaction, Cambridge University Press & Assessment, https://dictionary.cambridge.org/dictionary/english/gut-feeling-reaction?q=gut+feeling%2Freaction (accessed: March 3, 2024, 16:33).

Intuition, Cambridge University Press & Assessment, https://dictionary.cambridge.org/dictionary/english/intuition (accessed: March 3, 2024, 16:35).

American Polygraph Association, https://www.polygraph.org (accessed: March 4, 15:42).

Awati R., *Garbage in, garbage out (GIGO)*, TechTarget, https://www.techtarget.com/searchsoftwarequality/definition/garbage-in-garbage-out (accessed: March 3, 2024, 18:48).

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The Legal Status of the Polygraph in Germany

Thorsten Floren*

Abstract

The use of the polygraph in German court proceedings has been made almost impossible by a large number of decisions over the last few decades. In contrast to developments in some neighbouring European countries, the German judiciary does not think much of the measuring device and it has been successfully banned from German courtrooms over the years for various reasons. This legal development is described in this article. On closer inspection, it becomes clear that underlying the rejection of the polygraph is the opinion that it cannot itself provide results that have a sufficiently scientifically based foundation for court proceedings. At the same time, this criticism also makes it possible to establish access for the polygraph to German courtrooms through targeted scientific research.

Key words: Legal status, court decision, Federal Court of Justice, inadmissible evidence, human dignity, prohibited interrogation methods, Germany

Historical development

The German psychologist, physiologist, and philosopher, Wilhelm Wundt is named as the founder of psychology as an independent science. In 1880, he standardised the experiment with the word association test, which was used by his student, Max

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Wertheimer, as the basis for identifying perpetrators when solving crimes. The first studies using the polygraph were published in Germany in 1913 by the psychologists Wertheimer and Jung. This was followed by polygraph tests by Keeler in 1935 (Schneider, 2010, p. 15; Wegner, 1981, p. 5 ff.).

Judicial judgement of the polygraph in Germany

In Germany, the highest court, the Federal Court of Justice (Bundesgerichtshof (BGH)), has dealt with the legal admissibility of the use of the polygraph in the German jurisdiction on several occasions. These proceedings always arose from the judgements of court decisions by instances subordinate to the BGH. A slight change in the attitude of the court can be detected over time, and it is also reflected in the lower court instances. However, it must be noted that the use of the polygraph has not been permitted in criminal proceedings in Germany since the first landmark decision of the BGH in 1954, although this assessment has become much more nuanced over time. This legal development is illustrated by three decisive BGH judgements and examples from other courts.

First, though, it is necessary to briefly discuss the type of procedure used in criminal law in Germany that makes clear why the BGH considers the polygraph test to be inadmissible. German criminal law is designed to ensure that every sentence imposed also presupposes individual guilt (the substantive principle of guilt) (Trüg, Habetha, 2016). This is derived from the principle of the rule of law and human dignity which is directly related to the German constitution (BVerfGE 80, 182 (182)). This constitutional principle must therefore also be explicitly observed in German criminal proceedings (BVerfG, NJW 2013, 1058 (1060)), from which it can be deduced that the actual facts of the case must be objectively investigated (Vieten, 2023, p. 124).

Decision of the BGH of 16.02.1954

In 1954, the BGH ruled in principle that polygraph testing was not admissible in criminal proceedings as a whole or in preliminary investigations (by the police or the public prosecutor's office). This principle also applies even if the accused or defendant expressly agrees to its use (BGHSt 5, 332).

In its judgement, the BGH explicitly referred to Art. 1 (1) of the Basic Law (Basic Law of the Federal Republic of Germany, the Grundgesetz (GG)), which states:

"Human dignity is inviolable. Respecting and protecting it is the duty of all state authority" (Art. 1 (1) GG). From this, the court derived the principle that the accused is always a party to the proceedings and must not be made an object, which would be the case if the polygraph were used. Furthermore, the accused does not need to comment on the charges or participate in the clarification of the facts. These rights of the accused cannot be sacrificed to the will of the public to solve crimes. The protection of the accused is also underlined by §136a of the Code of Criminal Procedure (Strafprozessordnung, (StPO)), which emphasises the "freedom of the accused's decision of will and confirmation of will" in relation to a statement on the charge, provides examples of unlawful interference with these rights of the accused, and makes such interference a punishable offence. Even with this legal standard, it is not possible for the accused to consent to the use of such "prohibited interrogation methods".

