EUROPEAN POLYGRAPH

PUBLISHED QUARTERLY

Volume 12 2018 Number 3 (45)

Andrzej Frycz Modrzewski Krakow University

EUROPEAN
POLYGRAPH
Journal of Andrzej Frycz Modrzewski
Krakow University

European Polygraph is an international journal devoted to the publication of original investigations, observations, scholarly inquiries, and book reviews on the subject of polygraph examinations. These include jurisprudence, forensic sciences, psychology, forensic psychology, psychophysiology, psychopathology, and other aspects of polygraph examinations.

Opinions expressed in articles and book reviews published in European Polygraph solely reflect the experience and expertise of their respective Authors and Reviewers. Their publication does not imply any form of endorsement on behalf the Editors and Publishers who provide space for the presentation of, often contradictory, views and discussion of positions.

Office
ul. Herlinga-Grudzińskiego 1; 30-705 Kraków
mail: m.krasnowolska@gmail.com
oleg1998@gmail.com
www.polygraph.pl

e-ISSN 2380-0550
ISSN 1898-5238

***European Polygraph* offers open access**
to all its issues:
http://www.polygraph.pl
https://www.degruyter.com/view/j/ep
The original of *European Polygraph*
is its electronic version.

EUROPEAN
POLYGRAPH

Volume 12 • 2018 • Number 3 (45)

Contents

Articles

Book review

Articles

DE GRUYTER OPEN

EUROPEAN
POLYGRAPH

Volume 12 • 2018 • Number 3 (45)

DOI: 10.2478/ep-2018-0010

Zbigniew Mikrut
AGH University of Science and Technology
Kraków, Poland
Michał Widacki
University of Silesia in Katowice
Katowice, Poland
Jan Widacki*
Andrzej Frycz Modrzewski Kraków University,
Kraków, Poland

Experiments in Using Face Temperature Changes as an Indicator in Instrumental Detection of Deception

Эксперименты с использовании изменений температуры лица в качестве индикатора в инструментальной детекции лжи

Key words: Face temperature changes and selection of deception, infrared camera in detection of deception

1. Introduction

Variations of face temperature are certainly a good indicator of emotional changes, which is why attempts at using them in the detection of deception are being made.[1] Such variations may be observed with the use of an infrared camera, which implies

* jan.widacki@gmail.com

remote sensing and removes the need to put any sensors on the body of the subject and makes the method potentially attractive for detection of deception. Theoretically, it can be applied without making the subject aware, and even more so without the subject's consent, which may material for its use for the purposes of police and/or special units.

In infrared imaging changes of facial temperature are manifested by changes of colours of its various areas. The imaging can deploy full range of colours, from blue to dark red.

There are a number of potential methods for transforming the changes of colour spots into a viable graphic chart. One was patented in the US and the UK,[2] and another one in the UK.[3] We made such first successful attempts at such processing of the changing colour patterns into a graphic chart and described them ourselves in 2016.[4]

With this problem solved, another one arrived. Even minor movements of the subject's head, so small they would be insignificant and would in no way obstruct a classical polygraph examination, interrupted observation of the fragments of the face selected for monitoring, as the observed area disappeared from the field of view of the camera. This entailed the need to design an algorithm that would let the camera follow a selected area of the face in a continuous manner.

The implementation of an appropriate algorithm and the results of the test are described in section 2 below.

Section 3 describes the results of observations of temperature changes for multiple rectangular areas ("windows") located in various parts of the face that were later compared with the polygraph record consisting in the analysis of breathing functions, the work of the cardio-vascular system (the pulse and the relative fluctuations in blood pressure), and the galvanic skin (electrodermal) response. Another phenomenon studied was the impact of the size and shape of the selected "window" on the results achieved.

Recordings of the reactions of the subject to polygraph test using the Utah Zone Comparative Test (Utah ZCT) [...] technique were used to test the algorithm for detection of facial temperature changes with a relatively remote infrared camera, i.e. approx. 200cm / 78 in. away from the face of the subject (see section 3).

2. Elimination of the impact of minor movements of the face of the subject

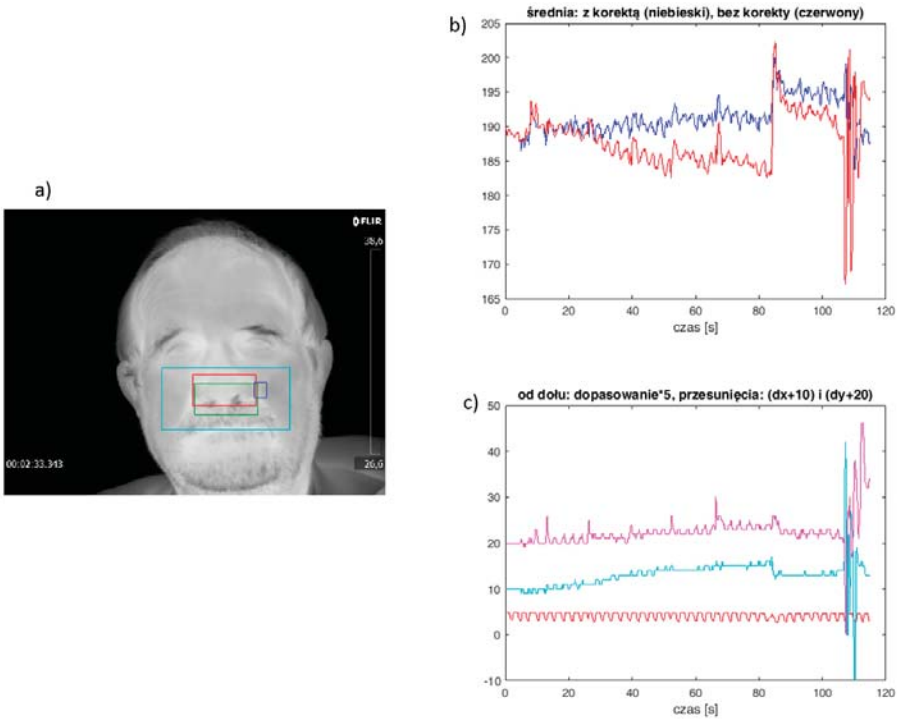
To achieve this goal, the researchers first had to define the "windows", that is rectangular fields on the face of the subject, within which the image was to be analysed.[5] It was essential that the infrared camera continuously tracks them in the successive frames of the film. The selection of an area had to account for three criteria simultaneously.

First, it had to contain objects with contrasted colours. Secondly, it had to be positioned in an area with largest temperature changes, that is in the vicinity of major blood vessels. Thirdly and finally, the objects it covered should be invariable in their shape and not change their position in relation to the windows, and even more so to the camera itself, which means that these should be the areas that change least due to the activity of facial muscles. With the criteria above in mind, the lower section of the nose was selected for the reference window (benchmark). This required setting the camera so as to give it a view of the nostrils. The reference window was surrounded with a border, within which the pattern was sought on the successive frames of the film. The size of the border defines the scope of permitted movements of the face. The reference was shifted within thus defined border. The correlation coefficient was calculated for every new position:

$$\gamma(u,v) = \frac{\sum_{x,y} \left[f(x,y) - \bar{f}_{u,v}\right]\left[t(x-u,y-v) - \bar{t}\right]}{\left\{\sum_{x,y}\left[f(x,y) - \bar{f}_{u,v}\right]^2 \sum_{x,y}\left[t(x-u,y-v) - \bar{t}\right]^2\right\}^{0.5}}$$

where f is the image of the frame, for which the t benchmark is sought, $f_{u,v}$ is the average value of the image $f(x,y)$ in the area below the reference t, and t is the average value of the image of the reference.

The process was carried out with normxcorr2 function in Matlab.[6] The calculated coefficients $\gamma(u, v)$ were recorded in the matrix. The coordinates of the maximum element of the matrix corresponded to the best match. The process of matching is presented in Figure 1.



b) means: with correction (blue), without correction (red)
*c) from the bottom: adjustment*5, shifts:(dx+10) and (dx+20)*

Fig. 1. The process of area adjustment and correction of the position of the tracked object (as described in the text).

The following areas used in the algorithm are marked on the image presented in Figure 1a:

- The light blue border defines the area within which the reference is sought.
- The green border indicates the initial position of the nose – the area, which was adjusted in subsequent frames of the film
- The red border surrounds the best match.
- The dark blue border defines the studied area from which the average temperature, reflecting the mean value calculated for the pixels contained in the window, was calculated.

The course of temperature changes in the studied area is presented in Figure 1b. The red colour denotes mean values calculated for the pixels in the dark blue window that did not change its position. The blue chart is an analogous curve, accounting for the cor-

rection of the position caused by movements of the face, with the data uploaded from the dark blue frame, whose position was strictly connected to the reference point of adjustment discovered (the red frame – Fig. 1a). The correction of location resulted in an observable change in the average temperature in the same area of the face, visible in the blue chart (Fig. 1b), which is substantiated by the horizontal character of the trend line in the blue chart.

Figure 1c presents additional curves illustrating the process of adjustment. The curves are shifted vertically or rescaled so as they did not superimpose. The bottom line presents the successive values of $Y(u, v,)$ adjustment coefficients, which were multiplied by five. The oscillations visible in the chart reflect the small changes in the successive pictures caused by the subject breathing through his nose. The two successive charts present the registered changes in the location of the face ("matching point") on axis x (light blue) and axis y (magenta), respectively. As can be seen from the chart, these are deviations in the range of several pixels (the vertical axis in the last two charts corresponds to distances in pixels.) More significant changes, visible towards the end of the test, are the result of quick intentional movements of the subject's head.

3. Polygraph record versus the results of thermal visual detection

The experiment in question was conducted with a FLIR A655sc infrared camera mounted on a tripod approximately 90cm (35 in.) away from the face of the subject. Such a setting of the camera had the face of the subject fill most of the shot. The software provided by the producer allowed to record video stream at 640×480 pixel resolution, at 30 frames a second. Such clips were later converted to a format compatible with Matlab (version 2016b).

The video was recorded during a practical stimulating test preceding the routine polygraph examination,[7] during which the subject was presented with six questions (stimuli).

The video recording the changes of the image of the subject's face was analysed in three configurations presented in Figure 2. Like in the previous case, the green border surrounds the area of the nose used for the correlation-based recalculation of the minor shifts caused by the movements of the subject's head. An analysis of the course of blood vessels in the face made it possible to define the remaining areas (windows).[8] The red (filled) window served the detection of changes of the lips position.

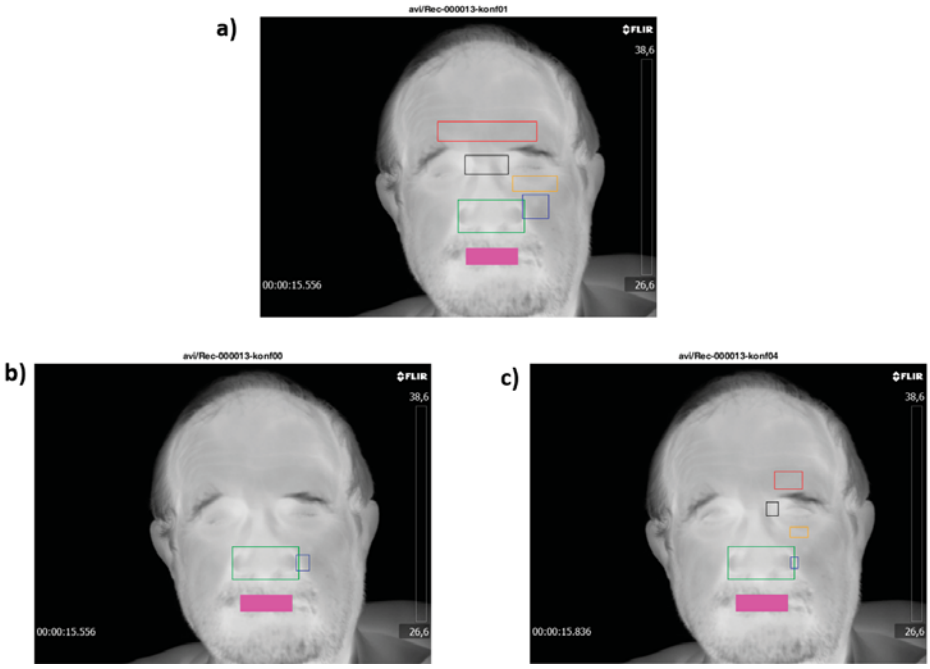


Fig. 2. Three examples of configuration: a), b), c).

