THE PHYSICAL BASIS OF WAR SHOCK. A PLEA FOR THE MORE PHYSICAL CONCEPT AND BASIS OF TREATMENT OF THE MENTAL AND INCAPACITY DELINQUENCY OF VICTIMS OF WAR HYSTERIA AND SHOCK.

BY

HOMER WAKEFIELD, M.D.
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A PLEA FOR THE MORE PHYSICAL CONCEPT AND BASIS OF TREATMENT OF THE MENTAL AND INCAPACITY DELINQUENCY OF VICTIMS OF WAR HYSTERIA AND SHOCK.

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WITH the progress of active warfare overseas, and with the participation of constantly increasing millions of men, our returning transports will bring back two types of maimed soldiers, both demanding reconstruction and reeducation; the surgical and mental cases. Both will tax the acumen and ingenuity of the medical profession to the utmost, but the latter class will probably more than the former present difficulties, both in way of immediate treatment and in reconstructive training in behalf of useful and self-sustaining after lives or careers. Should the Central Powers be enabled to hold out for a military decision a year or two hence, when our country can bring its full resources to bear, we may expect numbers of thousands of men, not maimed in body, who have suffered mental impairment through fright, shellshock, and allied causes, returned as mental or “nervous” wrecks, exhibiting defects rendering them delinquents, and un-
til in some measure restored, dependents upon so-
ciety. Such cases will present the greater difficulty
because of the apparent absence of actual physical
injury, on which account we may expect our psy-
chiatrists, following the experience of France, to
divide into two diverse camps or schools, based upon
the purely psychical or metaphysical theory, on the
one hand, and the physical or material theory, on the
other. The one group will probably be treated too
wholly by hypnotism, psychic impression, persuasion,
and other purely mental means, while the other
may too wholly ignore such measures; both of which
would prove most unfortunate.

A prime objective of this paper is to set forth:
(1) the absolute unity and indivisibility of the
physical and the mental; (2) the mentality solely
as a function of the physical body; and (3) in the
final analysis, of interrelations between the mind
and body, which involve quite as much influence
of the body upon the mind as of the mind upon
the body. Moreover, that the mentality, as a function
of the physical body, is not exclusively a function
of the brain or nervous system, but of the entire
solid and fluid constituents of the body, their chemi-
cal and physical status, and of the biologic reac-
tions as dependent upon these factors.

The Psychoneuroses of War Shock.—In those
cases of concussion trauma of the more delicate
tissue structures, which do not exhibit macroscopic
rupture or other form of broken integrity, we must
not lose sight of the fact that in more violent
traumas such naked eye evidences do appear, show-
ing that the lesser ones differ in degree only. In
fact, we observe that the malfunction of tissue in-
tegrity disrupted by concussion trauma is not un-
like the malproduct of anemia.

The investigation of war shock has been so far
baffling, only because it has not been sufficiently
recognized as a genuine traumatic shock. That its
true status has been obscured by an excess of
theories regarding it, there is little doubt. Even on
the part of those who look to the physical body
for the lesions responsible for the major mani-
festations, there has been much disposition to con-
fine the mischief done to a single organ and to seek
repair by a single rectification or by an artificial
supply of some particular secretory product, whereas
the clinical picture should be a more general one.

The recognition of the spasmodic deflection of
the major volume of blood of the body from the
superficial to the deep circulation, and the asphyxial
effect of such deflection upon the dependent super-
facial and extremity tissues, on the one hand, and
on the venous stasis of the internal glandular and
other organs, and upon the blood per se, on the
other, has been conspicuous by its absence. The
predisposing features, such as spasmodic phenomena
of low density tissues, have likewise escaped con-
sideration, though emotional proclivities, actual
fright, and chill have been mentioned by writers on
the subject. It is gratifying to note that Hen-
derson, Crile, Van Slyke, Cullen, Cannon, and others
have observed acidosis as an important chemical
change incident upon impaired circulation.

An interesting and most significant observation
made by Cannon, Fraser, and Hooper^ is that in the
onset of shock (1) the red corpuscles are apparently
retained in the capillaries, (2) the blood in propor-
tion to the extent of the shock, exhibits a markedly
higher red cell than a venous count, while (3) hemor-
orrhages further exaggerate the diversity. The
obvious explanation of this is that upon spasmodic
contraction of the superficial tissues, the involved capillary collapse evacuates the corpuscles of lower specific gravity and fluid constituents of the blood and reduces the capillary lumen beyond the capacity of the denser red cells to pass. Moreover, it may be implied that the muscle and integumental tissues would exhibit a much higher percentage of red cells in shock than observed in the lobe of the ear, a finger, or a toe, unless those parts were coincidentally especially subjected to spasmodic local anemia by chill. Those tissues which have been previously affected by accrued metabolic or fatigue products, exhibit hyperesthesia and correspondingly excessive spasmodic reactions. It appears imperative that all of these factors must be considered collectively in order to grasp properly the composite clinical entity, even as physical phenomena.

Non-recognition of the stasis of the rising column of blood in dilated venous trunks, its increased volume and weight coincident with the lowered blood pressure and progressive general circulatory failure may lead to disaster and death. Cannon finds that acidosis increases as the blood pressure falls. Wiggers suggests that a further reduction of venous pressure by bleeding would seem a rational procedure in the case of acute cardiac failure. Either that or dilution of the blood by hypertonic salt solution also further decreases the hemoglobin percentage, while conversely cases appear to be benefited by transfusion of blood after hemorrhage complications.

In this connection, the long ago ascertained fact should not be neglected that "in asphyxia the un-aerated blood passes with so much difficulty through the systemic capillaries as finally to arrest the action of the heart." The arterial blood, according to Flint normally contains less water than the venous, but the observed fact that the capillary blood becomes more concentrated relative to the extent of the shock shows that it becomes more retentive of the corpuscle elements with the extension of constriction of the capillary lumen. Cannon, Fraser, and Hooper observed that "a dilution of the blood which continues to progress beyond the fourth or fifth day after injury is ominous, and the longer the dilution continues the more unfavorable it becomes," signifying the presence of sepsis.

It will be recalled that many of the survivors of the "Black Hole of Calcutta" afterward died of septic fever. Since venous blood contains a higher percentage of water than arterial blood, we may deduce that asphyxiated blood in general exhibits a fall in specific gravity as evidence of partial disintegration, despite that its red cells pass through constricted capillaries with difficulty. Swelling of these cells would also be a factor. Hydremia may be regarded as a suboxygenation sequence and as a factor of susceptibility to infection.

