

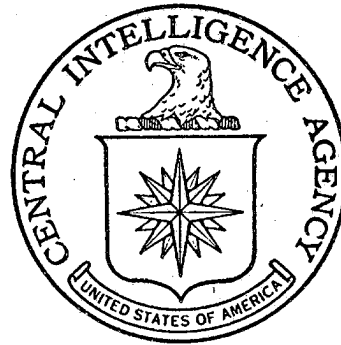
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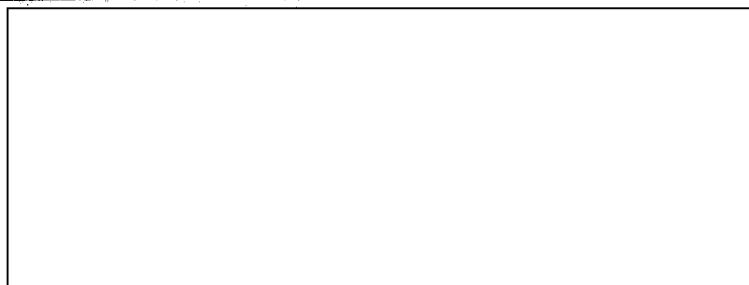
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SOVIET BEHAVIORAL RESEARCH METHODS--A POSSIBLE APPROACH TO
LIE DETECTION

Over an extended period, but particularly in the last few years, Soviet scientific research has been directed toward discovery of specific physiological phenomena associated with human behavior, including mental behavior. This work has contributed to the identification of the physiological manifestations of an organism's response to data presented to it. Soviet reports have described the quality and quantity of physiological manifestations of mental involvement during the organism's handling of information. While this research has not been undertaken primarily to develop competency in lie detection, it has nevertheless produced a body of data and instrumentation, the application of which would produce a strong lie detection capability in the USSR. This becomes apparent when the development of Soviet activity in this area is considered.

A. R. Luria, of the Institute of Defectology, Academy of Pedagogical Sciences, has stated that basic mental activity is neither a natural process of maturation nor an independent acquisition. A vast human experience is passed to the child from which he acquires new knowledge and new modes of behavior. Intelligent perception, purposeful memory, active attention, and voluntary action, among other psychological attainments, are all the result of protracted development of the child's active behavior. L. S. Vygotsky has said the most important activities of mental life result from social development of the child. These should be sought for, not in the mind, but in the forms of human intercourse with the world of the adult.

The orders and patterns of behavior develop memory, which is gradually organized through language. Language is constituted by the first signal system, then the second signal system*, and finally by the complex interplay between these two forms of sensory input and motor expression. The child learns to

*I. P. Pavlov's concept of the first signal system of man and animal--direct impressions of the world of reality. Second signal system (peculiar to man)--speech as a form of abstraction from the world about us.

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formulate its own aims and intentions, first, in its external and then in its internal speech. The child thus creates the highest forms of purposeful memory and voluntary activity. Connections called forth by speech gradually become predominant and substantially change the natural force relations of the stimuli. Behavior is always subordinated to the "law of force." In a complex stimulus, the decisive role is played by its strongest component. This proposition, demonstrated by Pavlov on animals, can be easily shown, also, in human beings. Many illustrations may be cited to show how changes take place in perception under the influence of verbal connections. The whole array of psychological adjustments and readjustments under the influence of speech do not take place at once but pass through successive stages. Out of this complexity, the normal individual will grasp and formulate that which is right, on the one hand, and that which is wrong, on the other.

A. Kreindler of the Academy of Sciences, Bucharest, Rumania, refers to a so-called "zone of speech" within the cerebral cortex. He refers to it as a mechanism directing the whole cortex in the basic functions performed by that structure. He thinks of it as the activating zone for all cortical areas implicated in all forms of complex function, including the formulation and expression of language, which stands at the pinnacle of the hierarchy of mental behavior.

A. Kreindler points out that the Soviet psychologists A.R. Luria and E.S. Bein (psychologist working with Luria) have worked out the regulative function of speech in the normal individual and its disorder in pathological states. Speech, besides being a means of communication and an instrument for thinking, is also a way of organizing human activity and a directing mechanism for psychic processes. The directive role of speech is unselective in its early stages but gradually acquires a complexity ultimately culminating in the highest verbal capacity so as to reflect one's own actions and to correct one's own errors.