Configuration "conf00" consisted of one medium-sized area situated around the nose (see: Fig. 2b). The remaining two ("conf01" and "conf04") make it possible to upload information from the areas of the forehead, base of the nose, cheek below the left eye, and cheek by the nose. Area selection was based on the three criteria discussed above. The selected areas differ in size: they are much larger in the case of "conf01" than of "conf04" (see: Figs. 2a and 2c).

Figure 3 presents a fragment of a polygraph recording with the registration result of a psychogalvanometer sensor recording changes in skin resistance of the subject (the galvanic skin response GSR, the electrodermal activity EDA), being part of the Lafayette LX4000 polygraph.

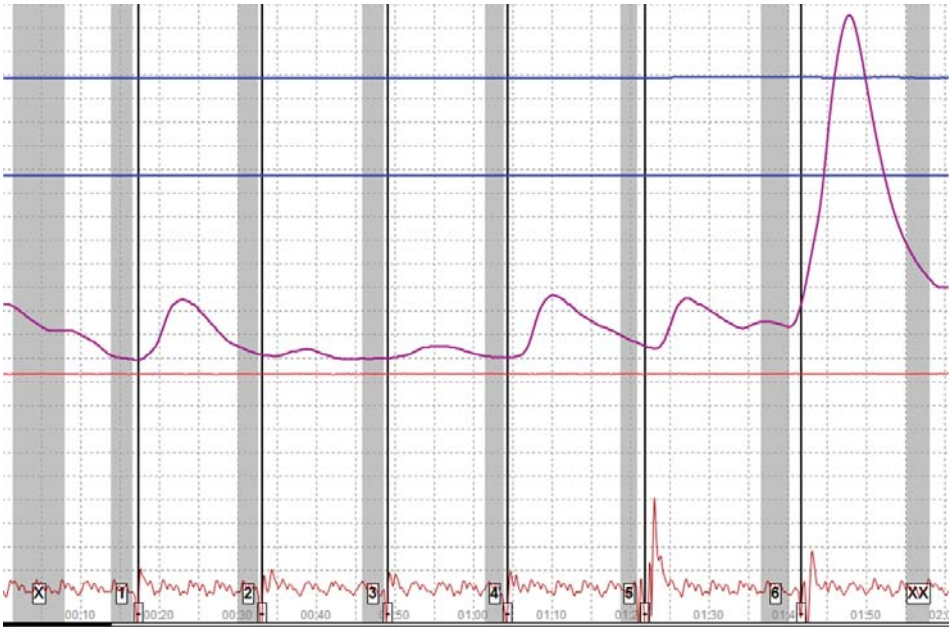


Fig. 3. Result of GSR sensor recording during a stimulation test.

Figure 4 presents the charts for the configurations discussed above. Each time a stimulus is presented is marked with colourful rectangles at the top of the figure. The green colour of the rectangle means a signal received on the GSR curve, whose counterpart will be sought on the infrared chart. The colours of the charts presented in the figure below correspond to the colours of the areas shown in Fig. 2. The configuration config00 is presented with dotted line, config01 – with thin lines, and config04 – with bold lines.

The visual analysis conducted by assessment of the value of local maximums shows significant differences observed for various locations and various sizes of the areas. The listing for individual answers is provided in Table 1.

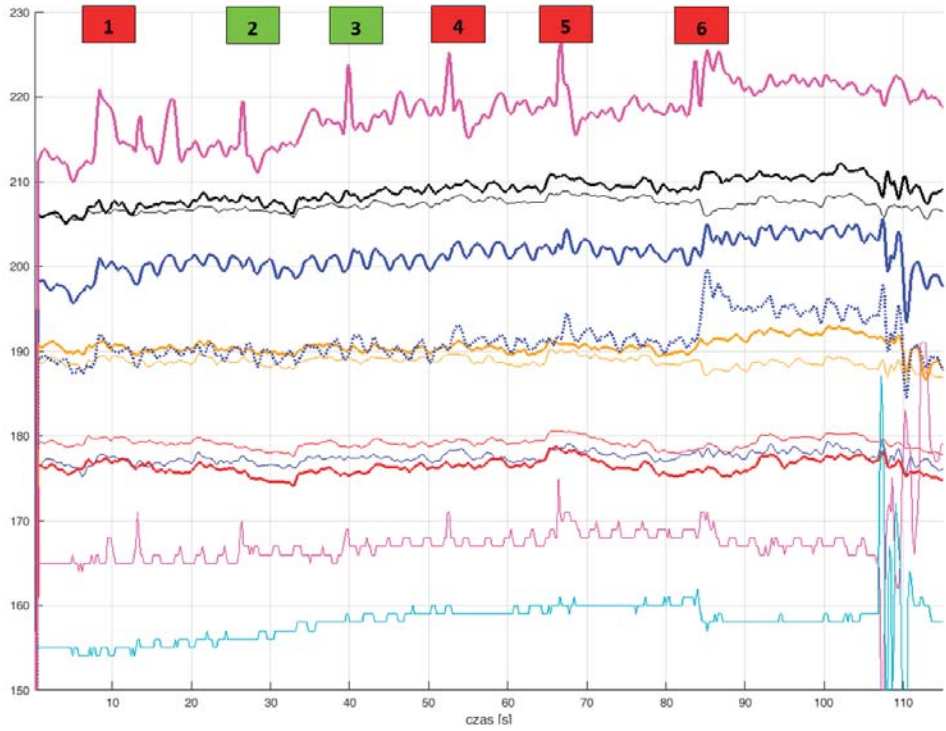


Fig. 4. Mean values calculated in windows defined for the following configurations: config00 – dotted line, config01 – thin lines, config04 – thick lines. Bottom: movements of the face in direction x (light blue) and direction y (magenta). Top: the area of the mouth (thick magenta line). A size 3 averaging filter was used for the functions calculated in the windows. The numbered rectangles mark the times when the subject provided the answers.

Configuration	Area	Size	Answer						Comments / (General Assessment + or -)
			1	2	3	4	5	6	
conf01	Forehead	big	+	+	-	-	+	+	Some responses are delayed/(-)
conf04	Forehead	small	+	+	-	-	+	+	
conf01	Base of the nose	big	+	-	-	-	+	-!	minimum instead of the maximum / (-!)
conf04	Base of the nose	small	+	-	-	-	+	+	(-)
conf01	Cheek under the eye	big	+	-	-	-	+	-!	minimum instead of the maximum / (-!)
conf04	Cheek under the eye	small	+	-	-	-	+	+	(-)
conf01	Cheek by the nose	big	+	+	-	+	+	-	(-)
conf04	Cheek by the nose	small	+	-	-	+	+	+	(+)
conf00	Cheek by the nose	medium	+	-	-	+	+	+	(+)

Table 1. Visual analysis of the defined areas: presence of local maximums.

As shown in Fig. 4 and Table 1, the lines for large and small areas are consistent, yet they do not make it possible to discriminate the reactions consistent with the GSR recording. Irregular situations are marked with exclamation marks. Characteristically, amplitudes of the functions obtained are lower for larger areas. Full consistency was obtained for the areas presented in the last two rows of Table 1.

4. Impact of minor changes of window location and size on the quality of the recording

Fig. 5 presents configuration config05 used for the analysis. The reference area was the window defined in the configuration config00 (see: the last line in Table 1 and Fig. 2b). The following investigated areas were moved (in respect to the reference area) towards the forehead of the subject, and their size was changed (see: Fig. 5).

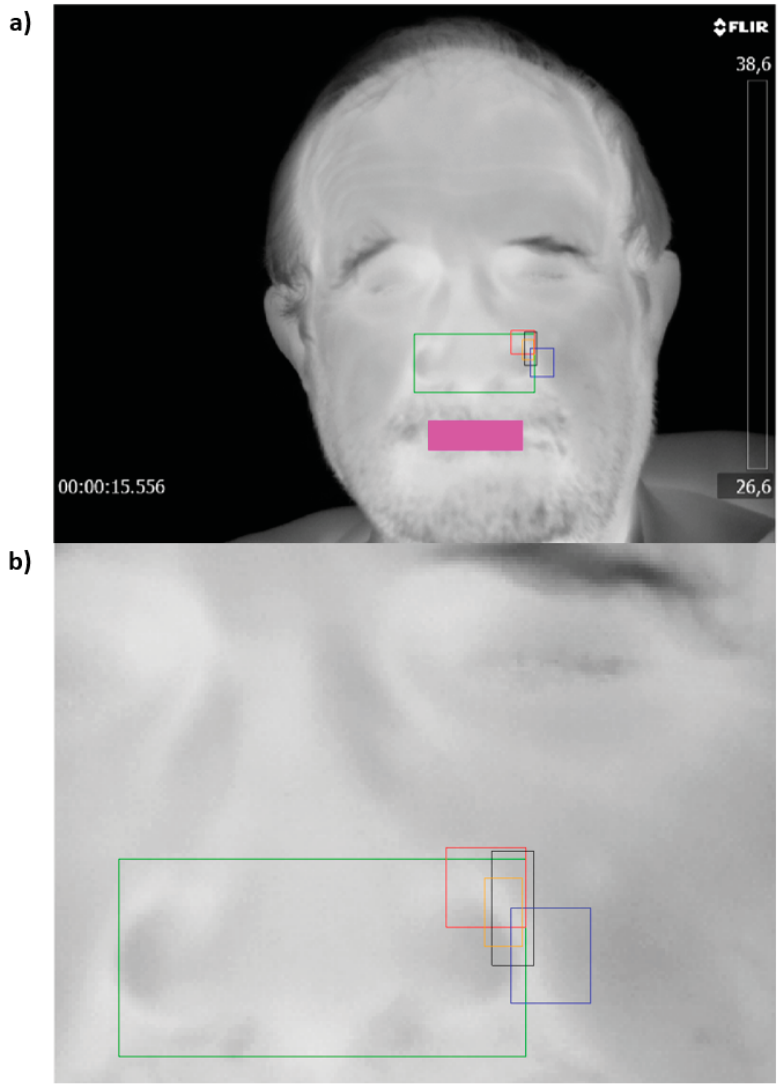


Fig. 5 a) Overview of config05 configuration, b) enlarged part of the image *showing the defined areas.*

Figure 6 gathers the functions (charts, curves) obtained, as previously, by averaging pixel values in individual areas. Five functions (counting from the top) are presented in "raw" form, which means that they were not subjected to averaging filtration. The order of presentation of the functions on the vertical axis corresponds to the successive

locations of the bottom edges of the areas defined in the config05 configuration, and presented in Fig. 5.

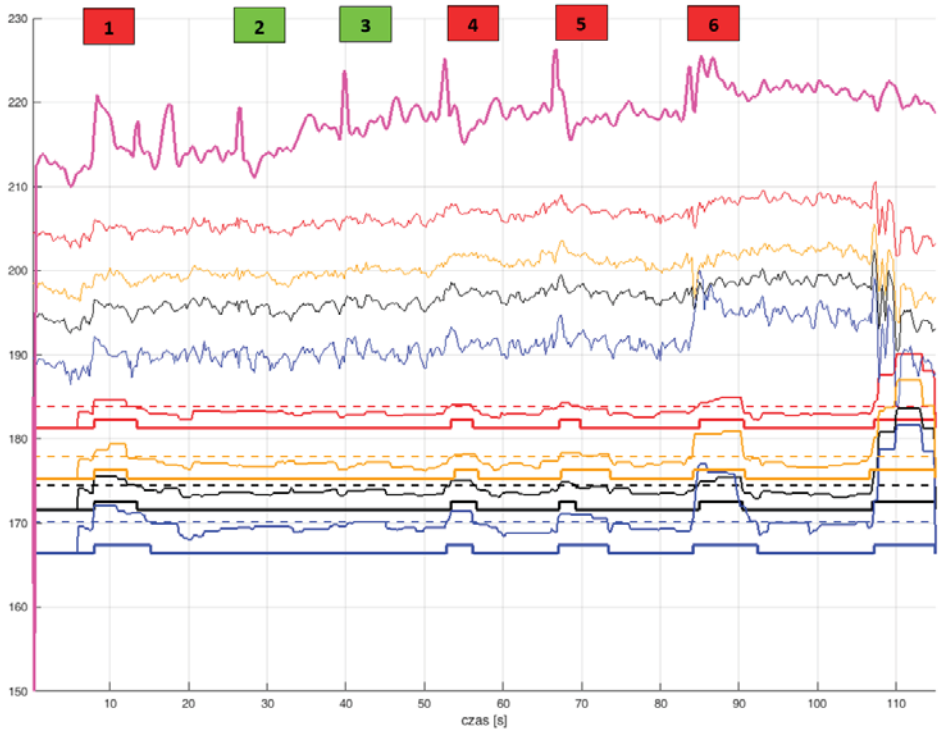


Fig. 6. Top to bottom: the function corresponding to the area "lips", with four functions calculated in the areas of configuration config05 (without the averaging filtration) below; further: results of detection and binarization of local maxima for four functions (described in the text).