Resultant Physical Incapacity of War Shock.—We have long been familiar with the peculiar consequences of violent injuries of shock proportions which have borne the name of amnesia, in which the victim of a fall, a blow, a runaway or railroad accident, etc., suddenly was mentally cut off from all his past experience and consequently from its utilization in the interpretation of current sense perceptions. The obliteration of all memory, habit, and automatic activity, and in some cases of some of the primal instincts, as may be imagined, places an individual in the position of a new-born infant, with everything to be experienced and learned over again, even in the use of the voluntary muscles and
the capacity for all physical expression, thus demanding vocational reeducation.

These effects may be partial or complete, and in different cases may or may not be amenable to restoration of the lost store of past experience and knowledge. Amnesia may be *simple*, with loss of memory only, *localized*, systematic or general; it may be continuous, alternating or periodic, stationary or progressive. In causation it may be termed traumatic, toxic, autotoxic, fatigue, asthenic, emotional, etc. In its manifestations, it may be predominately sensory (or perceptual) or motor. Amnesia recognized as an affection of discoordination or incoordination between the engram preamble and the motor reaction to current sense perceptions has been defined by such terms as consciousness disaggregation, dissociation, etc., which are not very elucidative as to fundamentals, causation or conditions.

Defective and inhibited functions of tissues of defective integrity, both motor and mental, must be studied as such, not as separate non-physical entities, but by determinations of faults of the underlying physical mechanism responsible for them, just as a mechanician looks to disorder in a motor when its mechanical action goes wrong.

Speculation as to how violent concussive force disrupts the vital integrity of living tissues, has not proved very productive of noteworthy solutions. However, electricity of high voltage and low frequency readily produces somatic death, whereas

the same voltage of high frequency is tolerated with impunity. Whatever the wave frequency of high explosive detonations, the extreme violence with which they occur proves so destructive to the more delicate tissues, that in the more severe cases the cerebrospinal fluid becomes blood tinged, hemorhages into the retina and conjunctiva occur, and bleeding from the ears, the lungs, the stomach, the bladder, and bowels, indicating tissue ruptures, may be induced. Later, for months after the disappearance of blood in extreme cases, leucocytes and globulines are found in the cerebrospinal fluid, indicating meningeal damage. From these ultra-serious cases one may discern the nature of the lesser ones as differing in degree but not in kind. Some degree of disorganization obtains, and restoration depends upon the minimum of damage done and the promptness with which circulatory compensation is reestablished and the progressive acidosis is arrested and neutralized with hyperdermatic injections of solutions of sodium bicarb. Adequate provision for the proper treatment of these shock cases directly behind the lines will accomplish much in the direction of a successful outcome.

The importance of prompt intervention following the experience of shock, and the unfortunate outcome of permitting time to elapse, even in the milder cases, before measures are taken to counteract the effect produced, is emphasized in artificially produced aphonia, such as by hypnotism. The restoration of these cases becomes increasingly more difficult in proportion to deferment of the same measures for its abolishment. The explanation is to be found in the fact that the tetanically contracted tissues are in a state of disintegration as a chemical sequence of physiologic tetanus. What-
ever the neurotic predisposition of the patient, this result is the same in kind.

Some Physical Factors of the Pathogenesis and Pathology of War Neuroses.—Since the war neuroses, so-called, have come to occupy so prominent a position in the catalogue of war-wrought injuries to the man on the fighting line, it seems to me that more regard should be paid to the underlying pathology, to physical conditions which predispose to the morphologic states and give expression to the typical symptoms. First of all let us recognize that the variation in susceptibility to hysterical manifestations, to shock and other typical features, between one man and another, finds expression in the more susceptible one succumbing to a correspondingly less violent perturbation. The consideration of the prime physical factor of such susceptibility carries us back to the fundamentals of the reactions of the living substance (or protoplasm) to external perturbation. No discoveries or theories concerning the nervous system have given us illumination on this subject equal to the long-accepted knowledge of the behavior of protoplasm in its reaction to environmental perturbation on the basis of its innate irritability.

When we appreciate that the degree of irritability, i.e. of esthesia and reaction energy expenditure, corresponds to the state of density of the involved living substance, we have elicited an explanation why it is that youth, the female sex, depletion by illness, inanition, starvation, chronic fatigue, sub-oxygenation, anemia, local and general, respiratory, cardiac, and circulatory insufficiencies, and allied conditions, produce coincidently a lowering of dependent tissue density and a corresponding precocity and overt intensity of reaction to environmental perturbations.

However great our regard for our present advanced knowledge of the nervous system, and of its physiologic function, both ganglionic and transmissional, we are in these cases gaining nothing by vaguely attributing to functional irregularities of the nervous system reactional abnormalities which per se account for the functional perversions when the nervous system exhibits no inherent variation from the normal, either organic or functional. Obscurantism and obfuscation have no place in scientific pursuits. Let us in time of war no longer cling to occult mysticisms however time honored are their passive acceptance. Even though the laity continue to allude to nervous phenomena, let us call them irritability phenomena.

Anesthetic and hyperesthetic phenomena exactly correspond with the etiological and pathological features of our knowledge of the characters of tissue reaction, according to the known laws of their status of irritability, and have no relationship with any known laws of any independent nervous function. All theories of etiology and prophylaxis must bear the test of exhibition of unmistakable relations of cause and effect. Unfortunately for medicine some unchallenged hypotheses that have come down to us are quite as occult and nebulous as if attributed to the supernatural. They entirely lack a scientific substratum and the superstructure is no less ethereal. Like the research man who attributes his failure to supernatural agency instead of his own incapacity, many unsolved problems of apparent functional origin have been attributed to some obscure malfunction of the nervous system, of which there exists no foundation in fact. A development of irritable weakness is usually denominated nervous prostration, neurasthenia, an
attack of nerves, etc., while the yet more obscure term nervousness is in almost universal use as expressive of lesser degrees of the same thing. In some mysterious manner the relationship of “nervous weakness,” chorea, hysteria, hysterical paralysis, hysterical convulsions, epilepsy, hysterical tetanies and contractures migraine, asthma, neuralgia, and many paroxysmal diseases are quite generally recognized. Perhaps less intimately connected with them may be recognized Raynaud’s disease, diabetes, railway spine, and war shock.