From the court's point of view, this right of the accused is deliberately disregarded and violated by the use of the polygraph. It is considered to be an "insight into the soul of the accused", as the rights of the accused are disregarded and violated in an unauthorised manner through the recording of unconscious bodily processes (e.g., blood pressure, pulse rate, breath length) (GG: Human dignity / §136 a StPO: Prohibited interrogation methods). By using the polygraph, the accused answers questions in an unconscious manner without being able to prevent it (BGHSt 5, 332, reasons: 1.).

This fundamentally negative attitude of the BGH is also reinforced by the accusation that the polygraph does not have the necessary level of reliability from a scientific perspective. The BGH took up the decision of the Regional Court (Landgericht (LG)) of Zweibrücken, which cited the reliability of the polygraph as a scientifically based method of investigation on the basis of English and American court practice. At the same time, the BGH referred to the German criminal law science, which almost completely rejected the use of polygraphs. Furthermore, the English and American court practice was not transferable to the StPO or the GG (BGHSt 5, 332, reasons: 2.; BGHSt 5, 34).

Decision of the BVerfG of 18.08.1981

More than 25 years after the first landmark judgement of the BGH, the Federal Constitutional Court (Bundesverfassungsgericht (BVerfG)) was called on to make a constitutional assessment on the basis of a trial decision by the LG. The LG had

rejected the use of polygraphs to exonerate a defendant on a charge of murder (LG Mannheim of 02.06.1980 - 2 KLs 3/80) and sentenced him to life imprisonment. Contrary to the BGH, the BVerfG has the task of determining compliance with the GG and the interpretation of the constitution. Contrary to the decision of the BGH, the BVerfG did not base its decision on Art. 1 (1) GG (human dignity), but on Art. 2 (1) in conjunction with Art. 1 (1) GG (general right of personality). By using the polygraph, the accused would have become "a mere appendage of an apparatus", which would significantly affect their personal rights, and this could not be compensated by the goal of the criminal procedure of establishing the truth (Busche, 2016, p. 45).

In principle, the BVerfG criticised the fact that even with a success rate of 90%, there was still the possibility that the accused could be the perpetrator even if the test result was negative. Moreover, the defendant's consent to the test procedure was not considered voluntary, as he would not have been able to prove his innocence due to a lack of other evidence, and he faced a substantial prison sentence (BVerfG 2 BvR 166/81 NJW 1982). This court decision was assessed very negatively in the specialised literature as having little or no justification (Schwabe, 1982, p. 367; Amelung, 1982, p. 38).

In 1998, the BVerfG again dealt with the use of polygraphs in criminal proceedings on the basis of a constitutional complaint. The complainant had wanted to introduce the results of a voluntary polygraph test he took as evidence in the trial brought against him for the sexual abuse of a child. In doing so, he invoked Art. 103 GG (a fair trial in accordance with the rule of law). This application was rejected by the BVerfG as it once again considered the use of polygraphs to be a threat to the protection of the accused's personality (Art. 2 GG) and that the refusal of the polygraph was not an indication of unfair criminal proceedings. However, the court left open whether the "screening of a person" by means of a polygraph was a violation of Art. 2 GG (BVerfG 2 BvR 1827/97).

Admission of the polygraph in German court proceedings outside of criminal proceedings until 1998

Contrary to the decisions in criminal procedure law, court proceedings in Germany were occasionally decided with the use of polygraph tests. In 1995, for example, the Senate for Family Matters of the Higher Regional Court (Oberlandesgericht (OLG)) admitted a private polygraph test that had been carried out to refute the

suspicion of abuse (OLG Bamberg 7 WF 122/94). Comparable decisions were made by the OLG Koblenz (OLG Koblenz 15 UF 121/96), the OLG Oldenburg (OLG Oldenburg 4 UF 60/96), the OLG Dresden (OLG Dresden 24 WF 1201/10) and the OLG Munich (OLG München 12 UF 1147/98). The OLG Koblenz justified its decision by stating that the use of the polygraph does not speak contradict the expert's expertise in court and that the test should be regarded as a further indication in the evidence procedure. In the context of a custody dispute, the OLG Oldenburg admitted the polygraph test as evidence based on the 95% probability level that it determined.

