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Simulated Blood Pressure Responses in Lie-Detector Tests and a Method for Their Detection

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SIMULATED BLOOD PRESSURE RESPONSES IN LIE-DETECTOR TESTS AND A METHOD FOR THEIR DETECTION*

John E. Reid

(This is an article of exceptional interest for it describes some very noteworthy original research in the field of lie detection which should contribute much to the increased accuracy of instruments used for purposes of detecting deception. In brief, the author describes how it is possible for a criminal suspect to control or obscure certain incriminating emotional responses in a covert effort to "beat the machine", and then goes on to describe a method and equipment which can be utilized to detect such attempts at simulation. The instrument's recording also furnishes deception criteria heretofore unavailable to lie detection examiners. The author, a member of the Illinois Bar, is a staff member of the Chicago Police Scientific Crime Detection Laboratory and in this capacity has spent some six years in the field of lie detection.—EDITOR.)

Instruments for recording changes in blood pressure, pulse and respiration have been used with considerable effectiveness in criminal and personnel investigations for the purpose of determining whether the person being tested is telling the truth regarding the matter under investigation. (See Figure 1.) It is generally conceded, however, that the recordings of approximately twenty per cent (20%) of the subjects thus tested are too indefinite in their indications to permit the examiner to make a deception diagnosis.[1] In most instances, ambiguities in the blood pressure recordings have been attributed to an abnormal physical or mental condition of the subject under examination. However, recent experiments in lie detection, conducted by the writer, have revealed that not all inadequa-

* The writer is indebted to Professor Fred E. Inbau of Northwestern University, author of Lie Detection and Criminal Interrogation, to M. Edwin O'Neill and Richard E. Gorman of the Chicago Police Scientific Crime Detection Laboratory, and to Paul V. Trovillo, formerly of that institution, for their help in the experiments described in this paper, and also for their suggestions in the preparation of the paper itself. The writer also gratefully acknowledges the assistance of Joseph S. Price of the Chicago Police Scientific Crime Detection Laboratory in the construction of the instrument herein described, and the assistance of Raymond W. Heimbuch, also of the Laboratory staff, in the preparation of the photographic illustrations.

[1] See Inbau, F. E., Lie Detection and Criminal Interrogation (1942), 55.

The use of the term "lie-detector" in this paper is not intended to convey the idea that the instrument is an automatic machine which infallibly determines falsehoods, but is considered by the writer as an instrument for recording physiological changes that occur as the result of question stimuli, the interpretation of which may be studied for indices of deception.

cies and ambiguities in the blood pressure tracings are the result of abnormalities in the subject but are frequently induced by some type of unobserved muscular movements. In an effort to clarify the nature of these muscular movements it was discovered (1) that all the typical blood pressure responses of deception can be produced artificially at will, (2) that such simulated responses can be differentiated from the true indicators of guilt complexes only through the use of new machinery for their detection, and (3) that recorded evidence of muscular movement is in itself a criterion of deception.

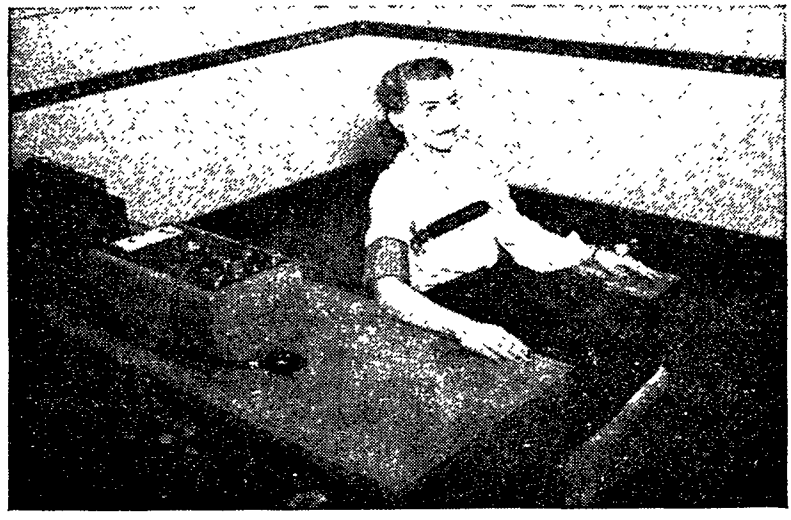

FIG. 1. *POSITION OF SUBJECT DURING LIE-DETECTOR TEST*

Observe blood pressure cuff on subject's right upper arm; pneumograph tube about the chest, and the galvanograph electrodes on the subject's left hand. In this illustration the subject is posed by Miss Mildred McGuffie of the Chicago Police Scientific Crime Detection Laboratory, and the instrument is a modified pre-1939 model of the Keeler Polygraph.

The medical profession has recognized that blood pressure changes can be artificially induced by muscular contraction and relaxation. Mulliner and McKinzie in their treatment of the subject state: "As the blood goes out into the 'arterial tree,' there is more resistance to its onward flow, due to the narrowing of the tube. This is *peripheral resistance,* which is increased or lessened by muscular contraction or relaxation. The greater the resistance, the harder the heart has to pump to send the blood to its destination, with consequent increases in arterial tension. Arterial tension or *blood pressure* represents the pressure against the sides of the blood vessels exerted by

the moving blood."[2] The writer's experiments have demonstrated that artificial blood pressure changes can also be induced by exerting pressure on various relaxed skeletal muscles and in effect accomplish the same or similar changes in the blood pressure that can be accomplished by the practice of muscular contraction and relaxation.