These subjects have been greatly obscured by the exhibited inability to recognize how such conditions could be caused by such immaterial causes as the emotions of fear, fright, terror, grief, intense anxiety, great depression of disappointed love, sudden loss of property, business reverses, military defeat, etc. Even characterizing them as vasomotor phenomena does not explain them. It is insufficient owing to the exclusiveness of its applicability to contraction of the muscular coats of the arterial system, mostly of the arterioles and its effect upon non-striped muscle fiber. Raynaud’s disease is probably its nearest approach, but even that involves far more than arterial reflexes. It must also involve the capillary system which possesses no muscular coats yet has a capacity of five to eight hundred times that of the entire arterial system. Raynaud’s disease is more typically a spasm of capillary contained striped muscle of the periphery and extremities than any other. It commences as a spasmodic exsanguination and more or less obliteration of the lumen of the capillaries. The ensuing peripheral anemia, the blanching, numbness and coldness are exhibited long in advance of the ultimate gangrene of the extremities. Observers of all nations are practically unanimous in characterizing the predisposing factors by names that are now known to refer to the same underlying condition. Raynaud characterizes the disease that bears his name as a neurosis. He observes that young nervous women, hysterical individuals and children are most affected by it, and that sexual debility, fatigue, cold, venous stasis, circulatory retardations, intensive emotions, etc., are among the exciting causes.

In an analysis of Raynaud’s cases, it is observed as not a unity of causative agencies, but of the nature of the ultimate underlying composite causative influence. In one case a chilling produces peripheral anemia, another factor is an intense emotion, another is ergotism, etc. In still another class of cases the same causes may produce diabetes instead of Raynaud’s disease or yet other diseases which exhibit the same characters of hyperesthesia as the prime predisposing factor, and of precocious and excessive reaction phenomena. In the case of diabetes we observe in one case chill produces hyperglycemia, boils and carbuncles, and another in which, following a sudden loss of fortune on the Stock Exchange, a man abruptly develops typical symptoms and becomes permanently diabetic.

Raynaud’s disease, occurring as a spasmodic affection, is quite different from that resulting from ergotism. Both may exhibit the typical characters of symmetrical gangrene of the extremities, but in respect to their pathogenesis, one is the antithesis of the other. Ergot would prove the most potent remedy for the spasmodic type. This, however, is not an example of similia similibus curantur, for the pathology is not the same, notwithstanding an identity of name. What, however, is true of Raynaud’s disease, is equally true of other diseases,
wherein the classification and name are determined by the pathological anatomy rather than by the pathogenic process involved. Ergotism is not a neurosis, notwithstanding that neurotic paroxysms may as effectually asphyxiate the extremities as ergot. Anesthetic leprosy may yet be found due in some cases to spasmodic, and in others to toxic phenomena. Bacterial infections, even with marked susceptibility, may remain atypical.

It should be stated here that an immediate effect of completely depriving a tissue of a constant supply of oxygenated blood is anesthesia, while the ultimate effect of a period of suspension of circulation is loss of tissue integrity (loss of density), the effect of which is hyperesthesia and exaggerated reaction. The unstable condition known as hysteria exhibits variable areas of both anesthesia and hyperesthesia.

When from shock, fright, terror, and other depressing emotions, the blood is determined from the superficial to the deep circulation, the entailed exsanguination of the superficial tissues necessarily involves a condition of peripheral tissue anemia, which may attain any degree, ranging from one of insignificant degree, to one sufficient to produce diabetes or even Raynaud's disease, as well as war shock. Graves' disease may result from the same effect, and lesser goiter and exophthalmos obtains in case of war shock. Chill, as well as fright, not infrequently, by exsanguinating the periphery, causes hyperglycemia and more or less acidosis, resulting in a series of boil and carbuncle developments. The blood deflections of chill of the extremities in the cold and wet trenches of certain seasons, result in trench fever and trench feet, as well as predispose to shock when shell detonations occur in too immediate proximity. In this respect privates are more exposed than officers, thus accounting for their greater proclivity to shell shock, while officers are more subject to the anxiety form.

The integrity of living tissue is dependent upon an incessant supply of blood carrying oxygen and nutritive substances. The highest integrity as expressed by the highest density, is that of the most perfect supply of the most perfectly oxygenated blood. Conversely, however, the density-integrity falls corresponding to the degree of anemia attained. The flaccid paralysis is the immediate resultant of the tetanic contraction which runs a definite progressive course, followed by exhaustion relaxation. The recuperation from this condition finds a state of lowered tissue density which remains with its ecstatic hyperesthesia of considerable anemia, and hyperemia of reestablished circulation. The alternation in these states is due to the circulatory fluctuations.

The Physical Basis of Emotion.—I know of no better way to present clearly to the reader the physical aspects of morbid emotions than to begin with a survey of the anatomical and physiological fundamentals underlying the conditions produced, and then to follow it with the clinical picture and final sequence. Let us first understand that the visceral venous system, especially the great venous trunks, by far the largest veins in the body, which constitute the so-called splanchnic venous columns of the thoracic and abdominal cavities of the torso, largely follow the spinal column. When completely dilated, the capacity of these great venous trunks is sufficient to contain nearly all the blood of the body, and in death they do contain approximately the entire volume of the blood then remaining in the body.
Under normal conditions of life, these trunks are so maintained in a state of tonic contraction that they act simply as channels of conduction of the return blood circuit rising back to the lungs and heart. When the walls of these veins are in a normal state of tone (tonic contraction) they act as the resistance box of the entire circulation of the body. When the tonicity of this vascular area is intact, the body is in possession of considerable recoil elasticity and of its maximum capacity for absorption of shock, whereas in its absence we are at the mercy of the thousand and one vicissitudes of everyday life, which otherwise are taken care of by these shock absorbers. Therefore the loss of tone constitutes susceptibility to shock, and conversely, shock, per se, involves lowered or loss of blood pressure. 

Without depreciating the importance of the above described dilatation of the splanchnic venous trunks in the great deflection of the blood volume of the body which takes place in the more violent emotions, we are inclined to recognize the more positive action of the spasmatic contraction, the recoil tetanus, of the superficial and extremity tissues which occur simultaneously with the splanchnic venous dilatation and thus serve to vacate these surface and extremity tissue areas of their capillary blood content which is, according to Flint, five to eight hundred times the capacity of the entire arterial system of the body. That alone entails corresponding weakness and incapacity. 

The loss of heat and normal color of the surfaces and extremities of the body, and the simultaneously occurring muscular tetany and rigidity, and more or less loss of motor functional capacity involved, are more directly related to the peripheral anemia than the splanchnic engorgement, which by its involved venous stasis exerts its major effect upon the heart, circulatory and respiratory functions. Somatic heat and motor capacity are dependent upon the superficial circulation and peripheral combustion, which in these cases is curtailed or abolished.