In its judgement, the OLG Munich compared the application of the polygraph between criminal proceedings and the family court cases. In family custody disputes, the difficulty is often that one party must refute the allegations made against them (in this case, the sexual abuse of a child) in order to be entitled to custody. This person must therefore actively prove their innocence in order to be able to realise their claim to custody or contact with the child. There is a clear difference between the criminal procedure approach and that of the family court. The polygraph test can, therefore, be a useful means of establishing the truth (OLG Munich 12 UF 1147/98).

Decision of the BGH of 14.10.1998

In 1998, two decisions were made by the BGH on the use of polygraphs in criminal proceedings. In the first, the defendant's appeal against the judgement of the LG Mönchengladbach was dismissed. The court referred both to the BGH judgement from 1954 and the judgements of the BVerfG, whereby the use of the polygraph was not permissible on the basis of Art. 2 (right of personality) and Art. 1 GG (human dignity) GG. Furthermore, the 3rd Criminal Senate criticised the implementation of the test procedure. A control question test was carried out without the knowledge of the court at the defendant's own request. The court held that the circumstances justified deferring action until the results of the test procedure were available, and that, should the outcome be favourable to the accused, an application for the admission of the evidence could appropriately be submitted. If the result is negative, this would not be done. In addition, the court expressed general doubts regarding the reliability of the test method used — the control question test (BGHSt 3 StR 236/95).

Decision of the BGH of 17.12.1998

In the same year, the 1st Senate of the BGH took up the fundamental evaluation of the polygraph test again on the basis of an appeal against a judgement of the LG Mannheim for sexual abuse. The accused had requested the test himself for his own exoneration, which was again rejected in principle by the BGH as evidence in criminal proceedings.

Specifically, the BGH cites a variety of reasons which, in its opinion, prohibit the admission of the polygraph in criminal proceedings. Firstly, the BGH referred to the prevailing opinion within German literature which is largely unfavourable towards this procedure. Only occasionally was the demand made to allow the use of the polygraph in court (Gundlach, 1992, § 136a StPO, m. n. 57; Undeutsch, 1977, p. 193 f.), or at least in preliminary proceedings (Schünemann, 1990, p. 131); (BGHSt 44, 308, 315, m. n. 657).

The BGH had also appointed a commission of experts (Fielder, Jänig, Steller, Undeutsch), which issued a written opinion on the applicability of the polygraph in court proceedings on 09.12.1998. On the basis of these expert opinions, the BGH deviated from its opinion of 1954 and now no longer sees the use of the polygraph as a violation of Art. 1 GG (human dignity) in the case of a voluntary test. The previously stated reason for refusal—the "insight into the soul" of the accused—is now denied. Likewise, §136a StPO (prohibited interrogation methods) is no longer raised. The polygraph is not used with the aim of deceiving the accused. Voluntary use at the request of the accused also does not reach the necessary degree of severity of the protective framework of §136a StPO. The BGH thus states that the use of a polygraph against the will of the accused is not permissible, whereas voluntary use does not violate human dignity or constitute a prohibited interrogation method (BGHSt 44, 308, 315, m. n. 658).

The main point that the BGH takes up in order to categorise the polygraph as inadmissible evidence is that it is unsuitable evidence is its lack of scientific validity (§ 244 (3) No. 2 Alt. 4 StPO). In its reasoning, the BGH considers the two test variants (control question test (CQT) and guilty knowledge test (GKT)) individually and refers to the expert opinions of Jänig, Fiedler, and Steller. They state that, according to scientific opinion, it is not possible to recognise clear connections between the reaction patterns of the vegetative nervous system and cognitive or emotional states. In conclusion, the three experts state that the use of the polygraphic procedure cannot be used to measure whether the subject was telling the truth or not. The risk of manipulation of the test cannot be conclusively assessed either

(BGHSt 44, 308, 315, m. n. 659). With regard to the control question procedure, it is not considered to be conceptually sound by the court and the way it works is not considered to be verifiable. This circumstance cannot be conclusively assessed in favour of the polygraph due to the very high hit rates of approx. 70 to 90 % in parts of the control question test (according to the expert opinion of Undeutsch) (BGHSt 44, 308, 315, m. n. 660). The BGH also considers the GKT to be unsuitable as soon as the offender is aware of the accusation against him and the related investigation results. The use of a polygraph in the court hearing is therefore always ruled out (BGHSt 44, 308, 315, m. n. 662).