If an approach were made to the problem of lie detection by way of Soviet research, the following factors would come to mind.

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First, there is need for knowing the number of parameters which may show variability in interpersonal communication. These may vary, depending on the nature of communication. The first signal system may be used exclusively, depending on visual, auditory, tactile, olfactory, gustatory, and kinesthetic cues. The second signal system may also be used exclusively, or the two may be used together.

At the Pavlov Institute, Koltushi, a study has been in progress involving interpersonal communication between chimpanzees. The first signal system, is, of course, used exclusively. Aspects of memory situations studied are those where discriminative recognition depends on visual stimuli such as triangles and squares. The experiment is arranged so that the experimental animal is being observed by a second animal. The second animal is then given the discrimination task and the learning times are compared. The investigators have as many as 21 parameters of behavioral characteristics which are incorporated in the character and learning assessment of the individual animals.

As might be expected, the exclusive use of the second signal system, limited to man, would have fewer parameters. E.N. Sokolov, Academy of Pedagogical Sciences, Moscow, believes that there are but two. The first is that induced by the orienting reflex, and the second is induced by conditioned reflexes. He seems to doubt that the Leningrad investigators needed as many as were suggested by them. It may be observed, however, that E.N. Sokolov includes several parameters in each of his two categories. He measures such items as vasomotor responses in the head, and hand vascularity, skin reflexes, electromyogram (EMG), electroencephalogram (EEG), and eye movements. Very often he adds to these pulse rate and respiratory rate and volume. Although E.N. Sokolov was not reporting on lie detection, he is studying an important aspect of it; namely, the means by which the orienting reflex may be perpetuated by reinforcement. He claims that orienting and conditioning can be separated and that they are largely dependent on the severity of the task or, in this case, the interrogation.

Interpolating E.N. Sokolov's remarks, it may be stated that if the question is easy to answer, orienting may be minimal and will rapidly disappear. If the question is difficult to answer, orienting will be strong and persistent. If the task at hand is very difficult, the response may be completely inhibited by the forceful orienting reflex.

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Luria, in another connection, has suggested that there is a test for the inhibited cortex. Photic driving of the cortex produces rhythmic activity in the corticogram, when the cortex is in the inhibited state.

[] Sokolov considers his work to be the objective study of sensory integration, but adds that the effectors, in this case the muscles of vocal expression, play a part in the neural integration (feedback). Their chief influence is on the discriminating power of the subject. Individual differences are of great importance and the only way known, at present, to rule these out is by increasing the number of test items. Sokolov places much emphasis on his concept of orienting. It may be recalled from his earlier reports that the orienting reflex appears when the stimulus lacks coincidence with a brain neuronal model and disappears when the new model is elaborated. It may be assumed that a stimulus forcing fabrication has no established neuronal model. If the identical stimulus is repeated a varying number of times, until orienting disappears, then the subject is habituated. It behooves the interrogator to modify his stimuli. It is the opinion of both E. N. Sokolov and Luria that any emotional conflict will arouse at least the automatic fractions of the orienting reflex and that orienting indicates directly the levels of excitation or inhibition.

Ye. N. Sokolov, University of Moscow, formerly Institute of Defectology, Moscow, has been elaborating on the EMG in speech mechanisms. He reports that the measurement of the electromyogram from the muscles of vocalization, as well as from systematic musculature, shows greater activity when there is effort. As effort decreases, the EMG decreases. Muscle tensions appear at the moment of difficulty and are reduced at other times. Emotional conflict increases tension. He reported that the highest tensions observed were in the act of writing. Muscle tensions are aroused in listening situations also. Impulses are accentuated by questions, especially if there are demands on memory. Tensions are greatest when memory is difficult. A differentiation can apparently be made between an effort at remembering and the simple answer--"I cannot remember." Tensions in the physiological components of speech appear in different parts of the speech apparatus at the same time. Sometimes the strength of the stimulus or the emotional reactions may desynchronize these tensions, and speech may be unintelligible or blocked.