Despite the differences in the location of the areas and their sizes, the functions have similar shape. The only significant differences were present around the 85th second of the recording.

Detection of the maximum values corresponding to the subject's deceptive answers (GSR local maxima) is a difficult task in the case of thus presented charts. That is why the decision to develop the algorithm supporting the analysis was reached. The amplitude was computed in a window moving along the given function. It was calculated by the subtracting of the minimum value from the maximum value. The functions resulting from that calculation (curves) are presented in the bottom section of Fig. 6 (thin lines, situated from 165 to 185 on the vertical axis).

This method made it possible to give emphasis to the local maxima. This made it possible to introduce cut-off lines (or thresholds, marked in broken lines in Fig. 6) precisely indicating the maxima, and consequently detecting the impact of temperature change caused by changes of emotions in the subject.

The position of the lines localising the maximums (thresholds) can be determined manually on the charts. Nonetheless, an attempt to generate them automatically was made, and in most cases provided successful results. To achieve this three methods were tested:

1) Definition of a threshold (a cut-off line localising the maxima) based on statistical analysis. To achieve that, the average and standard deviation were calculated for each of the four functions. The threshold was set at the level of mean value increased by half of standard deviation. Unfortunately, the results were unsatisfactory.
2) threshold level calculation based on the histogram of amplitudes of local functions, with the assumption that the histogram has a minimum that separates the answers during which the subject reacted from the ones during which the subject did not react (bi-modal histogram). The histograms for individual areas are presented in Fig. 7a (left column). However, the bi-modal assumption failed.
3) Using the standard histogram to calculate the accumulated histogram (see: Fig. 7b). After double "smoothing" (i.e. application of averaging filtration) with a window whose length is equal to 3 histogram bins (histogram bars), the difference (derivative) was calculated in a window with the length of 3 bins, and the maximum of the latter function was calculated (which correspond to the inflection point of the function of accumulated histogram). The threshold was situated in the histogram bin subsequent directly to the maximum (see: red curves and triangles on the x-axis in Fig. 7b).

The third method turned out the best results, which are presented in Fig. 6 (see: the thick lines situated below the corresponding functions of "local amplitudes"). Table 2 contains the parameters calculated for individual areas.

Area border colour	**Area field (in pixels)**	**Amplitudes of "area average" functions**		**Amplitudes of "local amplitudes" functions**		**Parameters of "local amplitudes" functions**			
		0÷80 [s]	**0÷100 [s]**	**0÷80 [s]**	**0÷100 [s]**	***avg***	***std***	***thresh* (meth. 3)**	***Δp***
red	441	6.3	6.9	3.3	3.7	1.9	0.75	2.6	0.76
orange	180	7.3	7.3	4.1	5.6	2.1	1.15	2.6	0.76
black	330	6.9	7.7	4.0	4.0	2.2	0.83	2.8	0.7
blue	525	8.2	13.6	5.7	10.7	3.6	1.88	3.8	0.87

Table 2. Parameters of the areas defined in configuration config05.

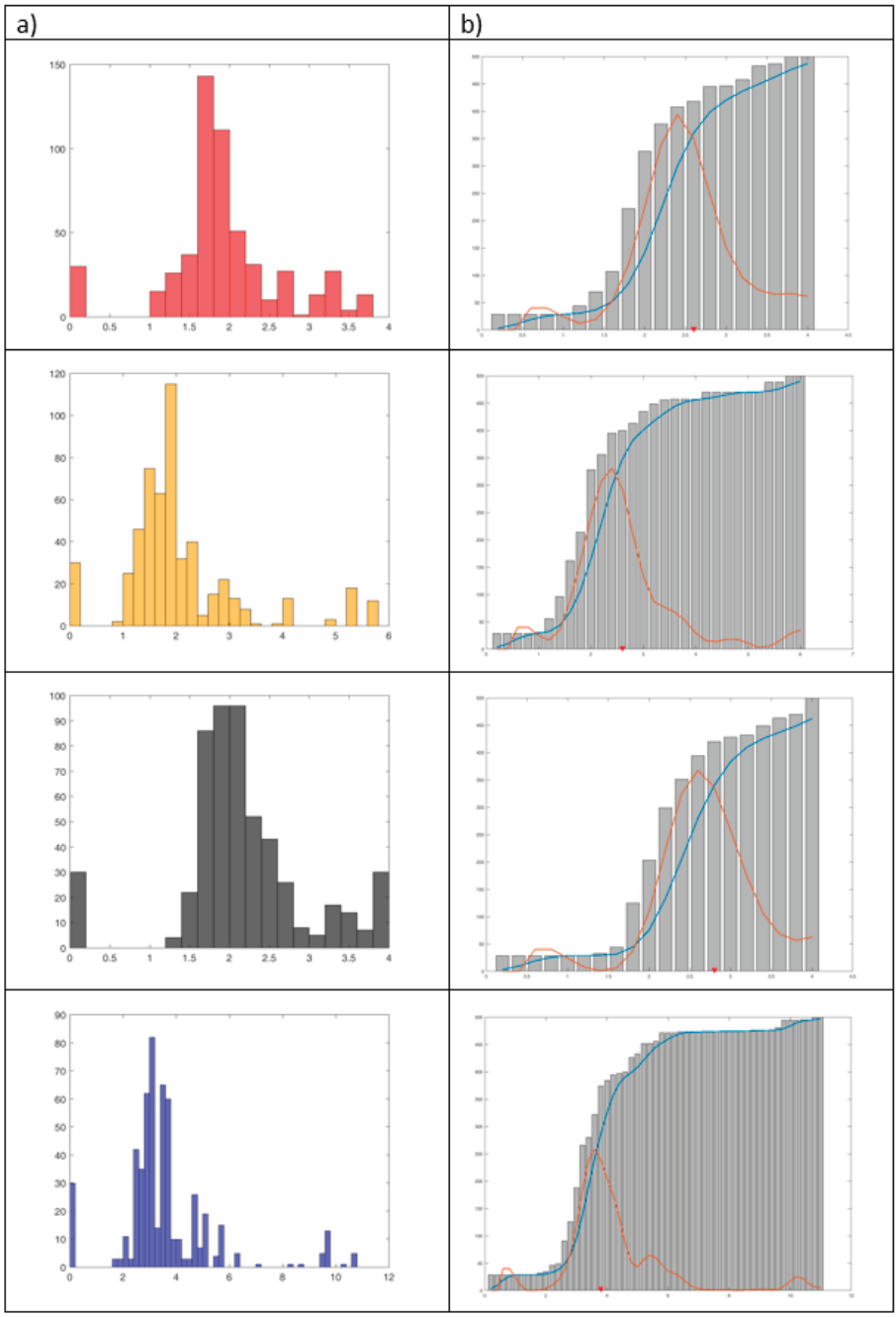


Fig. 7. a) histograms of the functions of "local amplitudes", b) cumulated histograms corresponding to the above, with smoothed functions (blue), derivatives (red), and thresholds (little red triangles).

Irregularities in the function of the means calculated in the tracked areas were recorded in the 85th second. For that reason, amplitudes were calculated for two intervals: [0, 80] and [0, 100]. The average (*avg*) and the standard deviation (*std*) were calculated for the scope [1, 100]. The threshold calculated with the third method (see above) does not depend on the time interval. The *Dp* parameter defined manually (see: Fig. 8) is thought-provoking.

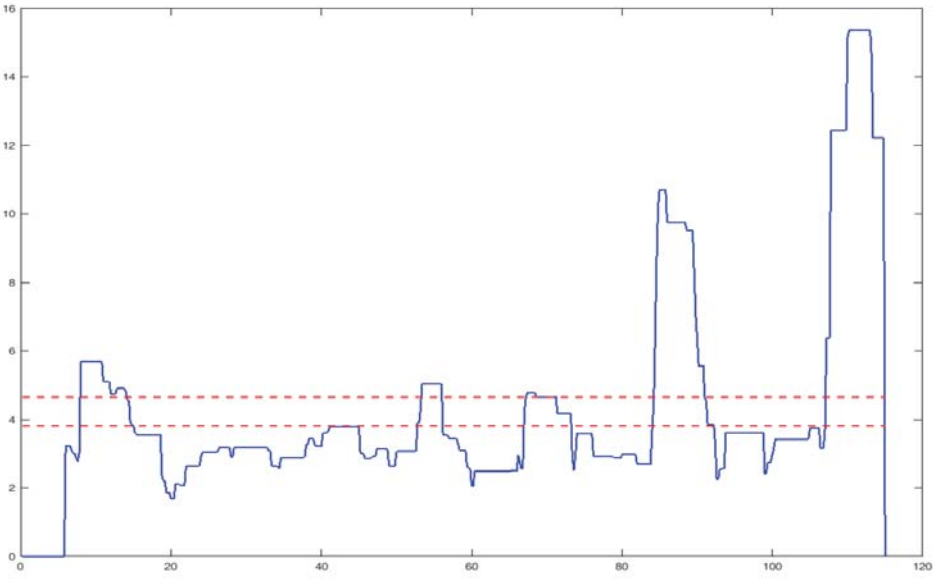


Fig. 8. The scope of changes for the correctly differentiating Dp threshold for the "blue" area.

This is a threshold variability range that correctly separates the answers during which a reaction occurred and was registered by the psychogalvanometer (GSR) from the ones that elicited no such reaction. It is the highest for the "blue" area, which also towers above the remaining parameters, when calculated both for the functions of "averages from the area" and of "local amplitudes". As the comparison of parameters demonstrates, it is mostly the location of the "window" that matters. Its size (area) is of less importance, although too small windows should not be defined, see: the second column of Table 2. The size of standard deviation outside the "blue" area does not influence the *Dp* parameter.

5. Analysis of the records obtained while performing Utah ZC test

The following stage of the study consisted in conducting a standard diagnostic polygraph test, during which the subject is seated in a special armchair, and instructed not to move but only provide short "yes" and "no" answers to the questions asked. The study conducted concerned a simulated situation in experimental conditions. Let us only explain that the task of the subject was to conceal the fact that the subject had visited a shooting range and fired shots at an image of a woman on a poster.

The polygraph examination made use of the diagnostic test that belongs to the routinely used Utah Zone Comparison Test (Utah ZCT, UZCT). The test was performed in single-question version. Control questions on the so-called "focused lie" and the following critical questions were used:

- Was it you who shot at the image of a woman?
- Did you have a gun in your hand on that day?
- Did you shoot at a shooting range on that day?

Thanks to the application of the standards of a polygraph examination, facial temperature changes could be examined for multiple stimuli coming in the form of questions in polygraph tests.[7] The examination was composed of a stimulation test ("with a number"), and 3 or 5 diagnostic tests, each of which contained three critical and three control questions.

To increase the comfort of the subjects, the recording was made from a camera set approximately 2 m (78 in.) away from the face of the subject, and not just 90 cm (35 in.) away as previously. Fig. 9 shows a sample configuration of the scene for this phase of the experiment. Polygraph sensors are attached to the body of the subject and "windows" can be seen delineated on the image of the subject's face.