Whether in the last analysis the superficial circulatory system is found to be more affected by fatigue-wrought tetanies, and the dilatation of the splanchnics is more largely produced by concussion shocks such as the explosion of large shells or the most abrupt mental or moral shocks, frights, or the most intense emotions, is of less consequence. The essential effect is a dual one representing the places of departure and arrival of the deflected blood. This loss of tone is characterized by extension or elongation of the circular fiber walls of the veins. The dilatation is evidence of that condition. The general relaxed state of the body is accompanied by a feeble state of the venous walls, and through it, is vulnerable to all the factors of traumatism. The flaccid dilatation of the venous walls is incident to the induced blood stasis within, at least in time relation.

When a person is toneless and relaxed, he is said to be in a state of irritable weakness. He is super-irritable, super-sensitive, super-excitable, super-impressionable, super-suggestible and super-credulous. His powers of resistance, of recoil, his stamina and his self-control are gone. What formerly was withstood with poise now becomes an unbalancer, an undoer. Trivial factors which formerly were of the most trifling import become factors of perturbation, disturbers of peace and of rest, and agents of excitation. That which the individual was oblivious of or proof against, now proves overwhelming of his weakened resistance.
If for any reason a person is weak and toneless from hereditary or acquired causes, from lack or absence of physical (motor) activity, from congenital defect, from depletion of illness or vicious indulgences, overwork, chronic fatigue, bad nutrition, etc., he loses in general tissue density and through it his tone, and he becomes soft and weak.

With the loss of tissue density the tissue reactions become correspondingly spasmodic and paroxysmal in character. The former manifestation of that calm stability and enduring strength of sustained effort is now replaced by instability and by jerky, spasmodic, and paroxysmal movements which are so characteristic of loss of motor integrity and of coordination. They are often violent but unenduring, for the accrued energy is quickly expended.

We encounter all degrees and stages of deflective determination of the blood of the body from the superficial circulation to the internal, and of a corresponding vacating of the superficial vessels, together with a congestion of blood, in the splanchnic trunks in inverse proportion. The vacated superficial vessels are responsible for the livid blanched hue of the skin and membranes and the general coldness of the surfaces of the body. The emptying of the blood vessels in the brain is responsible for the coincident incapacity for reason, and for the loss of consciousness. The aggregate anemia of the superficial circulation, extending from the brain to the extremities, is the cause of the incident loss of sensation. Dizziness comes with anemia of the brain, and fainting with a more complete asphyxia. Both are incident to some degree of deflection of the blood of the body into the splanchnic veins, and the degree of collapse depends upon the degree of splanchnic venous engorgement. This peripheral asphyxia is most marked when the body is erect, and is relieved by recumbence.

The maintenance of normal mentality requires the circulation of at least one-fifth of the blood of the entire body exclusively in the brain. This large proportion falls below normal under many conditions, but in none so much as in those of splanchnic venous engorgement and congestion, in which event the rising column of blood returning to the heart and lungs stagnates in this great reservoir, producing volumetric anemia of the brain, even in advance of that of the other arterial and capillary circulation.

With the above fundamentals we are prepared to understand the nature of the process which is involved, when, by excited emotions and by shocks, the victim experiences superficial and extremity contraction and tetanic rigidity. Then the surfaces of the body become livid white and cold; the circulation and heart laboriously struggle with their burden of engorgement and congestion of the doubled volume of the rising column of venous blood, and the heart's function fails for the dual reason that its cavities do not fill and its muscles themselves languish for oxygen and nutrition. The vascular system of the lungs fails to adequately receive or oxygenate the blood and the individual in his air hunger yawns and the breathing assumes a sobbing and stammering character, the labored inspiration trebles the time duration of the expiration. Vague discomfort is followed by respiratory distress, the sensation of anguish succeeds to a distressing faintness, a sense of sickness eventually comes to a crisis, a change in the tide, and all the senses become blunted and vague; a sort of drunkenness, incident to the bloodless brain, is manifest. Swallowing movements,
hiccough, or other convulsive manifestations supervene, then consciousness is lost.

In general, the loss of tissue density is the predisposing cause of human wrecking, and the disruption of the body's resistance box occurs secondarily, as an exciting factor of a final collapse. These are well recognized facts, and our Government is now engaged on a wholesale scale in eliminating from the embryonic elements of our army all those too unstable for the test, and in strengthening the tissue integrity and vital capacity of those who can be hardened sufficiently for the fray in the minimum time available.

The active belligerents of the world war have found that the weakling and the unhardened recruit soon falls a prey to what has been variously termed traumatic or war neurosis or psychosis, shell shock, etc., which may not only disqualify him for service, but invalidate him home a human wreck. He suffers a breaking down of his splanchnic venous tone. His powers of recoil and resistance are gone. His great venous trunks have dilated, his blood sags in its rising column and fails to reach the heart and lungs in sufficient quantity to attain re-aeration, and collapse and incapacity to live in the erect posture are inevitable. When this extreme condition is once attained, resuscitation is attainable only to be invalidated home, never to be useful as a soldier again, and perhaps incapacitated by unfitness in civil life in rare extremes.

The war neuroses are classified into the purely mental types and the physical or convulsive (hysterical) types. The abrupt and violent reactions to sensorial traumata of concussive force, and the excessive recoils which they entail, range in physical changes from none at all of visible differentiation to those terminating fatally, in which are exhibited extreme congestion and ecchymoses on each side of every superficial vessel of the brain. Numbers of punctiform hemorrhages appear at the terminations of the smallest vessels on the surface, together with a general softening and partial edema of the brain. It is interesting that in surgical shock, war neuroses, and spontaneous and revival conversions, fatigue is an important exciting cause. Also, that men predominate in the so-called spontaneous conversions and officers predominate in the analogous mental form of the war neuroses, while the subordinate privates and the weaker sex predominate in the opposite forms. Women are also more disposed to hysteria than men. The hysterical forms of both war and civil-life neuroses are more amenable to hypnotic treatment than the others. The best prophylactic measure against the underlying fear of both war and religion is education against it; while conversely the religious inculcation of fear of death, post-mortem torments, etc., fosters war neuroses in troops. Cultivation of depressive mental emotions constitutes an unfortunate preparation for modern warfare.

A sensorial impression which is sufficiently abrupt and violent to produce a shock effect, a tetanic recoil, and a rigidity or contracture, in place of a normal reaction, is not to be differentiated between its occurrence in war and civil life, except in degree and violence of effect. Both appear in ultimate form as sterile emotions. In both cases, the fatigue factor is largely produced by the effects of prolonged recoil producing a succession of bombardments or single concussions of great force.