E. Herman and W. Krolikovska (Lodz, Poland) have indicated their belief that thinking and inner speech, as well as expressive speech, constitute one single process. They did an electromyographic study of the lips and found

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that inner speech muscular potentials were present in the lips even though there was no movement. In some subjects, the responses were numerous, with amplitudes of about 100 microvolts. Other cases showed fewer responses with less amplitude. The lip activity of this group could be increased by silently reciting poetry. These investigators noted that personality characteristics of the subject were of importance in the nature of the results obtained, particularly his emotional organization. Increased emotional base lines markedly increased the lip activity.

F.N. Shemyekin, Institute of Psychology, Academy of Pedagogical Sciences, Moscow, is investigating the transition of sensation to thought to speech. He restated an earlier axiom from Soviet psycho-physiology that new thoughts are made from old thoughts, but not deterministically. It is time, he said, to make a connection between theories of thought and the information theory. It would seem that a modification in the modeling of a new thought, perhaps a fabrication, should institute the behavioral changes E.N. Sokolov implicated in the establishing of a new neuronal model.

D.A. Oshanin, industrial psychologist, Institute of Psychology, Moscow, speaking of methods which directly reflect the functional state of the cortex, stated that the most sensitive methods consist of those which will determine the elementary psychic reactions to verbal stimulation.

V.V. Chebysheva, an industrial psychologist at the same Institute, pointed out that as thinking increases, behavioral variability also increases. This should increase the number of useful parameters for studying both autonomic and somatic responsiveness to verbal stimulation.

L.V. Filonov, (Institute of Psychology), who is working on the effective coding of information, has shown that decision-making modifies choice reaction time. Therefore, a perceptual-motor pattern of behavior based on factual experience should require less time than a perceptual-motor pattern requiring decision and choice in the area of fabrication. Thus, the tempo of response, in and of itself, carries information.

There is no doubt that the analysis of the EEG constitutes the one most important approach to mental behavior in Soviet literature. As a result of this emphasis, considerable effort has been devoted to improvement in the recording of brain potentials. M.N. Livanov, Institute of Higher Nervous Activity,

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Academy of Medical Sciences, has been credited with the development of the electroencephaloscope or toposcope.

A. V. Snezhnevsky, Psychiatric Clinic, Central Institute for Advanced Training of Physicians, pointed out that the toposcope makes it possible to record bioelectric potentials from 50 points on the cerebral cortex simultaneously. The instrument works on the basis of electronic commutation. The impulses are amplified sequentially by a single common three-cascade impulse amplifier. The sweep circuit is arranged so that 50 illuminated spots appear on the screen. These are arranged in five rows. Below these rows are 50 columns, each of which corresponds to a particular spot. Each spot and each column correspond both in position and in number to a particular electrode on the patient's head. Further implementation may be observed in Snezhnevsky's paper.

It was reported recently that a Soviet toposcope now has been developed with 100 channels and that there are prospects for machines with 400 channels. The important problem is to create an accurate operating link between the toposcope and computer systems. It will then be possible to analyze excitatory and inhibitory interrelationships of brain potentials involved in orienting and conditioning processes.

In conclusion, it would appear that truth would disturb the stimulus-orienting response mechanism less than the modeling of both defensive and offensive fabrication. In other words, a truthful statement is likely to have a preformed neuronal model in the brain, gained by way of factual experience. Therefore, the orienting reflex should be minimal. A falsification requires decision, verbage choice, and judgment designed for self-protection, for protecting or offending another, or for the denial of the truth. A neuronal model for fabrication should be non-existent or imperfect. Therefore, the orienting reflex should be prominent and reinforced. The instrumentation required to obtain the desirable information from response analysis in the Soviet sense would include:

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- (a) Plethysmographs - vasomotor changes
- (b) Psycho galvanometer and thermocouples for skin reflexes
- (c) Polygraph for EKG, EEG, EMG, and respiration
- (d) Reflectometer - for recording invisible light reflection from the eye surface
- (e) Visual light oscillator - photic driving
- (f) Toposcope - brain potential analysis
- (g) Computers
- (h) Trained interrogator

The above listing of equipment would constitute the ideal. According to Sokolov, practical requirements would be less. [redacted]

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