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A renaissance in voice analysers as tools for detection of deception?

The current situation in the world, and especially the threat of terrorism, creates a demand for new technologies that allow observation of human psychophysiological reactions without entering into direct contact with the person and without that person's knowledge, to evaluate the person's honesty (deception), intentions, hidden information, and information provided.

This has resulted in a revival of interest in devices and techniques for investigating emotional changes in the sound of the human voice (Widacki 2007).

The fact that changes in the voice *are* a good indicator of emotional changes has long been known, both from general observation and from psychophysiological research.

In 1970, the American Dektor Counterintelligence and Security Company introduced to the market a device called the Psychological Stress Evaluator (PSE), used to register psychophysiological changes in the sound of the human voice (Hoddard, 2002).

The device was created by Charles McQuiston, Allen Bell, and Bill Ford, former officers of the US Army. McQuiston was a polygrapher in the American army, Bell a counterintelligence officer, and Ford an electronic engineer. One

may infer from this that the US Army conducted some research, or at least a study, of the potential to use changes in the voice to detect deception as early as the 1960s. Moreover, other sources prove that, even at that time, US army services made use of the study of emotional changes in the voice to test the honesty of their informants (Hopkins 2005).

Similar work was also conducted in the USSR in the 1960s (Kulicki 1994).

Since the introduction of the PSE to the market and efforts at its commercial use, many works have been published on this method of lie detection. The evaluation of efficiency achieved by this method has shown extreme divergence (see: Kubis 1973, Hopkins 2005, Chapman 1989, Damme 2001).

In 1998 voice analysers were disqualified by the US Equal Employment Opportunity Commission, and furthermore, the research conducted by the Polygraph Institute of the Department of Defence proved that there are no arguments suggesting that the validity of such tests exceeded statistical probability. Moreover, the Appellate Court of the State of Wisconsin recognized the results of such a test as non-credible in 2001 (Barland 2002, Horvath 2002).

Attention was turned at the time to the fact that all voice analysers register only a single physiological correlate of emotions (emotional changes of the voice), while the traditional polygraph registers at least three physiological correlates: changes in the respiratory activity, changes in the activity of the heart, and GSR (Widacki 1980, Widacki 2008).

In recent years, attention was again turned to voice analysers and the prospect of using them in detection of deception for forensic, counterintelligence, business, and human resources management purposes (Widacki 2007).

Currently available are both devices measuring only voice parameters and analysing its changes, and those integrated with polygraphs registering other psychophysiological reactions simultaneously.

Known and available on the market are the following independent devices and testing technologies related to them:

- Psychological Stress Evaluator (PSE)
- Voice Stress Analyzer (VSA)
- Layer Voice Stress Analyzer (LVA)
- Truster
- Vericator.

In recent years at the University of Warsaw a number of preliminary voice analyser trials have been conducted. The research was of the pilot trial type and covered voice analysers LVA 6.50, Ti Pi 6.40, and Truster Pro, available on the market and marketed as professional.

The voice analysers tested are software packages for computers equipped with a soundcard. The kits included a microphone, a connector for optional connection to a telephone, and hardware HASP protection against using more than a single copy of the software.

These analysers are the latest edition, advanced and developed variations that continue the line of the Truster Pro. The number of functions in the newer models is even greater.

The utterance is analysed automatically and divided into segments of approximately 2 seconds, with each separately evaluated by the device, with appropriate numerical values attached.

Each utterance of the subject undergoing the test may be analysed in real-time or afterwards, based on a tape or computer recording of the voice. The analysis covers the involuntary reactions of the organism manifested in the tone and frequency of vibrations in the vocal waves of the subject. The device makes use of the technology for analysing the stress level, manifested in the voice of the subject, calculated with a special algorithm analysing stress intensity, and measuring it and grading.

As has already been mentioned, testing psychophysiological changes of the voice can be conducted in various situations:

- 1) real-time testing, without the subject's awareness
- 2) forensic testing, akin to polygraph testing
- 3) analysis of sound recordings.

In case 1) the test is conducted in real-time, during the interview. The sound may be acquired from a microphone or telephone receiver, while the results of the test are displayed in real-time as simple messages or reports. The analysis may be conducted at the time while talking to the subject, or afterwards, based on the recording.

In case 2) the test is conducted like a classical polygraph test, with a voice analyser being used in place of the polygraph. The test is conducted according to one of the techniques used for polygraph testing. Analysis of emotional changes of the voice replaces the analysis of diagrams in polygraph testing.

Tested in case 3) are sound recordings acquired earlier.

The pilot research made use of the Peak of Tension (POT) test, known from routine polygraphic procedures.

The result of initial pilot testing encourages further experimental research and allows the following claims to be made:

- 1) without a doubt, the voice analyser detects and illustrates changes in psychophysiological reactions

- 2) there is a repeatability of results while using different types of voice analysers
- 3) deception, invoked both in laboratory conditions and in field studies, can be discovered with a voice analyser
- 4) marked changes occur in the recording of the voice caused by changes other than deception
- 5) it seems theoretically possible to single out reactions related to deception from among others portrayed by the voice analyser
- 6) potential voice changes related to deception look similar in laboratory studies to those conducted in real life as field studies
- 7) there is a broader field for using a voice analyser than in the case of a classical polygraph (for example, for an *ex post* analysis of a recorded utterance)
- 8) reactions recorded by the voice analyser in the POT-type tests are similar to the galvanic skin response (GSR) reactions in such classical polygraph tests
- 9) it was observed that answers concerning facts which the subject is not certain about result in a reaction, yet generate a smaller one than in the cases when the subject is consciously deceiving
- 10) manifestation of emotional changes in the voice with the voice analyser is possible also during a free conversation (e.g. while conducting negotiations), and does not involve a special test procedure, and therefore can be conducted without informing the subject
- 11) levels of capacity to manifest emotional changes in the voice differ from person to person
- 12) repetition of the test results – much like in polygraph testing – results in the weakening of emotional reactions in the voice, which is caused by habituation.

It seems that the testing of emotional changes of the voice as the method for the detection of deception requires further experimental research. Although the research conducted so far does not allow classical polygraph testing to be replaced with voice analysis, as the pioneers of the method wanted, they allow the assumption that analysis of emotional changes of the voice may firstly significantly complement classical polygraph testing, and can secondly be taken into consideration as one of the range of methods (for example together with the method for analysing eyeball movements and/or testing changes of facial temperature) incorporated into the new polygraph to allow detection of deception without direct contact with the subject and without the subject's informed consent. Thus it can be taken into account as a constituent

of the new polygraph, testing physiological correlates of emotions, other than the ones tested so far.

Literature

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