The war neuroses, or as the French term them: cerebral commotions, which are now elucidated and
Dr. Paul Sollier, the eminent neurologist now of Lyons, are defined by Dr. Sollier as 'hysteries in the raw'—elementary hysterias, in which the physical, as distinguished from the psychical, element is absolutely preponderant; whereas in the ordinary traumatic hysteria these two elements are almost on the same level. In the words of Dr. Sollier: "When we envisage the similarity of the pictures presented by ordinary hysteria and the nervous phenomena that result from shell shock, we are forced to conclude that their nature is identical. Shell shock thus demonstrates to us that hysteria may be provoked by causes purely physical, and we are led to conclude that the purely psychological theories are inexact, since they do not apply to all the cases. Since it is undeniable, on the other hand, that hysteria can be provoked by emotional and moral causes, we must conclude that there exists an entire gamut of forces—physical, mechanical, organic, and psychic—that may lead to the same clinical results."

Dr. Sollier's identification (1) of war neuroses (shell shocks, etc.) with civil life hysteria, which is mostly observed in women, in the absence of the more violent shocks, and (2) its recognition as an essentially physical affection, and best treated by physical measures, is a great stride in the proper classification of the fundamental emotional element. This final attainment in neurology is a complete substantiation of a position taken by Professor Angelo Mosso of the University of Turin, who wrote many years ago: "The vivid impression of a strong emotion may produce the same effects as a blow on the head or some physical shock. There are men who, through fear, have lost consciousness, sight, or speech; others, still more sensitive, have remained for a long time paralytic, unable to move legs or arms, and have lost all sensibility. Some remain for a long time sleepless, others fall into a sort of exaltation resembling the outbreak of mental disease, many lose their appetite, or are afflicted with articular diseases, and in some the nervous system suffers such a shock as to cause violent fever." The siege of Strasbourg in 1870 is cited as producing from fright, paralysis agitans, convulsions, etc. In the present war, all the above and yet greater injuries of this type abound. A painful sensation of having been beaten on the head, which is not infrequent, conforms to Mosso's classical description.

Whether from faulty synthesis or from later experience incompatible with its normal sustenance, when the vital integrity of a tissue is lowered, it is primarily and most conspicuously exhibited by a corresponding lowering of its density; and its functional performances are typically related to the phase of its coincident density, both in reaction time and in expenditure of energy. Tissue density is thus a common factor in both physical and mental cases. A lowered somatic tissue density constitutes a predisposition to the superimposed traumatic concussion of war as well as of civil life. Habitual emotionalism, the overwrought depression of distressing anxiety, and fear of religious origin, exhibit the same type of neurotic symptoms as those developed under fire. In fact, the former group may predispose to the latter. The wet-brained alcoholic exhibits psychical peculiarities not unlike victims of cerebral injury. Periodical or constant hyperesthesia is a symptom typical to both. Emotionalism and hysteria are but expression phases of hyperesthesia. The various transition phases exist-
ing between hyperesthesia and anesthesia include the wide range exhibited between the manifestation of exaltation and melancholia, and between the extremes of mania and dementia. The normal balance belongs to an intermediate phase. Typical characteristics of behavior: impetuosity, impulsiveness, impatience, intolerance, discontent, unrestraint, lack of self-control, etc., of hyperesthesia, thus contrast with stolidity, apathy, obtuseness, and the clouded and stupid minds of the dullard, the sluggard, and the pronounced stages of feeblemindedness and general paralysis.

Secondary Stasis in Visceral Organs.—The existence, as an initial event, of a pronounced venous engorgement and congestion, especially of the splanchnic venous trunks, must of necessity cause serious circulatory stagnations in the important visceral organs which are directly dependent. One cannot ignore the fact that the several ductless glands, notably the thyroid, thymus and adrenal, are thus seriously disturbed in their functions, while the occurrence of war nephritis, incidental to chill, shell shock and other events of the trenches, adds to our observations of chill and the greater depressing emotions, in times of peace, as etiologic factors of nephritis in general. In Graves' disease the circulatory disturbance is the most marked and constant symptom, and in nephritis also it is pronounced, though regarded more as a result than as a cause. Edemas occur in both, but in the former they are fleeting in character. Vascularity occurs in the thyroid in the former, but only in the more acute types of the latter. It is a matter of common observation that acute manifestations of thyroid swelling and exophthalmos occur in varying degrees in individuals, not affected by Graves' disease, during periods of great emotional stress and spasm, in cases of shock and other manifestations which are consequent upon the factors typical of emotion and shock conditions.

Apart from the major casualties of war rendering men defective, there are several obscure types of pathological manifestation which render the victim vocationally unfit. Emotion sterilizes the motor reaction sequences of sense impression stimuli, by dissipation of the energy that otherwise would be focussed, differentiated, and directed to specific purposes. Inhibition, whether due to tetanic contraction or flaccid paralysis, invalidates all applied effort. Incoordination and discoordination involve defeats of those unities of collective physical and mental expression which are necessary to singleness of purpose and action of individual thought and effort. Frustration frustrates design and purpose because of rendering the individual impotent to act at the right time, or until the psychologic moment has passed.

All of the above elements of vocational unfitness are affections of physical instability. They are fundamentally expressions of hyperesthetic conditions with which the psychiatrist is called upon to deal as first in importance in connection with the rehabilitation of the war shock cases. The release of the victim from hyperesthesia must precede any efforts to train him in any useful vocational pursuits. Until that can be attained any technical training will prove an unfortunate expenditure of time and money. In many cases, out-of-door exercise and occupations of simple form should precede indoor trade trainings.

The mental pathology of inculcating (1) intense excitement and emotional stress which has no fo-
cused outcome, (2) a highly wrought tension, aborted short of its motor sequence, (3) a state ending in muscular tetany and rigidity, instead of activity, (4) a preamble of a motor reaction excited to a high degree and yet deprived of its normal sequence and thus rendered sterile, is as damaging to those organs involved in the mental function, as are those recognized physical organs which are engorged and congested, without release or alleviation, by artificial stimulations and inflammations of the states of war neuroses. In all sterile emotions, whether instigated by religious excitement and emotionalism, by alcoholic intoxicants, or unrequited love, the result is practically the same, namely, a reaction, which is made up of a combination of sense impressions and perceptions, with or without deliberation and physical (motor) expression, including speech.