The Experiments

Blood pressure recording experiments were conducted with the writer as the subject and an associate as the operator. It was learned that lie-detector blood pressure recordings can be falsified in such a manner as to prevent a deception diagnosis either *by the use of muscular contraction or by muscular pressure.* The manner in which these blood pressure changes were effected was imperceptible to the operator and not detectable (on the basis of previously established deception criteria)[3] by any distorted indications in either the blood pressure or respiratory tracings.

In the experiment during which the tracings illustrated in Figure 2 were obtained, blood pressure changes were artificially induced at will by muscular contraction and also by muscular pressure.

Muscular contraction or muscular pressure, when used to falsify blood pressure changes, must be confined to the arms, hands, thighs, legs or feet, because if the torso muscles are uti-

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[2] Mulliner, M. R., and McKinzie, R. T., Elementary Anatomy and Physiology (3rd Ed., 1931), p. 328. Also see Howell, W. H., Textbook of Physiology (10th Ed., 1928), p. 494, Crandall, L. A., An Introduction to Human Physiology (3rd Ed., 1943), p. 134, and Abramson, D. I., Vascular Responses in the Extremities of Man in Health and Disease (1944), p. 142.

For a further study of muscular tension in relation to blood pressure changes, see Jacobson, E., Progressive Relaxation (1938).

A reasonable search of the medical literature revealed no direct comment regarding blood pressure changes due to muscular pressure in the manner reported by the writer. Indirectly it was reported in Blood Pressure, Cause, Effect and Remedy, by Barker, L. F., and Cole, N. B., at page 37, that veins near the surface of the body are subject to muscular pressure during bodily movements and that "such pressure from without is easily exerted, since the veins have thin muscular and elastic coats and are easily collapsible in contradistinction to the arteries which always maintain their tubular shape."

Also see Blood Pressure Simplified, a manual published by the Taylor Instrument Company, at page 62, in which the Katzenstein method of testing the function of the heart is reported, and is based on the observation that when both femoral arteries are digitally compressed, the blood pressure will rise from 10 to 20 mm. of Hg.

Likewise see Jansen, W. H., Tams, W., and Achelis, H., "Blutdruckstudien. I. Zur Dynamick des Blutdrucks," Deutches Arch. f. Klin. Med., 144(1), 1924 (cited by Abramson, D. E., *op. cit. supra* note 2, p. 235), which states "that binding the extremities of normal persons with elastic bandages caused only an insignificant increase in blood pressure."

[3] Trovillo, P. V., "Deception Test Criteria. How One Can Determine Truth and Falsehood from Polygraph Records," Jour. Crim. Law and Crim., 33(4): 338-358 (1942).

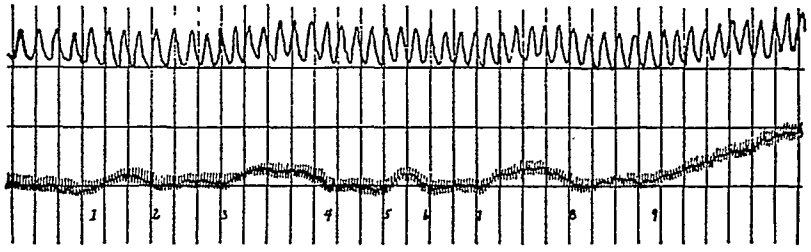

FIG. 2. EXPERIMENTAL RECORD ILLUSTRATING VARIOUS SIMULATED BLOOD PRESSURE RESPONSES BY MUSCULAR CONTRACTION AND BY MUSCULAR PRESSURE

In the above illustration, and in all those which follow, the tracing on the upper portion of the graph is the respiratory recording; the lower tracing is the blood pressure-pulse recording; the chart on which the recordings were made is six inches wide, and each vertical line represents a five-second interval.

At 1, slight contraction of the thigh muscles; at 2, thigh muscles relaxed; at 3, sustained contraction of the thigh muscles; at 4, thigh muscles relaxed; at 5, slight pressure exerted on the right forearm; at 6, pressure released; at 7, gross pressure exerted on the right forearm; at 8, pressure released; at 9, gradual and sustained pressure exerted on the right forearm without relaxation. (In the above caption, and in the captions to Figures 3 and 4, the terms "muscles relaxed" and "pressure released" are used to mean that at the point indicated on the chart the muscles are completely relaxed or the pressure is completely released.)