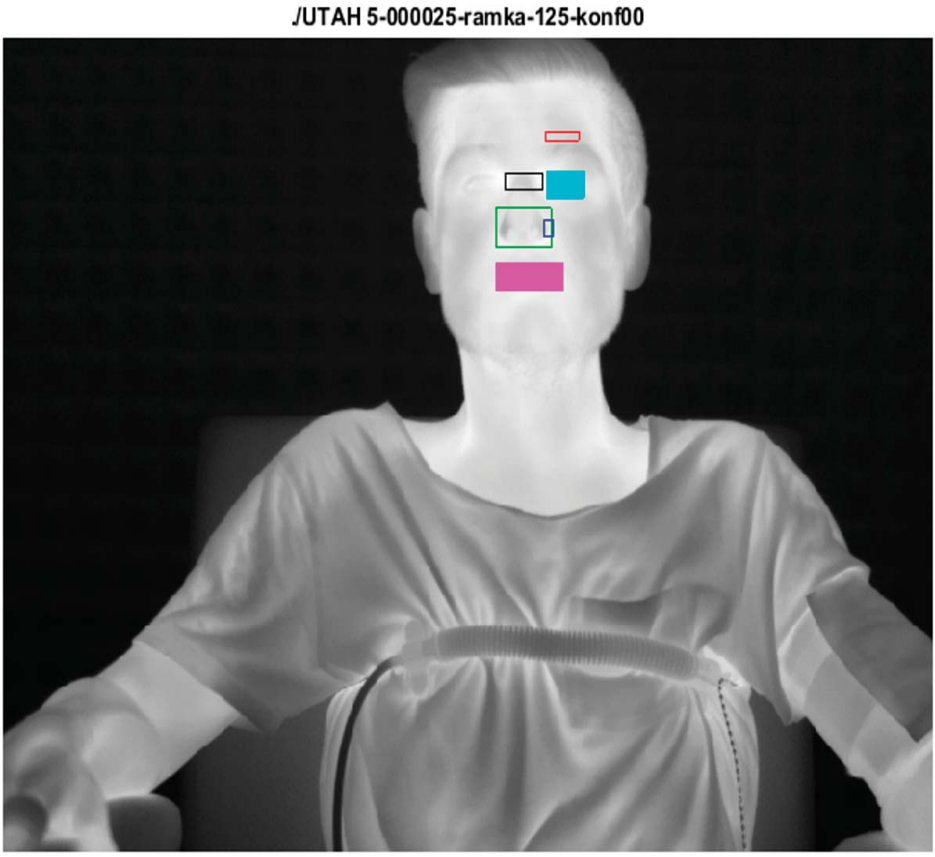


Fig. 9. Configuration defined for the subject; a similar configuration was used in the remaining experiments.

As the illustration clearly shows, moving the infrared camera to distance of around 2m away from the face of the subject radically reduced the image of the face, and consequently the area of the "windows" to be analysed.

Figures 10, 11, and 12 present three sample recordings of changes of facial temperature registered in parallel with the polygraph examination. To offset partially the reduction of the sizes of the "windows", the analysis was conducted on 16-bit pixel representation images (see: axis y in Fig. 10, 11, and 12).

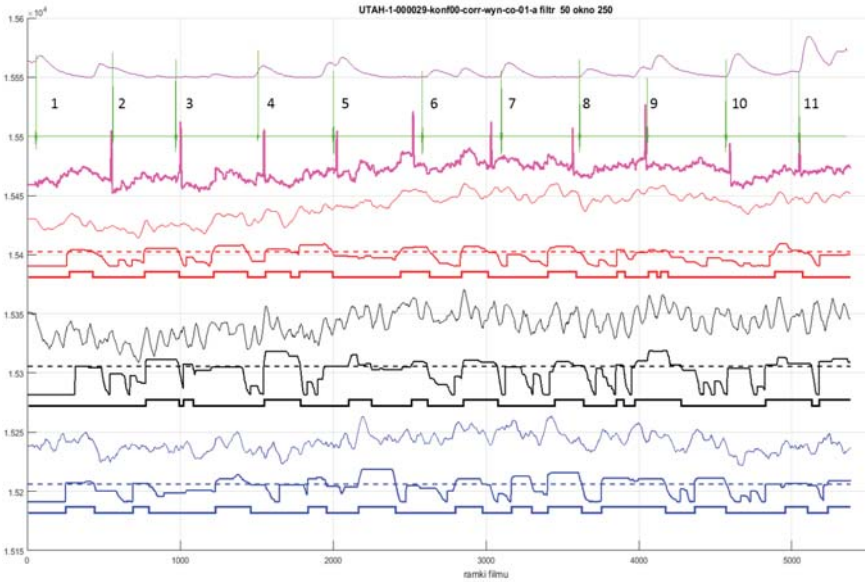


Fig. 10. Results of analysis of the video stream from the infrared camera for person AC144. Colours in line with configuration described in Fig. 9.

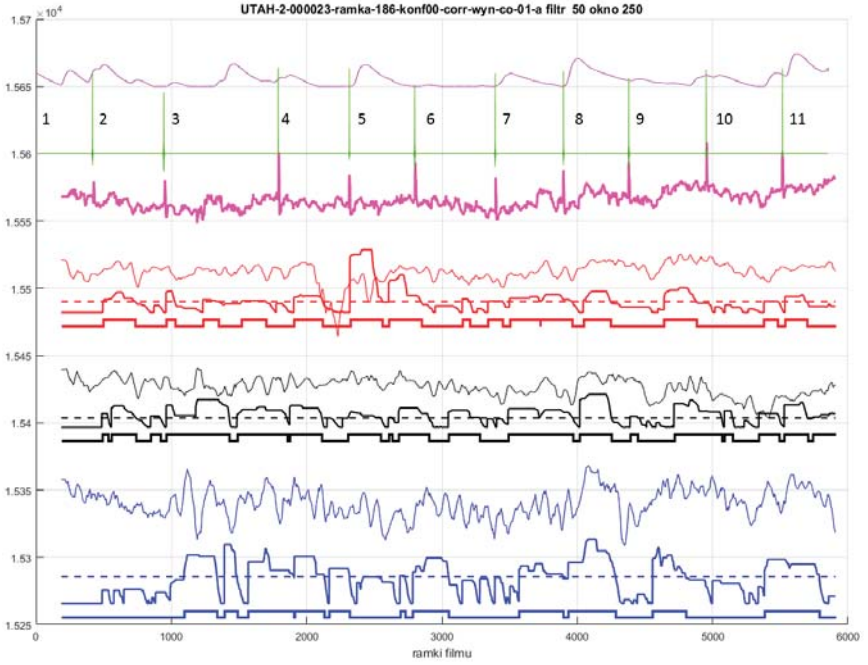


Fig. 11. Results of analysis of the video stream from the infrared camera for person KT 100, series 2. Colours in line with configuration described in Fig. 9.

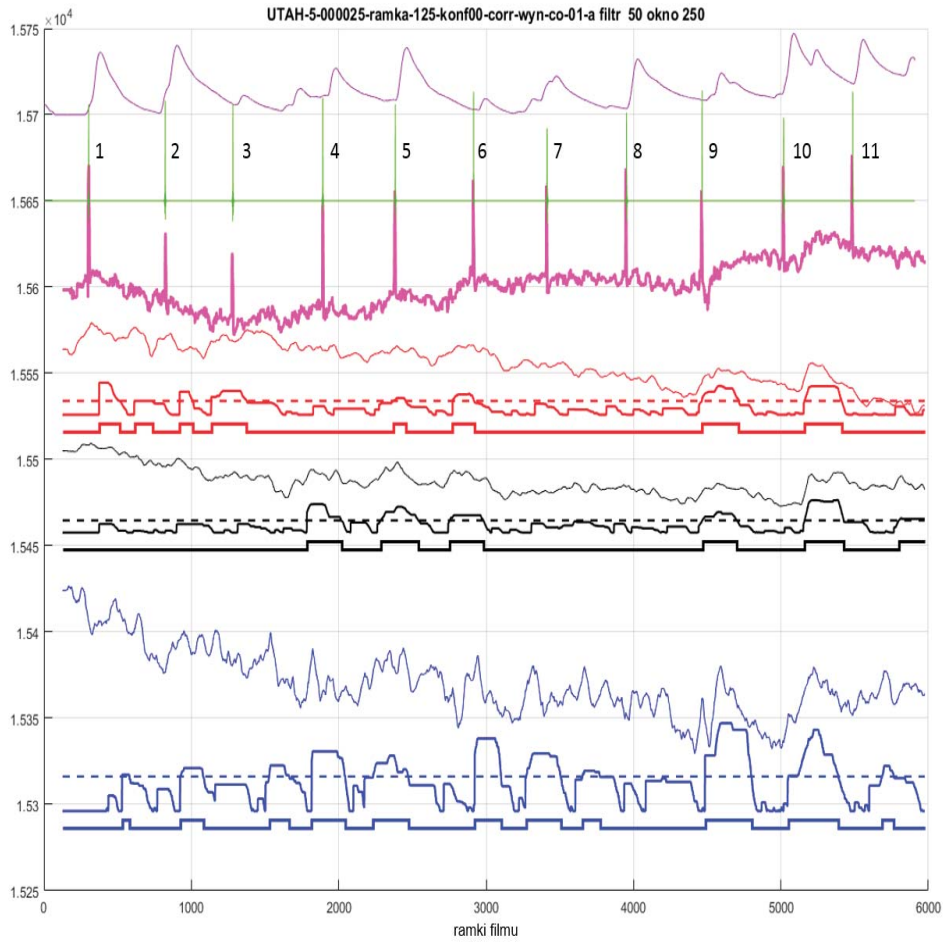


Fig. 12. Results of analysis of the video stream from the infrared camera for person KT 100 series 5. Colours in line with configuration described in Fig. 9.

The thresholds (situation of the lines detecting maxima) were set manually. Each recording was complemented with two charts visible at the top of the figures 10, 11, and 12. Violet colour denotes the signal from the psychogalvanometer (one of polygraph sensors recording the galvanic skin response GSR), The green colour denotes the moments (recorded by the asker) when answers were given. Numbers of the questions asked were entered between the curves.

The data in Table 3 is based on the readings from the polygraph and infrared recordings presented in figures 10, 11, and 12. Due to the shape of the curves, it is best to conduct

comparative analyses by comparing infrared signals (the chart of facial temperature changes) with the signal from the psychogalvanometer sensor (the curve of galvanic skin response changes, GSR). The latter is presented in figures 10, 11, and 12 as the first curve from the top (violet).

FILM	Probant												
.000029	AC144	pytanie nr	INT1	S2	N3	C4	R5	N6	C7	R8	N9	C10	R11
Diagram 1		Pneumo	Rm										
	POLIGRAF	GSR				Rm	Rm	Rd		Rd			
		CARDIO	Rm			Rd						Rd	
		czoło				x					x		
	Termowizja	oczy		x		x			x		x		
		nos					x		x		x		
FILM	Probant												
.000023	KT100	pytanie nr	INT1	S2	N3	C4	R5	N6	C7	R8	N9	C10	R11
Diagram 2		Pneumo											
	POLIGRAF	GSR					Rm			Rd			Rd
		CARDIO		Rm		Rm			Rd				Rm
		czoło			x	x				x			
	Termowizja	oczy				x	x			x			
		nos		x	x					x			x
FILM	Probant												
.000025	KT100	pytanie nr	INT1	S2	N3	C4	R5	N6	C7	R8	N9	C10	R11
Diagram 3		Pneumo											
	POLIGRAF	GSR		Rm			Rm		Rd				Rd
		CARDIO		Rm			Rm		Rm				Rd
		czoło			x							x	
	Termowizja	oczy					x					x	
		nos									x	x	

Legend:
X – the line of temperature rises in the given window, after the start of the question
Rm – minor reaction on polygraph channel
Rd – major reaction on polygraph channel

Table 3. Comparison of the results of detection of facial temperature changes and the reactions recorded by the polygraph.

A decision was made to assess globally a whole polygram (a single test) for the needs of the table, marking the strongest (Rd) and two successive (Rm) reactions. Only the volume amplitude was considered a reaction on cardio and GSR channels, as their extensity and duration were disregarded. The reactions to some questions on cardio and GSR channels were similar in volume, in which case they were appropriately labelled; if two reactions were present on one channel during a test, both received the Rd label.

6. Summary

The purpose of the experiment was first to find an independent method for transforming infrared camera image into a chart (curve), secondly to develop a method that would allow continuous observation and registration of the subject's facial temperature changes, and thirdly to find an answer to the question whether human emotional reactions registered with a standard computer polygraph (Lafayette, LX-4000) have their counterparts in the changes of face temperature recorded with infrared camera (FLIR A655sc).

The method of transforming infrared camera image into a curve described in literature[4] was successfully used and improved.

A number of characteristic areas of the face were selected and studied to analyse the infrared test video stream recorded at a close distance (approx. 90 cm). An algorithm detecting significant changes in the temperature of the selected areas was created. Moreover, areas whose analysis offers best results were defined. Full consistency with GSR recording was obtained for two areas situated near the nose (see: Table 1, the last two rows).

The comparison of polygraph test recordings and thermal reactions, described in section 5, only partially validates the claim that the reactions are consistent (parallel, simultaneous). The curves obtained by the averaging of pixel values from individual areas seem consistent with one another, yet are only to a small degree consistent with the registered skin galvanic response GSR (see: figures 10, 11 and 12, and Table 3). This, however, does not mean that no consistency was discovered between the obtained values, as such consistencies were e.g. observed for the questions N9 and C10 (for video stream 000025).