Under normal conditions, when a sense impression is not attended by some kind of physical expression, it is because its impulses are too weak. It may be so feeble as to create no other than a subconscious impression (short of eliciting the attention). A yet stronger one may elicit a focus of the conscious attention, yet not evoke motor expression. With sterile emotions we observe a bestowal of sufficient stimulus, or impetus, to excite motor impulses, yet which are in these cases repressed. We thus have for our consideration a general physical disequilibrium which is due to an unbalanced reaction (an aborted reaction).

Sterile Emotion.—There are many causes which would create in a weak man the emotion of fear, in a weaker one that of terror, yet in a strong man anger or rage. There is often exhibited a motor stress which excites one to escape and another to combat—unless it be that it is so excessive that it is sterilized in tetanic contraction. According to the observations of Cannon of Boston, the disability of one or the capacity of the other, are dependent upon the capacity of the suprarenal and thyroid glands to secrete substances called epinephrin and thyroid secretion, which, as internal secretions, play a dual role in reestablishing the equilibrium of the general circulation. It appears that a profound normal emotion is attended with the secretion of epinephrin and thyroid secretion, by virtue of which motor reaction is assured with circulatory compensation. Conversely, in the event of the sterile emotion, we observe the determination of blood to the venous trunks, muscular collapse, fear, capitulation, etc. But also in such cases we may find glycosuria, albuminuria, air hunger, etc., which are also symptoms of adrenal insufficiency; while muscular twitchings, tremors, spasms, and even tetanic convulsions occur from derangements of, and disequilibrium between, these glandular organs.

It is to be observed that wholly normal individuals exhibit an elasticity of recoil which is indicative of a certain capacity for shock absorption which is only shattered by concussive shocks of such violence that the integrity of the involved tissues is disrupted or destroyed, which may be to such a degree that it would be attended with fatal sequence.

The unstable individual exhibits a conspicuous absence of such a margin of safety, of elasticity and capacity for absorption, and in perhaps what Dr. John J. B. Morgan terms "potential neurosis," there is a disposition to react to potential perturbations by tetanic recoils, recoils that simply serve to develop a state of biologic tetanus, in which state the involved tissues remain, and thus causing con-
tractures of the extremities instead of the normal reaction, i.e. constituting a contraction of normal intensity, followed by relaxation.

The inhibition of normal motor response in the face of powerful artificial incitement of such a reaction, is responsible for the cumulated dynamic stress that finds expression in the exhibited state of tension, and eventually when the resistance powers of the organism are overwhelmed, finds vicarious outlet, and the normal exit being closed, it finds escape in a diffuse tetany or an impulse wave which pervades the entire motor organism. This we term emotion. It is a sterile substitute for utilitarian action.

Having thus once forced such a false passage, as it were, of subsequent vicarious energy escape, which by this channel is facilitated; and as multitudinous repetitions not infrequently widely open this path, the victim correspondingly finds his endurance for resistance so lowered that trivial vicissitudes of daily life attain to emotional reaction and energy escape. We say the individual is unstable, restless, unenduring, impatient, intolerant, and moreover irritably weak, because he lacks the strength which stability involves, because he lacks control of the emotional responses to factors of irritability, and is hysterical because of the typical emotional and spasmodic character of the expressed physical phenomena.

This condition may be regarded as analogous to a steam boiler with a safety valve which has been regulated to blow off steam at so low a pressure that no accrued power is accumulated, and all machinery requiring other than the lowest ebb of kinetic energy is unmoved by it. The vicarious discharge which is abnormal in sterile emotions, is quite identical with that diffuse wave, so typical of what we also call emotion, which accompanies the orgasmal discharge of the connubial function, and I attribute to this fact the explanation why sterile emotions, originally of religious character, so often recur as typical sex or pervert sex emotions and later reappear repeatedly with all their characteristics and accompaniments, as such.

Under normal conditions the current impression impulses accelerate allied past impressions to a repetition of their past reactions and into an associative reaction with the current one, culminating in a unified motor expression. If conversely the individual be emotional, the motor reaction is manifested as a diffuse wave-like flow that lacks definition and unified direction.

An emotion of terror may fail to focus into a definite act of defence or flight, and thus be expressed as a general muscular contraction, a tetany or rigor, or as a general muscular flaccidity. In either case, paralysis of action supervenes. An emotional wave in the form of a thrill is equally diffuse and sterile as a motor expression. The inability to hold the impulses to the normal paths is obviously a manifestation of physical weakness.

In an hour of peril, a person of physical strength and high integrity of animal efficiency will experience a reaction characterized by focus, direction, and definition of action. The weakling under the same circumstances will be overcome and frustrated, he will in common parlance lose his head. We say his will is paralyzed, but in truth the elementary factors that go to make up the will fail to materialize, and the volition in turn is absent. The accrued energy which might have taken form as a voluntary act flows away as a diffuse wave, or
is exhibited in a general muscular contracture. It is therefore in the form of either a diffuse emission of kinetic energy or of a muscular contracture, a sterile and defeated (abortion of a) voluntary act.

Present space will not permit going more fully into their elucidation, but it is not infrequently the case that functional abnormalities are in reality perversions, wherein the abnormal function, while a perversion of the function which is disordered, is or would be normal to some other function. An action which is in harmony and equilibrium with one organ, office, or function, would usually be in disequilibrium with another, and thus its action, in the vicarious capacity, constitutes a derangement which is basically a disequilibrium. When functional abnormalities occur in connection with the mental function, we term them unbalanced states, which they are in truth.

Kennedy characterizes as flabby the typical physical feature that bears strain badly, as distinguished from the robust type. These are most misleading terms. Hyperesthesia is the type which is especially vulnerable, whereas there are asthenic types which are more anesthetic than hyperesthetic, which are decidedly flabby. Conversely, many men who might be well characterized as robust, in the usual acceptance of that term, are without recoil endurance or resistance. A type of man exhibiting supertensity or tenseness of attitude, together with considerable degree of so-called robustness, generally makes a poor showing of toleration of the vicissitudes and perturbations of anything like modern warfare. As deaf mutes are determined good material for aviators, so may men of blunted sensibilities be found to best withstand the violence of concussive commotions. When the requisite physical status is not procurable in sufficient numbers of physically hardened sound men, the safer increment must come from the unsound of blunted rather than exaggerated sensation.

Peripheral and Somatic Acidosis.—Peripheral and general acidoses are observed both locally and somatically in the type of cases under consideration. Instances wherein tetanic states, spasmodically acquired and tetanically perpetuated, are productive of superacid generation, are now readily recognized, not only by the biochemist but by the chemical pathologist and the well informed physician in general practice. Not only is sustained tetanic contraction attended by disengagement of sarcolactic acid as a cleavage product, but when wide areas of peripheral and extremity tissues are involved, the incidental exsanguination of the capillaries and the entailed asphyxia produce a degree of multiple acid formation which indicates arrested tissue synthesis.