Decision of the BGH of 30.11.2010

In its judgement, the 1st Criminal Senate of the BGH fully confirmed the case law from 1998 and continues to regard the use of the polygraph as unsuitable evidence (in accordance with § 244 (3) No. 2 Alt. 4 StPO). In addition, the BGH does not see any changes in the scientific data basis, as there is still insufficient connection between the body reactions measured by the polygraph and a certain behaviour (BGHSt 1 StR 509/10). This judgement is viewed negatively in the literature, firstly because of its very brief reasoning and secondly because it ignores the evolving findings on the polygraph (Steller, 2000, p. 31, 42) (Putzke, 2011, p. 559; see also Putzke, Scheinfeld, Klein, Undeutsch, 2009, p. 607).

Admission of the polygraph in German court proceedings outside of criminal proceedings from 2010

In 2013, the Local Court (Amtsgericht (AG)) of Bautzen admitted the use of polygraphs as evidence in criminal proceedings relating to rape, both for the injured party and the accused (AG Bautzen 40 LS 330 Js 6351/12, m. n. 80, 83). In the grounds for the judgement, the AG also refers to European practice, for example in Poland, where the polygraph has long been admitted as evidence in criminal proceedings (AG Bautzen 40 LS 330 Js 6351/12, m. n. 84). In 2016, the AG Bautzen again admitted the polygraph in criminal proceedings on suspicion of sexual abuse to the detriment of a child. In doing so, the AG specifically addressed the points criticising the use of the polygraph listed by the BGH, i.e., if the accused voluntarily submits to the test, it cannot be assumed that the result is inappropriate evidence (AG Bautzen 42 Ds 610 Js 411/15, m. n. 52). Rather, the polygraph is admissible in favour of the accused under the following conditions:

1. The physio-psychological examination must be voluntary.
2. The procedure must be ordered by the court or public prosecutor in the context of judicial or prosecutorial proceedings after the accused has voluntarily consented.
3. The procedure must be carried out by a certified expert under laboratory conditions with monitoring of at least four parameters (blood pressure fluctuations, respiration, skin resistance, vasomotor activity).
4. The procedure must deal with the offence.
5. The result may only be used to exonerate the defendant (in full or as circumstantial evidence) (AG Bautzen 42 Ds 610 Js 411/15, m. n. 58).

In 2021, the AG Schwäbisch Hall ruled that the polygraph was admissible as evidence in court in a family law case for the purpose of invalidating allegations of sexual abuse of a child. The court also made a comparison between the polygraph with its expert assessment and a psychological expert witness. Both would be admissible if they had the appropriate professional or scientific qualifications (AG Schwäbisch Hall 2 F 150/20). In 2022, the same court again admitted the polygraph as evidence in court in family law proceedings. However, this would only be possible if it were used voluntarily by the parties involved (AG Schwäbisch Hall 2 F 88/21).

Looking to the future

In conclusion, it must be clearly stated that the widespread use of polygraphs in German criminal procedural law is very unlikely in the near future. It is true that the case law of the highest German court, the Federal Court of Justice (BGH), has opened up slightly to the authorisation of the polygraph. It is also worth noting that there have been isolated decisions by lower courts that have clearly contradicted the decision of the highest court and allowed polygraphs to be used as evidence in court in some cases. For the time being though, the need within Germany seems to be not so much on the legal side but rather on the scientific side, to reduce the fundamental concerns of lawyers regarding the suitability of the polygraph in conjunction with psychological experts through well-founded research. In any case, there is certainly less distrust of the experts than of the technical assistant, the polygraph, yet it is precisely this player who has the greatest potential

for development. In addition to the constant improvement of medical knowledge and measurement methods, IT-based examinations such as video technology represent new opportunities to recognise and, if necessary, assess further parameters of physical interactions or reactions.

References

Amelung, K. (1982), Urteilsanmerkung zum Beschluß des BVerfG vom 18.08.1981 – 2 BvR 166/81, *NStZ*, 1982, pp. 38–40.

Busche, J. (2016), Bildgebende Verfahren, Beweisführung und Glaubwürdigkeit, *Freilaw*, 1/2016, pp. 41–52.