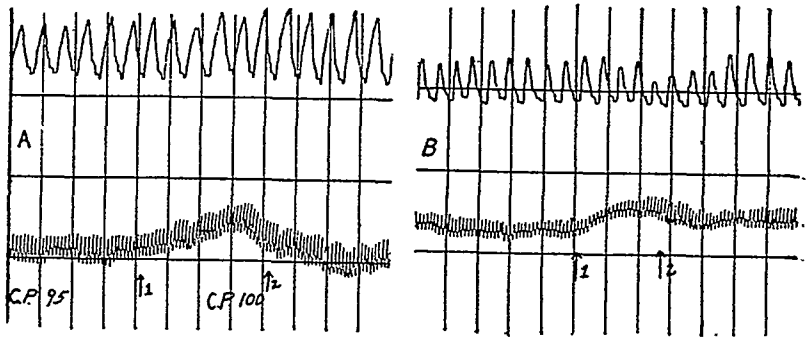

FIG. 3. SIMULATED BLOOD PRESSURE CHANGES DUE TO MUSCULAR CONTRACTION

(A) At 1, muscles in the right forearm are stiffened, or contracted; at 2, muscles relaxed.

(B) At 1, muscles in both thighs contracted simultaneously; at 2, muscles relaxed.

In all illustrations, where indicated, *C.P.* is cuff pressure.

lized for this purpose, distorted recordings in the respiration will appear, revealing such attempts at falsification.

In order to simulate a true blood pressure change by muscular contraction without distorting the blood pressure or respiratory tracings, the muscles in the extremities must be stiffened or tensed without moving or flexing the muscles of the upper arm to which the blood pressure cuff is attached. (See Figure 3A and B.) To induce a blood pressure change due to muscular pressure, the ventral or anterior side of the forearm, for exam-

ple, is forced down against a hard surface until the blood vessels in the arm are compressed by pressure self-exerted, resulting in a restriction of the normal flow of blood and a consequent increase in blood pressure.[4] (See Figure 4A and B.)

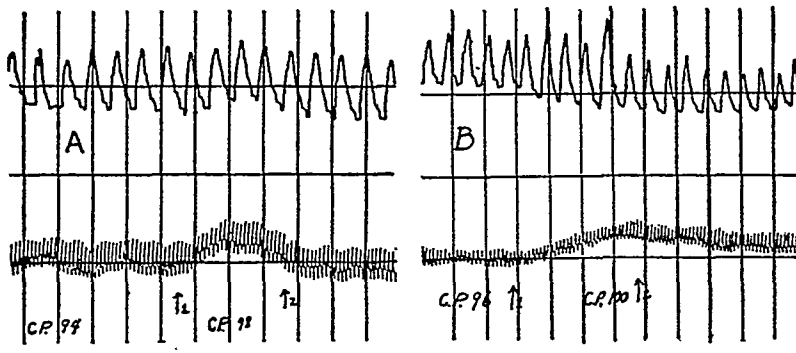

FIG. 4. SIMULATED BLOOD PRESSURE CHANGES DUE TO MUSCULAR PRESSURE

(A) At 1, pressure exerted on the muscles of the right forearm; at 2, pressure released.

(B) At 1, pressure exerted on both feet by pushing down against the floor while in a sitting position; at 2, pressure released.

Experiments were conducted to determine whether the simulated blood pressure responses, obtainable when pressure is applied on the forearm, are the result of compression of the muscles of the forearm itself or the result of the contraction of various other muscles used to produce the compression. The writer's forearm was placed in a relaxed position upon a table and while a recording of the blood pressure was made an assistant forced a wooden compress against the dorsal or posterior surface of the forearm. This resulted in a blood pressure variation comparable to that obtained when the pressure is self-exerted, thereby establishing the fact that at least the major portion of such changes is due primarily to muscular pressure and not to muscular contraction.

That the foregoing methods for simulating blood pressure responses can be utilized to falsify a test record and thereby deceive the lie-detector examiner is illustrated in Figure 5. In the course of the test—an experimental card (control) test—the writer, as the subject, exerted pressure on the right (cuff bearing) forearm when questioned about a card other than one actually selected in advance of the test. A blood pressure re-

[4] References to increases in blood pressure are not increases in absolute blood pressure but rather the relative increases appearing in the recorded pressure curves during lie-detector tests and often alluded to as the "mean" blood pressure. The pressure changes so recorded are proportional to the blood pressure changes of the body.

sponse was produced at that point which simulates a true deception response and thereby serves to mislead the examiner.

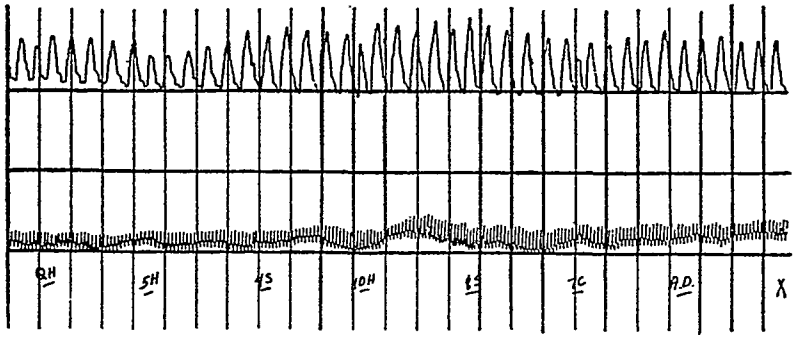

FIG. 5. CARD (CONTROL) TEST RECORD SHOWING FALSIFIED BLOOD PRESSURE RESPONSE

The card chosen before the test was the four of spades, but, by means of pressure on the muscles of the right forearm at the ten of hearts, the "deception response" appears at the ten of hearts.