Approximately universal peripheral exsanguination involves pathogenic conditions which, however, extend far from the periphery. Whenever any large vascular area is approximately vacated, we may be sure that the visceral venous system is in inverse ratio over-engorged and congested, and such a condition of stasis is of little if of any less importance as a factor of retardation and inhibition of the general circulation. The over-distended and over-weighted splanchnic venous trunks then constitute a serious menace to the ascending flow of blood when the body is in the upright position. The rises of blood pressure occurring in contrast with the general circulatory failure of these cases, are probably related to the coincident acid-
osis. Stefani ascertained that dyspnoic blood produced local vascular dilation and central constriction, which in general would raise blood pressure. Bradford and Dean have shown that on producing asphyxia in a curarized animal, a great rise in arterial tension occurred, followed by a more gradual fall. The relation of vascular tone to the alkalinity of the blood seems to be established by Leonard Hill's findings that the vascular tone is increased by raising the alkalescence of the blood.

In general, conditions exhibiting asphyxia are productive of a fall in the alkaline reserve (acidosis).

Oertel and Grawitz have been largely instrumental in showing that a marked polycythemia form of concentration of the blood is found in conditions characterized by chronic stasis, cyanosis, and edema, and that this is more marked in the capillaries than in either the veins or arteries. Lazarus Barlow has given us at this point a most explicit illumination by determining that the withdrawal of the blood from one part of the body, in the course of a deflection to another part, is accompanied by a rise in specific gravity in the tissues which thus become anemic. Taken collectively, many important points are elucidated by these investigators.

The physiological course of reaction events followed by tissues subjected to devitalizing conditions, appears to be governed by the degree and abruptness of the effect. When sufficiently severe and abrupt, cell death occurs in the phase of contraction. When conversely the effect is insufficient to produce cell death, following a varying period of exhaustion flaccidity, vital recuperation follows. When the devitalizing factor is a peripheral and extremity spasmodic exsanguination, there is observed an alternate succession of contrasting events.

The antecedent and predisposing low tissue density, often attended with hydremia, is primarily succeeded by a sudden ejection, especially of the watery elements into the deep venous trunks, leaving a marked inspissation of the blood remaining in the capillaries, which in turn, as a compensatory process, takes up water from the tissues. When, as in Raynaud's disease, the asphyxia is sufficient to produce extremity tissue death in this phase, its form would be predestined to be dry gangrene. Conversely, however, when instead, it is followed by exhaustion flaccidity and a passive hyperemia, low tissue density reappears in increased degree, and perhaps hydremia or edema, or both. Intermediate between tissue death in contraction and flaccid paralysis, we observe the more common forms of rigidities, contractures or clonic contractions of the so-called hysterical events, and between vascular exsanguinations and passive hyperaemias we have fluctuating variations in the specific gravity of the blood.

**Collateral Susceptibility.**—Over thirteen years ago and lately I directed the attention of the profession to the coincidence of susceptibility to bacterial infection with hyperesthetic neurotic manifestations, as due to the common cause of the lowered tissue density, the infection occurring as a direct result to the incidental lowered surface tension and osmotic pressure of the involved cells and coexisting lowered vital reaction. Among the many factors of reduced tissue density, none are more rapid and pronounced in their causative action than those exsanguinating reactions which have so long been grouped under the caption of vasomotor reflex actions.

The present war has afforded us remarkable in-
stances of coincident extreme spasmodic exsanguinations of the tissues, especially of the lower extremities, which are attended with those typical characters which have come to be known by the general term war neuroses, in relation with a virulent infection recognized as trench fever. Furthermore, it has been a remarkable general observation that conscripts in an abrupt transition from civil to military life with its rigorous discipline, strenuous drilling and other intensive training, its fatigues, weather exposures, etc., before general hardening has been attained, and in some cases owing to belated supplies of proper clothing for experienced cold weather, have been affected with pronounced super-susceptibility to virulent infections.

It is not without interest that recorded observations of the effects upon hardening of men in the first, second, and third years respectively, of service in the German Army, for the period from 1867, following the Austro-Prussian war, to 1874, excluding one year of the Franco-Prussian war, of 1870-1, exhibit the attained extent of hardening in terms of specific gravity of tissues, and show clearly the relation of same to their experienced reaction to surface cold, and susceptibility to the then prevailing infectious diseases. The second year of service exhibits degrees of tissue hardening greatly beyond those of the first year, and those of the third year are well in advance of those of the second year. The then most prevalent infectious disease, typhoid, showed only a half to one-third in third-year men what was exhibited by first-year men. A similar decrease was shown in the derangements due to exposures to cold—chill. Since the German Army counts on the first year of service to weed out the weak men who pass the examining physicians, it is not surprising that its officers have deprecated the physical efficiency of the American Army made up largely of first-year men.

Gustave Jaeger, who presented the above-mentioned statistics, quotes some most interesting tables from Beneke exhibiting the relative percentages of water, salts, organic solids and fats of the arm bones respectively of a soldier, a woman affected with tuberculosis, and a boy dead of caries, and from Ranke, of percentages of solids of muscles, brain, spinal marrow, and blood, of a decapitated young healthy criminal and of an old man dead of marasmus. These two tables show the remarkable loss of solids, inversely, increase in proportion of water, in diseases which involve a loss of tissue density. In the latter case, the loss of solids incident to disease much more than offsets the usual loss of tissue water incident to old age.

The value of hydrogogue catharsis, diuresis, and perspiration as artificial and natural measures for the active elimination of water from the blood, is recognized as essential for the maintenance of high degrees of tissue integrity, and incidentally immunity from both infection and pathologic chill reactions. The same might be said of emotional reactions, the proclivity to which would be greatly lessened by all measures which lessen the proportion of tissue-contained water.

Relation of Manifestation to Severity of Case.—In considering symptoms in relation to the severity of morbid causes, it may be accepted that kyphesthetic manifestations are significant of lesser degrees of disorganization than the anesthetic type. All progressive mental declines exhibit mania in early and dementia in late stages. Traumatic neuroses exhibiting amnesia, apathy approaching de-
mentia, accompanied by deafness minus central labyrinthine disturbance, are far more serious than those exhibiting hyperesthetic symptoms. Exhaustion anesthesia is to be recognized also as the transient end result of processes attended with hyperesthesia, emotion, and their exhausting trains of manifestations.