What seems to be the reason for deterioration of infrared detection in the experiment described in section 5 above, was the excessive distance between the camera and the face of the subject. The reason for such results may also be the excessively small size of the sample used for the study. Theoretically, with a far larger sample (the larger group

of persons examined), the consistency of reactions could be greater. Further tests must first be performed on a larger sample, and secondly the infrared camera must be situated closer to the face (e.g., at a distance of 90cm). Moreover, the claim made in literature[9] that the galvanic skin response may precede other, notably thermal, reactions in time also requires validation through experiments.

References

[1] Gołaszewski M., Zając P., Widacki J. (2015), *Thermal Vision as a Method of Detection of Deception*, European Polygraph, 9, 1, p. 31.

[2] US Patent 6996256, patent EP 1286620 (Detection system and method using thermal image analysis, 2006).

[3] Patent EP 0885587 (Thermal imaging method and apparatus, 1998).

[4] Widacki J., Widacki M., Antos J. (2016), *Preparation to Experimental Testing of the Potential from Using Face Temperature Changes Registered with an Infrared Camera in Lie Detection*, European Polygraph, 10, 1, p. 35.

[5] Matlab release 2016b, The MathWorks, Inc. Natick, Massachusetts.

[6] Lewis J.P. (1995), *Fast Template Matching*, Vision Interface, p. 120–123.

[7] *Kryminalistyka*, ed. by J. Widacki (2016), 3rd ed., CH Beck, Warszawa.

[8] Aleksandrowicz R. (2009), *Mały atlas anatomiczny*, PZWL, Warszawa, p. 97.

[9] Boucsein W. (2012), *Electrodermal Activity*, 2nd ed., Springer, New York–Dordrecht–Heidelberg–London, p. 29–36, 130 and ff.

The article is a part of Polish National Centre's (NCN), project no. DEC-2013/11/B/HS5/03856

DE GRUYTER OPEN

EUROPEAN POLYGRAPH

Volume 12 • 2018 • Number 3 (45)

DOI: 10.2478/ep-2018-0011

James Allan Matte*
Matte Institute of Polygraph Science
Williamsville, New York
USA

Setting the Record Concerning the Differences Between the Matte Quadri-Track and the Backster Zone Comparison Techniques

Установление записей различий между методами Matte Quadri-Track и Backster Zone Comparison Techniques

Key words: Matte Quadri-Track Zone Comparison Technique, Backster Zone Comparison Technique, Either-Or Rule, Dual Equal Strong Reaction Rule, Fear of Error, Othello Error, Hope of Error, Truth Cut-Off Scores, Stimulation test, Habituation

There has been some question within the polygraph community regarding whether the Matte Quadri-Track Zone Comparison Technique with its innovative changes were original or merely a copy of the Backster Zone Comparison Technique from which the MQTZCT emanated. The published documents provided herein, clearly show that the MQTZCT reduced the Truth Cut-Off scores in its conclusion table six years before

* jamesallanmatte@mattepolygraph.com

This author acknowledges his gratitude to Gregory C. Adams, former director and chief instructor (2011–2018) of the Backster School of Lie Detection for his thorough review of this article and confirmation of the authenticity of its contents.

the Backster ZCT implemented its Truth Cut-Off score reduction. The MQTZCT also retained the value of the Cut-Off scores in each chart, rather than diminish their value with each chart as in the Backster ZCT. Furthermore, it also ameliorated Backster's "Either-Or" Rule, with the Matte "Dual Equal Strong Reaction" Rule, effectively inhibiting the successful use of countermeasures. The MQTZCT introduced the *Fear of Error* Control Question for comparison with the *Hope of Error* Relevant Question as a means of addressing the *Othello Error* (Ekman Dec. 1986). The MQTZCT used the Stimulation Test in conjunction with the MQTZCT, contrary to Backster's rejection and non-use. The MQTZCT also eliminated Backster's superfluous question regarding prior polygraph tests, and subsequently also eliminated Backster's drug question.

In 2015, a Director of a polygraph school accredited by the American Polygraph Association (APA), while attending an APA seminar, told an APA member advocating the use the Matte Quadri-Track Zone Comparison Technique (MQTZCT) that it was only a copy of the Backster Zone Comparison Technique and there was nothing original about it. Ordinarily, such a comment would have been ignored. However, such a statement by an APA School Director, having access to a myriad of polygraph students, required corrective measures. A meeting with that school director by this author, explaining the existence of documentation supporting the MQTZCT's unique features independent of the Backster ZCT, resulted in an invitation for this author to give a presentation of the MQTZCT to the school director's forthcoming class in March 2016. Unfortunately, that invitation was never confirmed, and this issue became dormant with the advent of more pressing projects requiring this author's undivided attention.

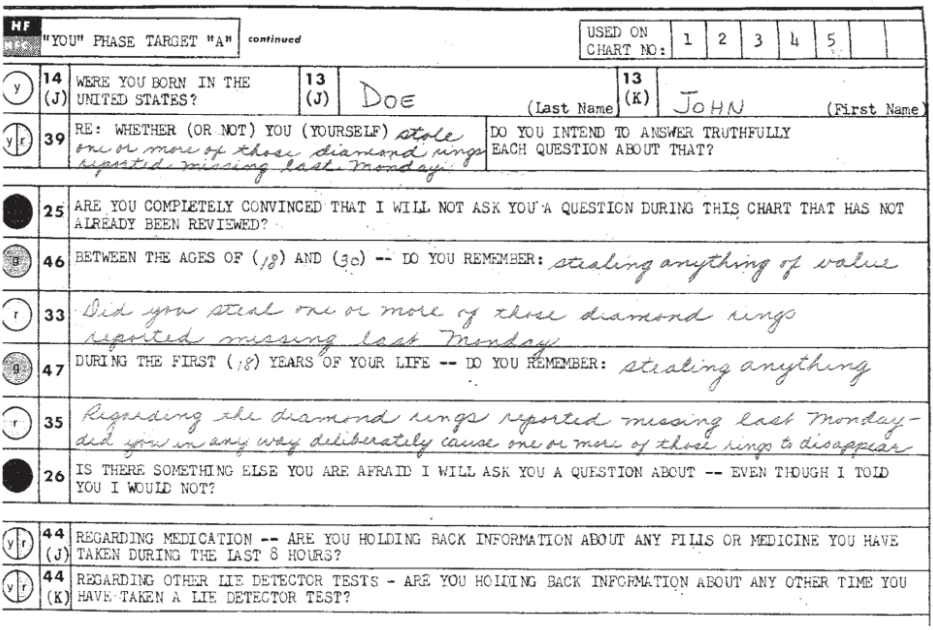
Nevertheless, this issue requires correction for historical purposes as well as edification for polygraph examiners. Hence, the following information, supported by documents, is offered to set the record straight.

Cleve Backster, Director of the Backster School of Lie Detection, published a Standardized Polygraph Notepack and Technique Guide for his Backster Zone Comparison Technique, starting in 1963, followed by other Notepacks in 1969 and 1979, which he distributed to each and all of his students. This 24-page Notepack contained all of the elements required for the student to administer the You Phase, Exploratory, and the SKY series of polygraph examinations. However, the You Phase, Backster's single-issue zone comparison test, is the format used in evidentiary examinations, to which the Matte Quadri-Track Zone Comparison, also a single-issue test, is being compared.

The 1969 Notepack, subsequently superseded by the 1979 Notepack, are of special interest to this article. In 1984, Backster made changes to the 1979 Notepack, and annotated those dated changes in the Notepack, but did not change the date (1979) of the Notepack. In fact, he continued to print the 1979 Notepack until his death in 2013. Nonetheless, the aforesaid Notepacks reveal important information regarding the date

of those changes, and their relationship with the changes made in the Matte Quadri-Track ZCT published in 1977, 1978, and 1980.

The Backster 1969 Notepack, shows the following format which includes question #44J Regarding Medication, and 44K Regarding other Lie Detector Tests. See Format below from (Bailey & Rothblatt 1970), wherein Robert Henson, Backster's partner, completed in his own handwriting an example of a finalized Notepack. Below is the question format.



HF "YOU" PHASE TARGET "A" continued — USED ON CHART NO: 1 2 3 4 5

y	14 (J)	WERE YOU BORN IN THE UNITED STATES?	13 (J)	Doe (Last Name)	13 (K) John (First Name)
y r	39	RE: WHETHER (OR NOT) YOU (YOURSELF) stole one or more of those diamond rings reported missing last Monday	DO YOU INTEND TO ANSWER TRUTHFULLY EACH QUESTION ABOUT THAT?		
	25	ARE YOU COMPLETELY CONVINCED THAT I WILL NOT ASK YOU A QUESTION DURING THIS CHART THAT HAS NOT ALREADY BEEN REVIEWED?			
g	46	BETWEEN THE AGES OF (18) AND (30) -- DO YOU REMEMBER: stealing anything of value			
r	33	Did you steal one or more of those diamond rings reported missing last Monday			
g	47	DURING THE FIRST (18) YEARS OF YOUR LIFE -- DO YOU REMEMBER: stealing anything			
r	35	Regarding the diamond rings reported missing last Monday - did you in any way deliberately cause one or more of those rings to disappear			
	26	IS THERE SOMETHING ELSE YOU ARE AFRAID I WILL ASK YOU A QUESTION ABOUT -- EVEN THOUGH I TOLD YOU I WOULD NOT?			
y r	44 (J)	REGARDING MEDICATION -- ARE YOU HOLDING BACK INFORMATION ABOUT ANY PILLS OR MEDICINE YOU HAVE TAKEN DURING THE LAST 8 HOURS?			
y r	44 (K)	REGARDING OTHER LIE DETECTOR TESTS - ARE YOU HOLDING BACK INFORMATION ABOUT ANY OTHER TIME YOU HAVE TAKEN A LIE DETECTOR TEST?			

Figure 1

In 1977, the Matte Quadri-Track ZCT was first published in the Newsletter of the Empire State Polygraph Society in New York State. It was subsequently published in greater detail in *Polygraph*, Journal of the American Polygraph Association, Volume 7, Number 4, December 1978.

One of the major changes was the lowering of the Truthful cut-off scores (numerical threshold) versus the Deceptive cut-off scores.

Backster's cut-off scores are the same for both the Truthful and the Deceptive, (+-5 and -5) whereas the MQTZCT scores are lower for the Truthful (+4 and -5) as can be seen in the diagrams in Figure 2 from the 1969 Notepack and 1979 Notepack with 1984 Revision, shown below.