The facility with which a simulation can be accomplished is further illustrated by Figure 6, showing an imitation of a blood pressure tracing obtained in an actual criminal case.

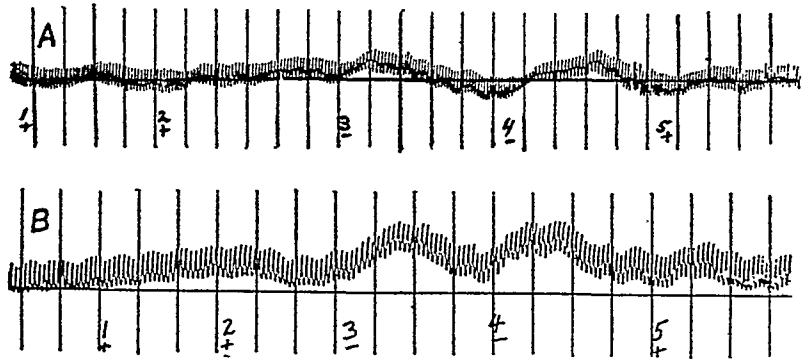

FIG. 6. SIMULATION OF ACTUAL CASE RECORD

A is a blood pressure recording of a thief who later confessed stealing $900. Questions 1, 2 and 5 are irrelevant and questions 3 and 4 are pertinent to the crime about which the subject lied. Note blood pressure rises on questions 3 and 4. On *B*, the writer was asked the same questions and simulated the blood pressure responses at 3 and 4 as shown above.

The criminal case records shown in Figures 7A and 8A are examples of incongruous blood pressure responses of the type which occasionally confront an examiner and which either prevent a deception diagnosis or render an interpretation very difficult. The explanation of these phenomena may be found in the method by which the writer actually simulated these two

tracings. By gradually exerting pressure on the muscles of the right forearm the simulation 7B was made of 7A. By gradually releasing the pressure applied at the beginning of the record, simulation 8B was made of 8A.

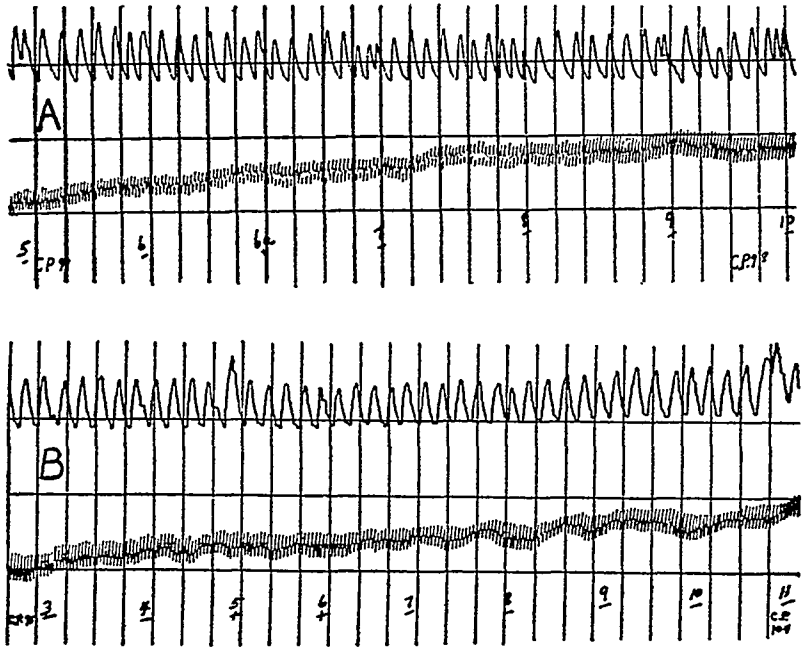

FIG. 7. SIMULATION OF ACTUAL CASE RECORD

A is a record of an identified sex criminal. Note gradual blood pressure rise from question 5 to question 10, an increase of 7 mm. of Hg. Compare *A* with *B*, wherein the writer simulated a gradual blood pressure rise by exerting pressure on the right forearm.

Criminal Case Studies

The reader must be mindful of the fact that in these various experiments the writer used his full power of concentration to simulate guilt reactions without being burdened with the guilt complexes of an actual criminal suspect. It is believed that the task of successfully simulating such blood pressure responses would be practically impossible for an untrained subject, but it is further believed that an untrained subject can influence his blood pressure reactions to such a degree as to introduce ambiguous responses which may confuse the interpreter.