Gundlach, H. (1992), StPO-AK zu § 136a m. n. 57.

Putzke, H. (2011), BGH, Beschl. v. 30.11.2010 – 1 StR 509/10. Entscheidungsbesprechung, *ZJS*, pp. 557–563.

Putzke, H., Scheinfeld, J., Klein, G. & Undeutsch, U. (2009), Polygraphische Untersuchungen im Strafprozess. Neues zur faktischen Validität und normativen Zulässigkeit des vom Beschuldigten eingeführten Sachverständigenbeweises, *ZStW,* 121.

Schneider, K. (2010), Der Einsatz bildgebender Verfahren im Strafprozess, Köln, Josef Eul Verlag.

Schünemann, B. (1990), Entformalisierung des Ermittlungs-verfahrens, Kriminalistik, p. 131 ff.

Schwabe, J. (1982), Urteilsanmerkung zum Beschluß des BVerfG vom 18.08.1981 – 2 BvR 166/81, *NJW*, pp. 367–368.

Steller, M. (2000), Psychophysiologische Täterschaftsbeurteilung als Entlastungsmöglichkeit bei Verdacht auf sexuellen Mißbrauch?, [in:] Salzgeber, J., Stadler, M. & Willutzki, S., *Polygraphie. Möglich-keiten und Grenzen der psychophysiologischen Aussagebeurteilung* (pp. 31–43).

Trüg, G. & Habetha, J. (2016), [in:] Knauer, C. & Kudlich, H.P. (2016), MüKoStPO, 1. Auflage, 2016, § 244.

Vieten, T. (2023), Die (Un)zulässigkeit des Lügendetektors als Indikator für die Verfahrensart des deutschen und amerikanischen Strafprozesses, Bonner Rechtsjournal, 02/2023, pp. 122–127.

Undeutsch, U. (1977), Die Untersuchung mit dem Polygraphen („Lügendetektor"), Kriminalistik, p. 193 ff.

Undeutsch, U. (2007), The actual use of investigative physiopsychologicial examinations in Germany, *European Polygraph*, *1*, 1, pp. 7–17.

Wegner, W. (1981), Täterschaftsermittlung durch Polygraphie, Köln, Carl Heymanns Verlag.

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Lithuanian govt in favor of polygraph tests for risky aliens, company business reps

VILNIUS, Apr 16, BNS – The Lithuanian government on Wednesday approved a proposal to expand the list of people who could be subjected to polygraph tests.

The list would include business representatives, persons who want to become intelligence collaborators and aliens who could pose a threat to national security.

The Seimas will have the final say on this issue.

Having drafted the amendments in question, the Defense Ministry says that the changes have been initiated by intelligence institutions.

According to the explanatory note to the bill, the changes were initiated in response to the shortcomings of the existing legal regulation "concerning the possibility of polygraph tests not only for employees of secret entities, but also for other persons who are authorized to work with or have access to classified information".

The Defense Ministry wants the possibility to subject business employees to polygraph tests as part of the screening process to receive permission to work with or have access to classified information.

Under the current regulations, persons working or applying to work with classified information, but who are not civil servants, soldiers, officials or employees of institutions, cannot be subjected to a lie detector test.

The proposed amendments would also allow polygraph tests for people who seek to be intelligence collaborators, as well as for aliens who pose a potential threat to national security.

The State Security Department now performs the assessment of aliens' threat to national security and provides conclusions and information to the Migration Department.

For the sake of legal clarity, it is proposed to detail the consequences for a person in cases where the result of a polygraph tests is negative and where a person refuses to undergo a polygraph tests.

The proposal provides that if a person refuses to undergo a polygraph tests, their permit to work with or to have access to classified information shall not be issued or shall be revoked. If the person under examination is an alien, they would be deemed as posing a threat to national security.

According to the current law, statutory authorities, military intelligence, the SSD, and the Special Investigation Service may perform polygraph tests.

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For example (in references):

Reid, J., Inbau, F. (1966), *Truth and Deception: the Polygraph ("Lie-detector") Techniques*, Baltimore: Williams & Wilkins.

Abrams, S. (1973), Polygraph Validity and Reliability – a Review, *Journal of Forensic Sciences*, 18, 4, 313.

and (Reid, Inbau, 1966), (Abrams, 1973) inside text.

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