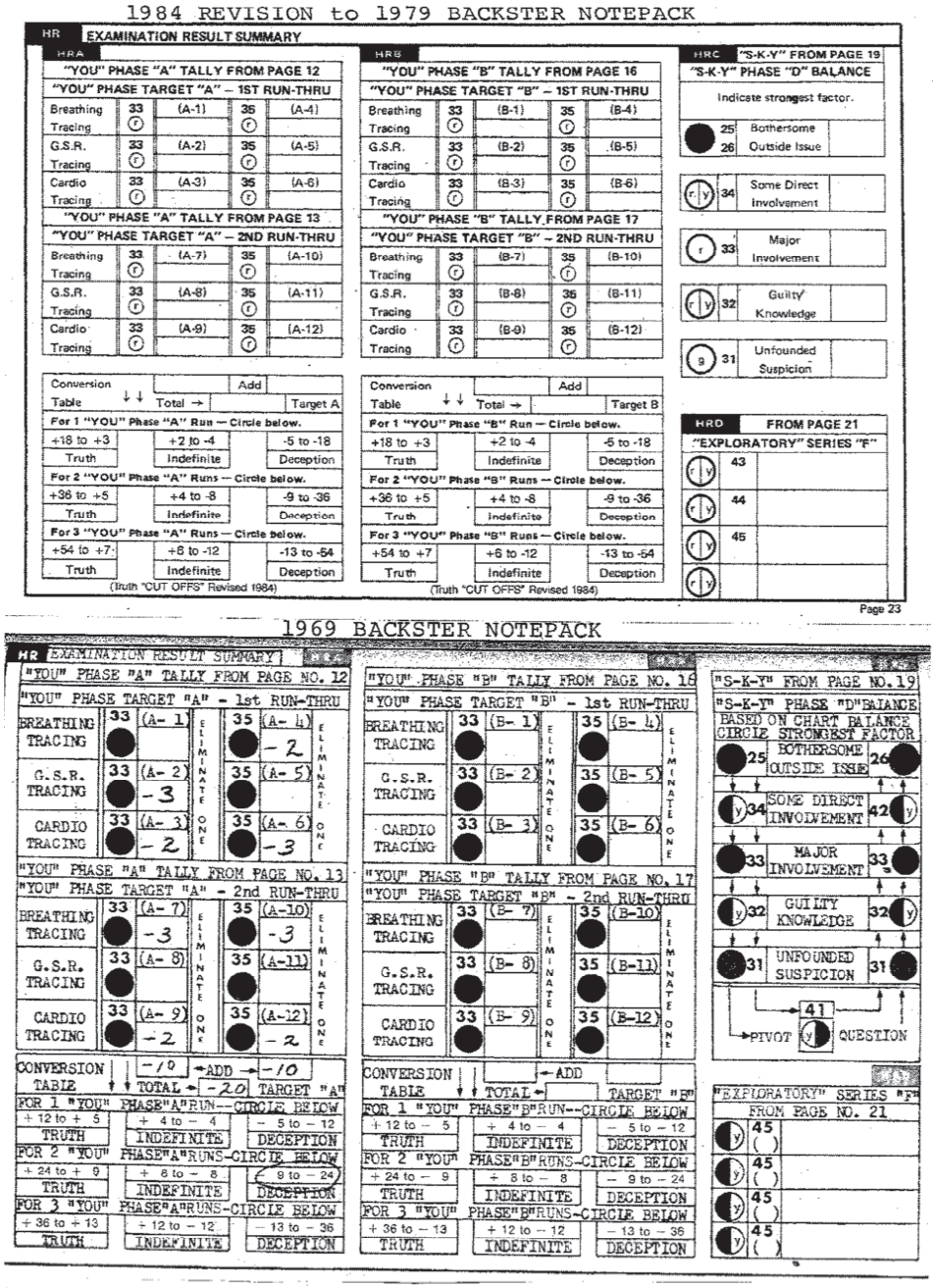

1984 REVISION to 1979 BACKSTER NOTEPACK
HR EXAMINATION RESULT SUMMARY
HRA
"YOU" PHASE "A" TALLY FROM PAGE 12
"YOU" PHASE TARGET "A" – 1ST RUN-THRU
Breathing Tracing 33 (A-1) 35 (A-4)
G.S.R. Tracing 33 (A-2) 35 (A-5)
Cardio Tracing 33 (A-3) 35 (A-6)
"YOU" PHASE "A" TALLY FROM PAGE 13
"YOU" PHASE TARGET "A" – 2ND RUN-THRU
Breathing Tracing 33 (A-7) 35 (A-10)
G.S.R. Tracing 33 (A-8) 35 (A-11)
Cardio Tracing 33 (A-9) 35 (A-12)
Conversion Table Add Total → Target A
For 1 "YOU" Phase "A" Run – Circle below.
+18 to +3 Truth | +2 to -4 Indefinite | -5 to -18 Deception
For 2 "YOU" Phase "A" Runs – Circle below.
+36 to +5 Truth | +4 to -8 Indefinite | -9 to -36 Deception
For 3 "YOU" Phase "A" Runs – Circle below.
+54 to +7 Truth | +6 to -12 Indefinite | -13 to -54 Deception
(Truth "CUT OFFS" Revised 1984)
HRB
"YOU" PHASE "B" TALLY FROM PAGE 16
"YOU" PHASE TARGET "B" – 1ST RUN-THRU
Breathing Tracing 33 (B-1) 35 (B-4)
G.S.R. Tracing 33 (B-2) 35 (B-5)
Cardio Tracing 33 (B-3) 35 (B-6)
"YOU" PHASE "B" TALLY FROM PAGE 17
"YOU" PHASE TARGET "B" – 2ND RUN-THRU
Breathing Tracing 33 (B-7) 35 (B-10)
G.S.R. Tracing 33 (B-8) 35 (B-11)
Cardio Tracing 33 (B-9) 35 (B-12)
Conversion Table Add Total → Target B
For 1 "YOU" Phase "B" Run – Circle below.
+18 to +3 Truth | +2 to -4 Indefinite | -5 to -18 Deception
For 2 "YOU" Phase "B" Runs – Circle below.
+36 to +5 Truth | +4 to -8 Indefinite | -9 to -36 Deception
For 3 "YOU" Phase "B" Runs – Circle below.
+54 to +7 Truth | +6 to -12 Indefinite | -13 to -54 Deception
(Truth "CUT OFFS" Revised 1984)
HRC "S-K-Y" FROM PAGE 19
"S-K-Y" PHASE "D" BALANCE
Indicate strongest factor.
25 26 Bothersome Outside Issue
34 Some Direct Involvement
33 Major Involvement
32 Guilty Knowledge
31 Unfounded Suspicion
HRD FROM PAGE 21
"EXPLORATORY" SERIES "F"
43
44
45
Page 23
1969 BACKSTER NOTEPACK
HR EXAMINATION RESULT SUMMARY
"YOU" PHASE "A" TALLY FROM PAGE NO. 12
"YOU" PHASE TARGET "A" - 1st RUN-THRU
BREATHING TRACING 33 (A-1) 35 (A-4) -2
G.S.R. TRACING 33 (A-2) -3 35 (A-5)
CARDIO TRACING 33 (A-3) -2 35 (A-6) -3
ELIMINATE ONE
"YOU" PHASE "A" TALLY FROM PAGE NO. 13
"YOU" PHASE TARGET "A" - 2nd RUN-THRU
BREATHING TRACING 33 (A-7) -3 35 (A-10) -3
G.S.R. TRACING 33 (A-8) 35 (A-11)
CARDIO TRACING 33 (A-9) -2 35 (A-12) -2
ELIMINATE ONE
CONVERSION TABLE -10 ADD -10
TOTAL -20 TARGET "A"
FOR 1 "YOU" PHASE "A" RUN--CIRCLE BELOW
+12 to +5 TRUTH | +4 to -4 INDEFINITE | -5 to -12 DECEPTION
FOR 2 "YOU" PHASE "A" RUNS-CIRCLE BELOW
+24 to +9 TRUTH | +8 to -8 INDEFINITE | -9 to -24 DECEPTION
FOR 3 "YOU" PHASE "A" RUNS-CIRCLE BELOW
+36 to +13 TRUTH | +12 to -12 INDEFINITE | -13 to -36 DECEPTION
"YOU" PHASE "B" TALLY FROM PAGE NO. 16
"YOU" PHASE TARGET "B" - 1st RUN-THRU
BREATHING TRACING 33 (B-1) 35 (B-4)
G.S.R. TRACING 33 (B-2) 35 (B-5)
CARDIO TRACING 33 (B-3) 35 (B-6)
ELIMINATE ONE
"YOU" PHASE "B" TALLY FROM PAGE NO. 17
"YOU" PHASE TARGET "B" - 2nd RUN-THRU
BREATHING TRACING 33 (B-7) 35 (B-10)
G.S.R. TRACING 33 (B-8) 35 (B-11)
CARDIO TRACING 33 (B-9) 35 (B-12)
ELIMINATE ONE
CONVERSION TABLE ADD
TOTAL TARGET "B"
FOR 1 "YOU" PHASE "B" RUN--CIRCLE BELOW
+12 to -5 TRUTH | +4 to -4 INDEFINITE | -5 to -12 DECEPTION
FOR 2 "YOU" PHASE "B" RUNS-CIRCLE BELOW
+24 to -9 TRUTH | +8 to -8 INDEFINITE | -9 to -24 DECEPTION
FOR 3 "YOU" PHASE "B" RUNS-CIRCLE BELOW
+36 to -13 TRUTH | +12 to -12 INDEFINITE | -13 to -36 DECEPTION
"S-K-Y" FROM PAGE NO. 19
"S-K-Y" PHASE "D" BALANCE
BASED ON CHART BALANCE
CIRCLE STRONGEST FACTOR
25 BOTHERSOME OUTSIDE ISSUE 26
34 SOME DIRECT INVOLVEMENT 42
33 MAJOR INVOLVEMENT 33
32 GUILTY KNOWLEDGE 32
31 UNFOUNDED SUSPICION 31
41
PIVOT QUESTION
"EXPLORATORY" SERIES "F"
FROM PAGE NO. 21
45 ( )
45 ( )
45 ( )
45 ( )

Figure 2

At the very bottom of the above 1979 diagram, in very small letters in parenthesis is the notation (Truth 'CUT OFFS' Revised 1984).

It shows that Backster reduced the Truth Cut-Offs, at least six years after the Matte Quadri-Track ZCT reduced its Truth Cut-Offs.

Furthermore, the MQTZCT eliminated Backster's 44K question regarding other lie detector tests.

The MQTZCT Inserted a new Control Question #23 regarding the examinee's fear that an error may be made on his test regarding the target issue.

The MQTZCT Inserted a new Relevant Question #24 regarding the examinees hope an error will be made on his test regarding the target issue.

See diagram below from APA journal (Matte 1978).

POLYGRAPH QUADRI-ZONE COMPARISON TECHNIQUE

	14J	Were you born in the United States?
	39	Regarding whether or not you stole that $1000 discovered missing from the safe at ABC Markets on 12 Jan 77, do you intend to answer truthfully each question about that?
	25	Are you completely convinced that I will not ask you an unreviewed question during this chart?
#2	46	Between the ages of 18 and 23, do you remember ever stealing anything?
ZONE #1	33	Did you steal that missing $1000 from ABC Markets?
#3	47	During the first 18 years of your life, do you remember ever stealing anything?
	35	Regarding that $1000 missing from the safe at ABC Markets on 12 Jan 77, did you steal that money?
#4	23	Are you afraid an error will be made on this test?*
	24	Are you hopeful an error will be made on this test?*
	26	Is there something else you are afraid I will ask you a question about, even though I told you I would not?
	44J	Regarding drugs, are you holding back information about any drugs or medication you have taken during the last 12 hours?

As seen in above illustration, Control Question #23 is compared with Relevant Question #24 for a score which is added to those scores acquired from the previous two Control-Relevant question pairs for a total score which is applied to the Conclusion

Table depicted Figure 3 below. The aforesaid Fear and Hope of Error questions are designed to address the *Othello Error* (Ekman Dec. 1986).

Dr. Ekman, in his 1986 book *Telling Lies* discusses the elements of "fear" in his chapter on the 'Polygraph as Lie Catcher' and states:

"The severity of the punishment will influence the truthful person's fear of being misjudged just as much as the lying person's fear of being spotted – both suffer the same consequence." Dr. Ekman felt that the polygraph examination, like behavioral clues to deceit, is vulnerable to what he terms the 'Othello Error' because the Shakespearean character Othello failed to recognize that his wife Desdemona's fear might not be a guilty adulterer's anguish about being caught, but instead could be a faithful wife's fear of a husband who would not believe her. Both cause an autonomic nervous response.

CONCLUSION TABLE

For

TRI-ZONE QUANTIFICATION SYSTEM

	CIRCLE APPROPRIATE NUMBER BELOW		
RESULTS FOR 1 CHART – SPECIFIC TEST	+12 to +4 TRUTH	+3 to -4 INDEFINITE	-5 to -12 DECEPTION
RESULTS FOR 2 CHARTS–	+24 to +8 TRUTH	+7 to -9 INDEFINITE	-10 to -24 DECEPTION
RESULTS FOR 3 CHARTS–	+36 to +12 TRUTH	+11 to -14 INDEFINITE	-15 to -36 DECEPTION
RESULTS FOR 4 CHARTS–	+48 to +16 TRUTH	+15 to -19 INDEFINITE	-20 to -48 DECEPTION

The Backster "conversion" table depicted below reflects progressively lower score requirements per chart as the number of charts in the tally increase until only minimum scores on all charts are needed to reach a conclusion.

CONVERSION TABLE ↓↓	TOTAL → [ ] ← ADD → [ ]	TARGET "B"
FOR 1 "YOU"	PHASE "B" RUN --	CIRCLE BELOW
+12 to +5 TRUTH	+4 to -4 INDEFINITE	-5 to -12 DECEPTION
FOR 2 "YOU"	PHASE "B" RUNS -	CIRCLE BELOW
+24 to +9 TRUTH	+8 to -8 INDEFINITE	-9 to -24 DECEPTION
FOR 3 "YOU"	PHASE "B" RUNS -	CIRCLE BELOW
+36 to +13 TRUTH	+12 to -12 INDEFINITE	-13 to -36 DECEPTION

Figure 3

Backster reduced the scores equally for both Truth and Deception in each subsequently administered chart to address possible habituation. This author theorized that the Guilty examinee may habituate to the control questions but not the relevant questions, whereas the Truthful examinee may habituate to the relevant questions, but not to the control questions. For a detailed discussion, read (Matte 1978, 1980 and December 2011).