In actual cases, ambiguous blood pressure responses which are misplaced in relation to deception indices, but which are somewhat similar in pattern to the simulated illustrations, may or may not be consciously accomplished. Heretofore the reasons for these unexplained blood pressure responses have usu-

ally been assessed to a faulty apparatus or an abnormal physical or mental condition in the subject. It is possible, however, that a percentage of these discrepancies in the blood pressure tracings may be the result of deliberate attempts by the subject "to beat the machine."[5]

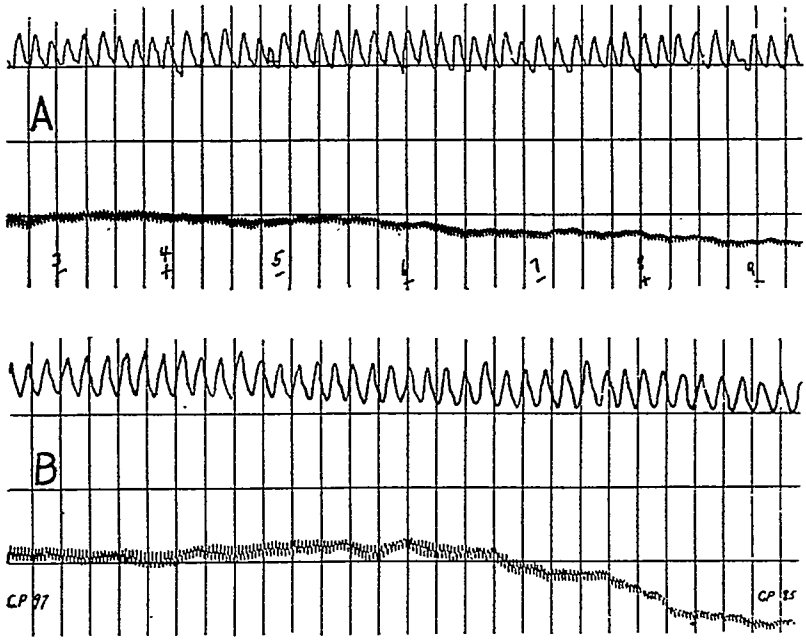

FIG. 8. SIMULATION OF ACTUAL CASE RECORD

A is a record of a confessed sex criminal. Note the downhill trend of the blood pressure as well as the gradual reduction in pulse amplitude. Compare *A* with *B*, wherein a similar change in amplitude and a downhill trend of the blood pressure were simulated by exerting pressure on the right forearm at the outset of the test and gradually releasing such pressure.

Where the deliberate attempt to distort the blood pressure tracing consists of a movement in the position of the cuff bearing arm, the resulting tracing is entirely different in nature from the result of a distortion induced by the sudden application or release of pressure. In the former instance a gross movement of the cuff bearing arm produces a sharp upward deflection of the tracing which immediately returns to the original baseline. (See Figure 9A.) However, when a deflection is produced by the prompt application of pressure, the tracing thus deflected will not return to the original baseline until the pressure is released (see Figure 9B), and if the deflec-

[5] On one occasion a young man who later confessed an automobile larceny was overheard to say that he "held one arm rather stiff during the tests." The blood pressure recordings of this subject were so irregular that a definite blood pressure interpretation was precluded, although the respiratory responses were sufficiently indicative of deception to

tion is produced by an immediate release of pressure maintained at the outset of the test, the tracing thus deflected will not return to its former baseline until the pressure is reapplied. (See Figure 9C.)

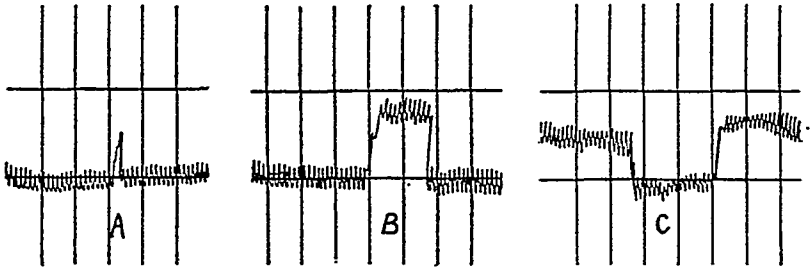

FIG. 9. ILLUSTRATIONS OF DIFFERENCES BETWEEN ORDINARY ARM MOVEMENTS AND MOVEMENTS PRODUCED BY SUDDEN MUSCULAR PRESSURE

At *A*, right arm to which blood pressure cuff is attached is moved momentarily and then returned to its former position. Note deflection in the recording which returns to approximately the same baseline. At *B*, great and immediate pressure is exerted on the right forearm. Note the change in the blood pressure baseline which is maintained for several seconds until the pressure is released. At *C*, pressure is exerted on the right forearm at the outset of the recording and then released (indicated by downward deflection). A new baseline is established until the pressure is reapplied.

The blood pressure recordings of one hundred and forty-seven (147) verified guilty criminal subjects and eighty-three (83) verified innocent criminal subjects were examined for evidences of sharp upward or downward deflections in the blood pressure graphs as shown in Figure 9B, C, which are due to muscular pressure. In forty-six (46) known guilty records there were indications that muscular pressure was employed, while in only two verified innocent records similar indications were noted. The two innocent subjects, who gave such indications in their records, were later definitely proved to be psycopathic. Numerous other blood pressure records of criminal suspects also indicated the use of muscular pressure during the tests but since these records were not verified as to "guilt" or "innocence" they were excluded from the statistics.[6]

report him guilty of the theft. In another case, a confessed rapist informed the examiners that he had read a publication on lie detection and learned that lying "slacks up your breathing," and therefore he decided that during the test he would breathe "fast." He also learned that blood pressure "slows up and goes fast" during the telling of a lie, so he "pressed his hand down hard to beat it." In still another case a guilty subject admitted that during the test he clamped his fingers around the end of the chair upon which his hand rested. (These case experiences were encountered before the subsequently described instrument was available for use during the tests.)

[6] The statistics seem to indicate that the application or release of muscular tension is common only to guilty subjects. However, the number of verified records observed is relatively small and therefore a definite conclusion cannot be obtained regarding deception when muscular tension is noted until a more representative number of records are studied for such indications.

The more common indication that muscular pressure was used by criminal suspects during lie-detector tests is the sharp downward deflections in the blood pressure graph as shown in Figures 9C and 10. In a great many cases the only evidence of the subject's employment of muscular pressure during the test appeared in the form of a sharp downward deflection at the end of the recording when the subject was instructed that

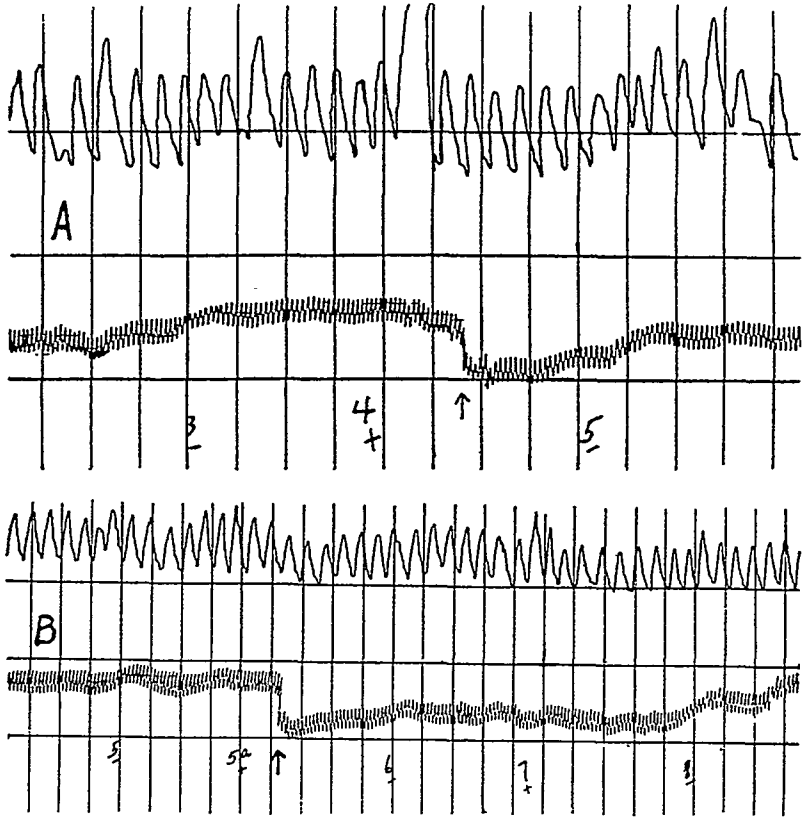

FIG. 10. INDICATIONS OF MUSCULAR PRESSURE IN ACTUAL CASE RECORD

(A) Case record of a confessed sex criminal. 3 and 5 are pertinent questions regarding the crime about which the subject lied; 4 is irrelevant; at arrow, subject was told to relax. No visible movement was observed but sharp drop in blood pressure recording indicates that artificial pressure may have been exerted. Note that after arrow, blood pressure baseline is at a lower point than it was at the supposed normal before question 3, indicating that the subject may have been exerting some artificial pressure at the outset of the test.

(B) Case record of a sex criminal suspect. Note drop in blood pressure recording after irrelevant question 5A to a baseline lower than on irrelevant question 4, indicating some artificial pressure may have been exerted at the outset of the test which possibly masked out a blood pressure response on question 5 relevant to the crime; 6 and 7 are irrelevant. A new baseline is established after 5A, whereupon an apparently genuine blood pressure response is exhibited on question 8 (pertinent to the crime).

no more questions would be asked. In such instances there were no visible signs of any movements and undoubtedly the sharp downward deflections were indicative of a release of muscular tension. (See Figure 10A, B.)

Evidence of muscular contraction and relaxation as well as sustained muscular pressure are not always characterized by distorted blood pressure patterns, such as in Figure 10A, B, at points indicated by arrows. That fact is amply illustrated by Figures 2, 3, 4 and 5, wherein the simulated blood pressure curves contain no obvious distortions. An examination of the tracings offers no satisfactory assurance (even to those looking for indications of such muscular activity) that the activity has not actually occurred. If a subject contracts or compresses any of the muscles of the extremities and maintains the same or an equal amount of pressure from the beginning to the end of the test there will be little if any visible distortion in the blood pressure tracing, but the recording will nevertheless be of an abnormal nature and not a reliable means in determining deception. Further, if the blood pressure baseline is at an upper range due to the prolonged application of muscular pressure the ordinary blood pressure deception responses may be masked out because the deception response range of the blood pressure is below that of the exerted pressure. (See Figure 10B.)