The Cut-Off scores for the Truthful were subsequently reduced in 1989 by this author from +4 per chart to +3 per chart as a result of published research (Matte 1989). The 44J question regarding drugs was eliminated as being superfluous and a possible distraction from the target issue.

However, a most significant change to the Backster ZCT was the amelioration of Backster's " Either-Or" Rule, which according to Backster, formed the nucleus of his Zone Comparison technique. (Matte 2010).

Backster's "Either-Or" Rule

To arrive an at interim spot analysis tracing determination of (+2) or (-2) there must be a significant and timely tracing reaction in either the red zone or the green zone being compared (Backster (1989, Matte 1996, 2007 and 2010).

(a) If the red zone indicates a lack-of-reaction it should be compared with the neighboring green zone containing the larger timely reaction.
(b) If the red zone indicates a timely and significant reaction it should be compared with the neighboring green zone containing no reaction or the least reaction.

In order for the "Either-Or" Rule to work, it has to have access to a control question on either side of each relevant question. Hence, Backster included a third control question #48 following the second relevant question #35 (Backster Notepack 1979).

Therefore, if there is an equal, strong reaction to the first control question #46 and its neighboring relevant question #33 that immediately follows it, that control question is deemed defective, and the examiner compares that relevant question to the control question #47 that immediately follows it, which hopefully has little or no reaction and thus is considered an effective control question.

The problem with this scenario, especially in this day and age, is that the format and psychological structure of the various polygraph techniques have been published and are readily available on the internet. Hence, a guilty examinee intent on using a coun-

termeasure, will not restrict its use to just the first control question, but to all of the control questions, thus rendering them all as defective, resulting in an inconclusive finding.

The Matte Quadri-Track ZCT uses tracks, wherein each track contains a control/relevant question, necessitating that each relevant question be compared only to the control question preceding it within the same track, thus eliminating Backster's selective approach. Therefore, when the aforementioned situation occurs where the relevant and its neighboring control questions within the same track have equal strong reactions, that control question as defined by Backster is deemed defective, thus a score of minus -1 is assigned to that track, rather than a -2 with the Backster ZCT, but only in the pneumograph and Cardiograph tracing. The electrodermal activity (EDA) tracing is not included due to its volatility, and in such circumstance is given a zero score.

However, if all three tracks produce a minimum score of -2 for a total of -6, and this is duplicated by a second or third chart, the results would indicate Deception, inasmuch as the cut-off score for Deception is -5 per chart. Hence it would appear that the use of countermeasures against the MQTZCT in that instance would be ineffective.

Backster did not believe in the usefulness of the Stimulation test, used in the Reid and Arther Techniques, hence did not teach its use in the Backster ZCT. However, the MQTZCT did use it in conjunction with the administration of the Quadri-Track ZCT. But unlike the Reid and Arther Techniques which administered the Stimulation test as the second chart, after the collection of the first relevant chart, the Quadri-Track ZCT abandoned the Second Chart approach, and administered the Stimulation test as the first chart before any of the relevant tests were administered. See (Abrams 1989, Matte Nov. 2012).

It becomes evident from the aforementioned documentation that the Matte Quadri-Track Zone Comparison Technique, while emanating from the Backster Zone Comparison Technique, became a unique polygraph technique with significant changes and improvements, some of which Backster subsequently adopted. A full and detailed review of the workings of the Matte Quadri-Track Zone Comparison Technique, may be found in Matte 1996, with its 2012 Supplement. The reader is also invited to visit website at www.mattepolygraph.com where more than sixty published studies and articles on the polygraph authored by Matte are listed, many with links to the actual study or article.

References

Abrams, S. (1989). *The Complete Polygraph Handbook*. Lexington, Massachusetts, USA/Toronto, Canada: Lexington Books.

Backster, C. (1969). *Standardized Polygraph Notepack and Technique Guide*. Backster Zone Comparison Technique. New York, NY.

Backster, C. (1979). *Standardized Polygraph Notepack and Technique Guide*. Backster Zone Comparison Technique. New York, NY.

Bailey, F.L., Rothblatt, H.B. (1970*). Investigation and Preparation of Criminal Cases: Federal and State.* Rochester, NY: The Lawyers

Co-Operative Publishing Company.

Ekman, P. (September 1986). *Telling Lies.* New York, NY: Berkley Books.

Matte, J. A. (December 1978). Polygraph Quadri-Zone Comparison Technique. *Polygraph*, Vol. 7, No. 4.

Matte, J. A. (1980). *The Art and Science of the Polygraph Technique*. Springfield, Illinois: Charles C. Thomas, Publisher.

Matte, J. A. (1996). *Forensic Psychophysiology Using The Polygraph: Scientific Truth Verification – Lie Detection.* Williamsville, New York: J.A.M. Publications.

Matte, J. A. (July 2007). Psychological structure and theoretical concept of the Backster Zone Comparison Technique and the Quadri-Track Zone Comparison Technique. *Polygraph,* Vol. 36, No. 2. 84–90.

Matte, J. A. (July 2010). A field study of the Backster Zone Comparison Technique's Either-Or Rule and scoring system versus two other scoring systems when relevant question elicits strong response. *European Polygraph,* Vol. 4, No. 2(12).

Matte, J. A. (2011). Psychological aspects of the Quadri-Track Zone Comparison Technique and attendant benefits of its Inside-Track. *European Polygraph*, Vol. 5, No. 2(16).

Matte, J. A. (2002–2012). *Supplement 2002–2012 – Forensic Psychophysiology Using The Polygraph: Scientific Truth Verification – Lie Detection.* Williamsville, New York: J.A.M. Publications.

Matte, J. A. (November 2012). Effect of the stimulation test administered before and after the first relevant chart of the control question test. *European Polygraph*, Vol. 6, No. 3(21).

Matte, J. A., Reuss, R. M. (1989). A field validation study of the Quadri-Zone Comparison Technique. *Polygraph,* Vol. 18, No. 4.

DE GRUYTER OPEN

EUROPEAN
POLYGRAPH

Volume 12 • 2018 • Number 3 (45)

DOI: 10.2478/ep-2018-0012

Tuvya T. Amsel*
Tel Aviv
Israel

A History Note: A Peep at the "Peak of Tension (POT)" Test & other "Recognition Tests"

Страницы истории: Взгляд на тест «пика напряжения» (Peak of Tension) и другие тесты распознавания

Key words: POT, history of POT, Recognition Tests

Recognition Test

"Polygraph techniques can be divided into two major categories, knowledge-based tests, also called recognition tests, and deception based tests. The recognition test family of PDD techniques includes; peak of tension tests (known & searching/probing), acquaintance (stimulation) tests and concealed information (Guilty Knowledge Test) tests. They attempt to determine if the examinee has knowledge only available to persons directly involved in an incident of concern." [1]

I. Early use

Although it is unclear who was the first to utilize the Recognition Test Leonarde Keeler was the first to report and describe it lengthy. On his writing he does not define the test

* ta@amsel.co.il

as a "Peak of Tension" test but rather use difference descriptive terms such as: Card Test, Map Test, Number Test, Name Test, Age Test, and Type of Crime Test [2]. On a 1930 paper he details a 1925 laboratory Card Experiment he conducted in Stanford University with Dr. Walter Miles and a Map Locations experiment [3].

But Keeler has not confined himself to laboratory experiments only and he employed the recognition tests in many high profile criminal investigations. One of the earliest one took place in 1929 described in Keeler's biography [4]:

> "Keeler used the map test ... It was used by him in Seattle, Washington in 1929 when Karl de Castro Mayer was under suspicion in the disappearance of James Eugene Bassett, a naval officer ordered to duty in the Pacific. No longer needing a car with his new assignment Bassett advertised his automobile for sale. Subsequently Bassett disappeared; however, his car was discovered in Mayer's possession. Mayer pleaded innocent and gave a plausible excuse for possession of the car. He offered to submit to a truth serum test to prove his innocence. Under the drug, he admitted nothing and then offered to take a polygraph test. Mayer was a hardened criminal but when he saw his reactions on the polygraph, lost his composure and refused to answer any questions. Keeler continued to question him and even though Mayer made no verbal replies, his reactions to Keeler's questions concerning areas on the map, helped first to place the disposal of the body in Washington, then narrow it down to a section of the county. Later the body was located in the area where Mayer's reactions indicated it would be found."

Ezra Carlsen (2010) added more information concerning this test [5]:

> "...For eight hours a day, five days straight, Mayer had been strapped to ... the polygraph while its operator, Leonarde Keeler, questioned Mayer about the location of the body. Mayer had refused to answer certain questions and had attacked the instrument. He was restrained, the machine was repaired, and the interrogation continued until, finally, the suspect offered his confession.
> "I know what that machine is," Mayer reportedly told the prosecutor. "I know it's recording the truth. I can't beat it. Let's not kid each other. You know and everybody else knows that I killed Bassett. What will you do for me if I come clean?"
> According to the machine, Mayer showed great anxiety when asked if he had shot Bassett; if he'd buried the body; if he'd hidden it near the "Little White House." For days, Keeler carried out his "fishing expedition," pointing to places on a map, asking if the body was at each spot, and interpreting Mayer's reactions on the polygraph chart. Keeler had narrowed it down to two cemeteries in the Bothell area outside Seattle when Mayer finally confessed."

II. POT in Court

On the early evening of May 22, 1934 the Emery and Mash Pharmacy in Baraboo, Wisconsin was robbed. The four robbery suspects who fled the scene of crime in a Ford T model car were chased by the local police as well as the neighboring Sheriff's office. Upon being stopped by Sheriff Roche the suspects stepped out of the car and one of them shot and killed the sheriff and immediately the suspects drove away from the scene. The suspects were captured later that evening. Due to the fact that the witnesses to the shooting were unable to identify the suspects who shoot the sheriff all four were charged with the attempted murder of the sheriff.

In February 1935 two of the suspects were tried in the Lake County Circuit Court under Judge Clayton F. Van Pelt. Due to the fact that the prosecution was uncertain who drove the car and who actually shot the sheriff Judge Van Pelt, upon stipulation, appointed Leonarde Keeler to polygraph them in order to establish they involvement in the incident [6].

Prof. Fred Inbau in his 1935 article "Detection of Deception Technique Admitted as Evidence" [7] reported about Keeler's tests of the suspects and it seems that Inbau was the first one to coin the term "Peak of Tension" when he described Keeler's "Name Test" applied on the two suspects polygraph tests:

> The Polygrams marked "B" and "C" contain the responses given during what might be termed "name tests," when an attempt was made to ascertain which of ten suspects, including the defendants, drove the automobile and which one shot the sheriff. For the purpose of such an examination, a list containing the names of these individuals, all known to each defendant and some of whom were also alleged to be implicated in the crime, was exhibited to the subjects and at points numbered from one to ten those names were mentioned in the question "Did - drive the automobile?" or "Did - shoot the sheriff?" ... By referring to the explanations appearing under each plate (set of questions), the reader will observe that in Loniello's name test "B" (pertaining to the driving of the automobile) the greatest change or deviation from his "normal" occurs at (8), where he reaches his "peak of tension" in blood pressure-due doubtless to the anticipation of being asked the question to which he expected to lie-and at which point there occurs a distinct and definite change in his respiratory curve."

III. Earlier use

The idea of the recognition test as a mean to identify the perpetrator was recommend by Prof. Hugo Munsterberg many years before Keeler. Munsterberg was a German professor in Freiburg University – Psychology Lab who was invited in 1892 to lecture in Harvard University. He settled in the USA and led the Harvard Experimental Psychology laboratory. He was one of the pioneers in applied and forensic psychology, extending his research and theories to industrial/organizational (I/O), legal, medical, clinical, educational and business settings. He was the president of the American Psychological Association (1898), the American Philosophical Association (1908), the Washington Academy, and the American Academy of Arts and Sciences. Münsterberg developed instruments indicating deception: heat of skin, heart rate of the heartbeat and speed of speech [8]. One of his assistance in the laboratory was Willian Marston.
In 1908, Münsterberg published his book "*On the Witness Stand*", where he discusses the many different psychological factors that can change a trial's outcome and pointed the way for rational and scientific means for probing the facts claimed by human witnesses by the application of experimental psychology to the administration of law. One of his suggestions is to use a recognition test type questioning:

> "The real use of the experimental emotion-method is therefore so far probably confined to those cases in which it is to be found out whether a suspected person knows anything about a certain place or man or thing. Thus if a new name, for instance, is brought in, the method is reliable; the innocent, who never heard the name before, will not be more excited if he hears that one among a dozen others; the criminal, who knows the name as that of a witness of the crime, will show the emotional symptoms." [9]

IV. Ancient Use

But the idea of the recognition test goes back to ancient days. If the Bible can be considered as a kind of a history book than the story of **AI** that is told in the book of Joshua (chapter 7) describes the earliest use of the recognition type test. Ai was Canaanite city that Joshua the leader of the Israelites tried to conquer but failed to do so in his first attempt. After the failure Joshua is being told by God that the reason for the failure is because one of the Israelites have looted gold, silver, jewelries that belonged to the treasury of God. God instruct Joshua to identify the looter by using the following mean c:

> "In the morning, present yourselves tribe by tribe. The tribe the LORD chooses shall come forward clan by clan; the clan the LORD chooses shall come forward

> family by family; and the family the LORD chooses shall come forward man by man."

Joshua followed God's instructions and:

> Early the next morning Joshua had Israel come forward by tribes, and Judah was chosen. The clans of Judah came forward, and the Zerahites were chosen. He had the clan of the Zerahites come forward by families, and Zimri was chosen. Joshua had his family come forward man by man, and Achan son of Karmi, the son of Zimri, the son of Zerah, of the tribe of Judah, was chosen."

Apparently the test was accurate because the suspect confessed and returned the goods.

V. Epilogue

As written in the book of Ecclesiastes attributed to be written by King Solomon:

> **"What has been will be again, what has been done will be done again; there is nothing new under the sun."** [11]

References

[1] Krapohl, D., Handler, M., & Strum, S., (2012), Terminology Reference for the Science of Psychophysiological Detection of Deception, 72

[2] Keeler, L., (1936) The Detection of Deception, reprinted in *Polygraph,* 23(2X1994). 166-7

[3] Keeler, L. (1930). A Method for Detecting Deception. *The American Journal of Police Science, 1*(1), 38-51. doi:10.2307/1147254

[4] Stevens, V., (1994), Biography of Leonarde Keeler. *Polygraph,* 23(2). 123

[5] Carlsen, E., (2010), Truth in the Machine, California Magazine, Cal Alumni Association. https://alumni.berkeley.edu/california-magazine/spring-2010-searchlight-gray-areas/truth-machine

[6] For a detailed review of the incident read: https://www.wiscnews.com/portagedailyregister/announcements/community/lillie-column-first-use-of-lie-detector-helps-convict-man/article_e6d12875-3758-5af2-9e04-c13ca565b164.html

[7] Inbau, E.F., (1935), Detection of Deception Technique Admitted as Evidence, Journal of Criminal Law & Criminology, 26(2), 265

[8] https://en.wikipedia.org/wiki/Hugo_Münsterberg

[9] Munsterberg, H., (1908), On the Witness Stand, Doubleday, NY, 132-3

[10] https://www.biblestudytools.com/joshua/7.html

[11] https://www.biblegateway.com/passage/?search=Ecclesiastes+1&version=NIV

Book review

DE GRUYTER OPEN

EUROPEAN
POLYGRAPH

Volume 12 • 2018 • Number 3 (45)

DOI: 10.2478/ep-2018-0013

Jan Widacki: Historia badań poligraficznych (literally: "history of polygraph examinations"), Kraków 2017

When the Andrzej Frycz Modrzewski Kraków University Publishing House (Oficyna Wydawnicza AFM) released a book by Jan Widacki entitled *Historia badań poligraficznych* (i.e. "history of polygraph examinations"), you realised with quite surprise that the issue of polygraph examinations had not been investigated from the historical point of view yet. Existing publications only treat historical questions in a cursory manner, without an attempt to investigate the controversial subject from the perspective of history. In this sense, Jan Widacki's essay into the history of polygraph examinations must be welcomed not only with appreciation but with a particular caring jealousy, as he has found an interesting chink in literature.

The work follows the clear, logical pattern that makes it the understanding of questions connected to polygraph examinations possible even to the uninitiated. The line of argument opens with reflections on the essence of lie (deception) and the earliest attempts at its detection, delving into the primordial times from the border between prehistory and history (the passages on the Vedas and the history of King Solomon) to show how realisations and reflections resulting from common sense and drawing from life's experience have gained scientific foundations (Chapter Two) with time. The author meticulously introduces the reader into the rudiments of disciplines (experimental psychology, physiology, study of emotions) relevant to the aforementioned examinations, presents the silhouettes of researchers, and describes (providing the necessary illustrations) the devices they used. In the third chapter, the author continues the previous subjects, presenting the first attempts at lie detection based on scientific foundations. Like anywhere else in the text, the reader will be pleased to find certain anecdotal threads (e.g. about Lombroso on p. 68), which nonetheless are much more than just an ornament or a testimony to the author's erudition, as they serve a very specific and practical goal by illustrating the claims he makes. Yet the greatest curiosity is satisfied by the chapter on the first attempts at the practical use of instrumental detection of deception (pp. 83–104), which discusses the development of polygraph examinations mostly against the background of the history of transformation of the law enforcement and judiciary systems in the United States in the earlier half of the 20th century. It is worth adding that the period as such was a fascinating moment in the development of the system, for example, in reference to civil rights (in the opposition to police practices, at times downright brutal), which is why the discussion of various, often surprising ideas (e.g. the use of scopolamine, see p. 96) practiced at the time by the creators and practitioners (Keeler) of polygraph examinations calls for very high appreciation.

Chapter Five is based on the juxtaposition of Reid's and Lykken's ideas, with an emphasis on the critical attitude towards the latter. Offering a subjective criticism of the book, which after all a reviewer is entitled to, you have an impression that this is where the current subjects, discussed against contemporary doctrine, including issues that are powerful bones of contention (especially in Poland) between individual authors begin to take the upper hand in the book. This fact is connected to the change of the narrative which shifts from a fascinating chat (which in no way does depreciate it, just the other way round) into something more of an academic lecture. The closer we move to contemporary times (chapters Six and Seven, and Widacki brought his considerations up to what he defined as "the end of the history of the polygraph", i.e. the late 1980s and the early 1990s), the more critical comments the author levels at the applied methods, practices, and judgements.

In a review, it is worthwhile to devote some attention to the formal layer. As mentioned earlier, the work is not only an interesting collection of insight into the development of polygraphy, but it has an additional profound educational value, not only on the forensic and process plane. Moreover, it is an absolute touchstone in terms of beauty and clarity of the language (a rarity today!), which makes its study and understanding easier also for non-specialists. The book can certainly be recommended to all the readers: both those advanced in forensic studies due to their academic or professional involvement and to the ones who are only taking the first steps on this beautiful path. With a formal tongue in cheek, yet with an absolutely stiff upper lip when it comes to the substance, a reviewer can say that the author managed to write a book edifying both the professor and the student.

Piotr Girdwoyń, Tadeusz Tomaszewski

The Basic Information for Authors

To publication will be accepts unpublished research papers as well as review article, case reports, book reviews and reports connected with polygraph examinations.

Submitted manuscripts must be written in English.

All papers are assessed by referees (usually from Editorial Board), and after a positive opinion are published.

Texts for publication should be submitted in the form of normalized printout (1800 characters per page) and in electronic form (diskette, CD), or sent by e-mail to Editorial Office.

The total length of research papers and review article should not exceed 12 pages, case reports – 6 pages, and other texts (book review, report) – 5 pages.

The first page of paper should contain: the title, the full name of the author (authors), the name of institution where the paper was written, the town and country.

Figures should be submitted both in printed form (laser print, the best) and electronic form.
Tables should be numbered in Roman numerals and figures in Arabic ones.

Figures, tables, titles of figures and titles of tables should be included on a separate page. The places in the text where they are to be included should be indicated.

The references should be arranged in the alphabetical order according to the surnames of the authors.

The references should be after the text.

Each reference should include: the surname (surnames) of the author (authors), the first letter of author's first name, the title of the book, year and place of the publication, the name of publisher, or the title of the paper, the full title of the journal, the year, the volume, the number and the first page of the paper.

For example (in references):

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

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

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

Texts for publication in "European Polygraph" should be mail to:

"European Polygraph"
Andrzej Frycz Modrzewski Krakow University
ul. Gustawa Herlinga-Grudzińskiego 1
30-705 Kraków (Poland)

or e-mail: m.krasnowolska@gmail.com
oleg1998@gmail.com

Rules and Regulations Concerning Publishing Papers in European Polygraph

1. All papers sent to European Polygraph by their respective authors undergo preliminary assessment by the Editor-in-Chief.
2. The initial assessment results in the decision whether to send the work for an independent review or return it to the author with the information that it will be not published.
3. Two independent reviewers for "internal reviews" are appointed by the Editor-in-Chief or by the Deputy Editor following consultation with the Editor-in-Chief.
4. The following cannot be independent reviewers: Editor-in–Chief, Deputy Editor-in-Chief, employees of Andrzej Frycz Modrzewski Krakow University, and people with papers published in the issue containing the reviewed paper.
5. The internal review should answer the question whether the reviewed paper is fit for printing and whether it requires any amendments, and if it does, state what they are, and must be in written form, and conclude in an unequivocal verdict concerning publication or rejection of an article.
6. If one of the reviewers provides comments and amendments, but does not disqualify the paper, the Editor pass the comments on to the author, asking for the author's opinion and any amendments.
7. Should the opinions of the author and reviewer diverge, the decision to print the paper or otherwise is made by the Editor.
8. In the case mentioned in 7 above, before making their decision, Editor-in-Chief can appoint another independent reviewer.

9. In exceptional cases, when there are significant circumstances justifying such a decision, and the Editors do not agree with the opinion of the reviewer, Editors may decide to publish a paper against the opinion of the reviewer.
10. The names of reviewers is not disclosed to the author, and the names of authors are not disclosed to reviewers.
11. Book reviews and reports are not reviewed, the decision to publish them is the responsibility of the Editors.

Ordering Information

Please, send your orders by e-mail to ksiegarnia@kte.pl, including:

- full name (first and last in case of natural persons; registered business name in case of legal persons)
- address (permanent address or registered seat),
- address for delivery of your copies of European Polygraph,
- number of successive issues ordered (minimum 4), and number of copies of each issue.
- One year subscription (4 issue): USD 50, € 40.
- Shipment costs is added of the subscription price.
- All subscriptions must be pre-paid to our account:
  Krakowskie Towarzystwo Edukacyjne Sp. z o.o. ul. G. Herlinga-Grudzińskiego 1C, lok. C224, 30-705 Kraków

Payment by USD: 24 1020 2892 0000 5102 0222 8161

IBAN PL 24 1020 2892 0000 5102 0222 8161
KOD BIC (SWIFT): BPKOPLPW
Name of the bank: Powszechna Kasa Oszczędności Bank Polski Spółka Akcyjna

Payment by €: 19 1020 2892 0000 5002 0222 8203

IBAN Pl 19 1020 2892 0000 5002 0222 8203
KOD BIC (SWIFT): BPKOPLPW
Name of the bank: Powszechna Kasa Oszczędności Bank Polski Spółka Akcyjna

All publication dates are subject to change without notice.

Условия подписки

Заказы содержащие имя и фамилию или название компании, учреждения, адрес доставки и номер журнала, от которого должна происходить подписка (минимум 4 номера) необходимо переслать на адрес: ksiegarnia@kte.pl.

Стоимость годовой подписки, охватывающей 4 номера составляет $ 50 или € 40.

Цена включает в себя стоимость доставки.

Предоплата должна быть произведена на наш банковский счет:

Krakowskie Towarzystwo Edukacyjne Sp. z o.o. ul. G. Herlinga-Grudzińskiego 1C/lokC224, 30-705 Kraków

Payment by USD: 24 1020 2892 0000 5102 0222 8161

IBAN PL 24 1020 2892 0000 5102 0222 8161
KOD BIC (SWIFT): BPKOPLPW

Name of the bank: Powszechna Kasa Oszczędności Bank Polski Spółka Akcyjna.

Payment by €: 19 1020 2892 0000 5002 0222 8203

IBAN Pl 19 1020 2892 0000 5002 0222 8203
KOD BIC (SWIFT): BPKOPLPW
Name of the bank: Powszechna Kasa Oszczędności Bank Polski Spółka Akcyjna.

Сроки публикации могут изменяться без предварительного уведомления.