An Instrument for Detecting Efforts at Simulation of Blood Pressure Responses

Having observed and contrived means by which the lie-detector tests could be defeated, the writer set about to devise a method and equipment which would detect such attempts at simulation. It was resolved that if muscular movements[7] could be graphically recorded in conjunction with the blood pressure then each effort to simulate a blood pressure response would be detected and a new index as to the cooperation or non-cooperation of the subject would be established to aid in the interpretation of the lie-detector records.

[7] Various types of body movements have been recorded by both physiologists and psychologists although neither the mechanism nor the method used by the writer has been previously employed. See Jacobson, E., *op. cit. supra* note 2, and Gaskill, H. V., "The Objective Measurement of Emotional Reactions," Gen. Psych. Monog., 14:177-280 (1933) Cason, H., and Cason, E. B., "Affectivity in Relation to Breathing and Gross Bodily Movements," J. Gen. Psychol., 9:130-156 (1933) and Burtt, A., "Motor Concomitants in Word Association," J. of Exp. Psych., 19:51-64 (1936). A few psychologists have recorded motor reactions, especially tremor as related to deception. See Luria, A. V., The Nature of Human Conflicts (translated from the Russian and edited by Horsley Gantt, 1932), and Runkel, J. E., "Luria's Motor Method and Word Association in the Study of Deception," J. Gen. Psych., 15:23-27 (1936).

The instrument designed for this purpose (as illustrated in Figure 11) consists essentially of a closed pneumatic system in which inflated rubber bladders (placed under the forearms and thighs) are connected to three separate tambour units, which permits the recording of any muscular exertion by the subject's feet, legs, arms and hands.

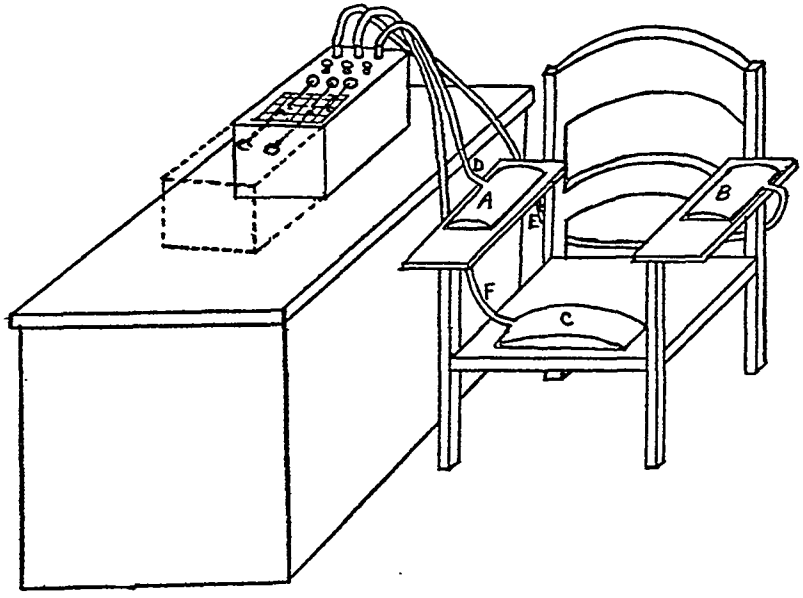

FIG. 11. *SCHEMATIC SKETCH OF INSTRUMENT FOR RECORDING MUSCULAR MOVEMENTS*

A, *B*, and *C* are air inflated rubber bladders. *A* and *B* are framed and stabilized to the chair arm rests, while bladder *C* is freely inserted in a specially prepared horizontal pocket in the front of the seat cover. Rubber tubes *D*, *E*, and F are fastened to a manifold (located within instrument box), which in turn is connected to three metal tambours that actuate individual pens on the recording styli. The broken lines illustrate the position of the blood pressure and respiration units which record simultaneously with the muscular movement tracings. (See Figure 1, photograph of blood pressure-respiration units.)

The manifold is a five-way metal tubular arrangement, the main pipe of which unites and interlinks the air passages to all five outlets. An air inflator bulb and a manometer are joined to two of the outlets while three tee fittings are attached to the remaining outlets of the manifold connection. The metal tambours and the rubber tubes *D*, *E*, and *F* are fastened to the remaining two openings of the tee fittings. To each of the outlets of the manifold that communicate with the bladders and the tambours, a stop-cock is inserted and placed between the main pipe of the manifold and the tee fittings.

The stop-cocks are used in this manner: two are turned to a closed position while the bladder attached to the third outlet of the manifold is inflated to the proper pressure using the inflator bulb and the manometer in combination. After the proper pressure is attained the stop-cock is closed and the next stop-cock is opened. The same procedure is repeated until all bladders have been independently inflated and closed off, confining the air to the bladders and the tambours.

An application for a patent has been made by the writer for the above described instrument.

The subject's forearms rest on the inflated rubber bladders and a manometer reading of the normal initial pressure is obtained (approximately 20 mm. of Hg.). When artificial pressure is exerted on one or both arms the manometer registers between 20 and 30 mm. of Hg. pressure depending upon the intensity of the exertion. The rubber bladder placed horizontally across the front of the chair seat under the subject's thighs is inflated to approximately 30 mm. pressure and when the

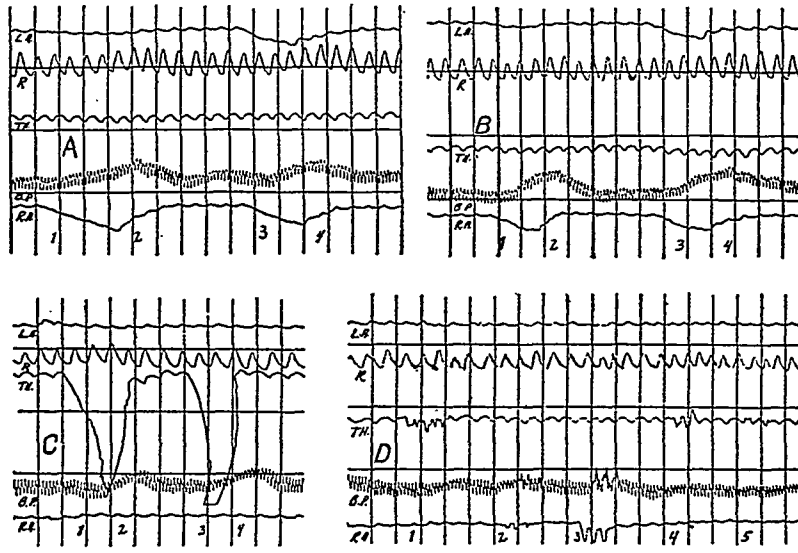

FIG. 12. PATTERNS OF MUSCULAR MOVEMENTS IN EXPERIMENTAL RECORDS

The letter symbols, *L.A.*, *R.A.*, *TH.*, *R.* and *B.P.*, below each tracing signifies the recordings of the left forearm muscles; the right forearm muscles; the thigh muscles; the respiration and the blood pressure.

Although the recordings of movements and of blood pressure-respiration responses actually occur simultaneously, the recording pens are not in the same vertical alignment. In order to prevent the opposing pens from colliding, the movement recordings are displaced laterally, preceding the other tracings on the chart a distance corresponding to a three-second interval.

(A) At 1, gradual pressure exerted on the right forearm; at 2, pressure released; at 3, gradual pressure exerted simultaneously on both forearms; at 4, pressure released. Note deflection of the *R.A.* recording at 1; and at 3, both *L.A.* and *R.A.* recordings deflected. Each exertion is accompanied by a blood pressure increase.

(B) At 1, contraction or tension of the muscles of the right forearm and hand; at 2, muscles relaxed; at 3, muscles of both forearms and hands contracted simultaneously; at 4, muscles relaxed. Blood pressure increase at 1 and 3; also at 1 a downward deflection of *R.A.* recording; at 3, both *L.A.* and *R.A.* tracings are deflected.

(C) At 1, pressure exerted on both feet by pushing down against the floor; at 2, release of pressure; at 3, muscles in both thighs contracted; at 4, thigh muscles relaxed. Blood pressure increases indicated at 1 and 3, as well as downward deflecting of thigh recording.

(D) At 1, knees moved together slightly (in and out); at 2, fingers of right hand moved; at 3, right hand moved; at 4, right foot moved by pivoting on the heel; at 5, toes moved. Note distortion in thigh tracing at 1, 4 and 5, as well as distortion of the *R.A.* recording at 2 and 3.

thigh muscles are contracted or compressed the manometer indicates 30 to 40 mm. pressure commensurate with the amount of the exertion.

The normal pattern for the muscular movement recordings is signified in most instances by a wavy line which is the result of body movement due to the respiratory action. Oftentimes body tremors are reflected and recorded in the normal body movement wave. Gradual muscular pressure (either by contraction or compression) applied to the forearm, hand, thigh, leg or foot muscles is indicated by a sagging downhill line which sometimes retains the wavy pattern. As the pressure increases a further decline is noted and when the pressure is released the recording returns to the original baseline. An immediate or prompt application of pressure is shown by a sharp downward deflection. Movements of the fingers, hands, knees, feet and toes are indicated and identified as distorted patterns in the muscular movement tracings. (See Figure 12A, B, C and D.)

Lie-detector tests have been compared to clinical examinations wherein similar physiological phenomena are recorded. Unlike the clinical patient, however, the guilty or lying criminal suspect does not willingly cooperate during a lie-detector test, but on the contrary usually attempts to control or obscure his incriminating emotional responses in a covert effort to "beat the machine." Therefore, it is imperative in the examination of criminal suspects to record not only involuntary bodily reactions but also those which can be purposefully altered at the will of the suspect. The preliminary experiments herein reported indicate that both muscular contractions and the application of pressure to skeletal muscles which can influence the blood pressure tracing may now be detected by new devices which even serve to locate the regions from which the muscular movements emanate.

Muscular Movements as Deception Criteria

Experiments beyond the scope of this paper, employing actual criminal suspects, are being carried on as a means of determining the extent to which movement recordings may be classified as patterns of deception. It was learned that not all subjects can influence their blood pressure curve by muscular action and therefore it is doubly important to record these movements as additional criteria to be studied in relation to deception. Examiners using the present technique will have a means, heretofore unavailable, of separating the true patterns of deception from the fraudulent ones and of isolating the patterns of bodily movement for new studies of their significance.