In some cases the severity of manifestation appears out of proportion to apparent causative factors. In these cases the physician must look to the predisposing factors, both remote and recent. Even emotional experiences, either violent or repeated, religious as well as profane, serve to predispose to excessive and precocious emotional spasms of pathogenic import. Alcoholic indulgence, fatigue, chill, and many distressing and depressing experiences predispose to excessive emotions. The etiological factors of emotion and of spasmodic and paroxysmal diseases in general, are practically identical. Individuals exhibiting proclivities to emotion, generally also exhibit the spasmodic as well.

An individual exhibiting that diathesis which we identify as a proclivity to fluctuating abnormal extremes of motor reaction, and as characterized by instability, emotion, hysteria, etc., is correspondingly lacking in motor control, and aggravations of the primary condition from any cause, correspondingly increase the existing motor incapacity, which is fundamentally volitional, and is thus truly an organic disease of the will. We observe a disruption of continuity between the physical preamble of the individual's reaction to sense impressions and the normally resulting motor sequence, and moreover, that correction of the defect must compass a reestablishment of coordination between the two. In bad cases a more or less complete reeducation must be considered.

Education in its wider sense involves experience, and general experience further involves the exercise of all of those physical functions which participate in that somatic attainment. The disruption of reactional motor coordination involves a corresponding destruction of the underlying physical mechanism which is responsible for all animal automatism, habit and memory, such as the accrued sequence of all past experience. Just as the original coordination, both motor and physical, was developed under the law of repetition, so all reestablishment of the same must be attained by a systematic and methodical exercise of the fundamental vital reactions to rebuild that complex superstructure which is so essential to the self-sustaining man.

What we term voluntary action is differential and discriminatory, corresponding to its volitional attributes. Volitional incapacity is not necessarily characterized by a weakness of motor expression, but by an incapacity to differentiate, focus, direct and control it. It is rather a problem of conservation than expenditure of energy. The unstable and the unfit individual is characterized by precocity and excessive motor expression, by impulsive and immaturity reasoned acts, and by lack of restraint and control of same. The lower the grade of voluntary motor expression, the less differentiated and focused, and the more diffuse it is. The lowest and most sterile form of motor reaction is that diffuse wave which we term emotion. In a sense, it is a vicarious escape of potential energy, an emission of what might have, in a person of higher tissue integrity, been conserved and accrued until capable of motive power, whereas as an emotion it is characterized by sterility in the economic sense.
All factors that inhibit the development, or accomplish the disruption of tissue integrity, correspondingly lower its capacity for utilitarian functionation. Anaemia, local and general, cardiac insufficiencies, circulatory impediments, etc., are common causative factors, but those events, spasmodic and paroxysmal, which asphyxiate the extremities and the periphery to a sufficient degree to engorge and congest the visceral venous system, are the most notable.

Mental Deficiency and Motor Incapacity of Hyperesthesia.—The present form of estimation of mental capacity by various mental tests on the basis of age equivalents, fails adequately to differentiate the imbecile from the temporarily disqualified hyperesthetic. The former type is one of maldevelopment; the latter is, on the other hand, a disability dependent upon abnormal function affecting mentation. The former is a sluggish, subsensuous condition, while the latter is a hyperirritable and hyperexcitable (hyperesthetic) one. The former is attended with functional deficiency, the latter by precocious and excessive functional reactions. It is obvious that these two diverse states should not be diagnosed by the same test as a unit condition.

The hyperesthetic individual, in any effort to focus and sustain the attention, may experience a cramp-like reaction, an emotional or spasmodic rigor or tetany of the involved organal tissues which effectually precludes adaptation of mental activity. The greater the stress of the occasion, the greater is the inability to exercise the mind with proper direction and definition. During a test or examination, these cases will in vain strain to think, to reason, or to remember, yet as soon as the paroxysm passes off and relaxation supervenes, the much sought mental goal is attained with ease. We therefore have exhibited in this class of cases, in one respect, the very antithesis of the actual feebleminded ones; yet in another respect the end result is the same. With regard to the biologic over-reaction status the antithetical processes thus prevail. On the other hand, the enfeebled effort to perceive, to discern, and to discriminate does not mature in the first case, and conversely it is inhibited in the second one. The ultimate result of the test is the same; the mental goal is equally minus. The application of a mental test to a recruit might in either type be attended with the same result, namely, with failure to pass on tests which it is deemed he should in accordance with his actual age. In the first case it is through permanent mental incapacity, and in the second it is through spasmodic onset of tetany which effectually precludes the exercise of the requisite mental activity.

Human documents afford us abundant illustration of the instances wherein even approximately normal persons, in the anxious moments and stress of educational and military examination, are utterly unable to recall answers to questions and solutions to problems with which they are perfectly familiar, and recall them with celerity as soon as relaxation supervenes, when the examination is over and it is too late to make it available on the test. This same experience is observed in progressively greater degrees corresponding to the exhibited degree of hyperesthesia.

As the degrees of hyperesthesia mount higher and higher, the stress of anxiety neurosis increases correspondingly. Unit degrees of stress are pro-
duced with correspondingly decreasing causative factors. An overwhelming fear of not being able to think of correct answers to questions, accomplishes the inhibition necessary to make such recollection impossible, in much the same manner that stage fright incapacitates an inexperienced public speaker.

The inability of an individual to summon and utilize his faculties of discernment and of discrimination, involving the interaction of current with past performance impressions, relegates his mental level to the normal equivalent of earlier years when the total impressions received corresponded with those of their present utility. This also corresponds with the comparison of the equivalent mental levels of immature minds in adults which measure to those of childhood.

Flustration and Frustration.—Prior to our consideration of volition or exercise of will, there should be preceded a concept of its underlying antecedents, which may be traced backward, beginning with the individual's completed resolution or will to do. Underlying all volition is the decision, underlying decision is discrimination, and underlying discrimination are many originally competing factors, the predominant one of which has become the dominant factor in the ultimate volition which is attained by a species of natural selection, i. e., by virtue of the exclusion of the minority factors. Volition is thus the more or less definite outcome of a complex process; it constitutes the ultimate goal of the collective mental process. Its expression may be emotional or a matured motor act. The will is not always perfect or normal as a unit first cause of voluntary acts. The mechanism of its complex process is subject to many misarticulations and disequilibriums of its constituent factors. The concert of reaction of its constituent factors may be unbalanced in both energy and time relation, with an exhibited ultimate sequence varying from one extreme of explosive violence to another of paralysis; which may be alternately manifested in an unstable person as reaction expressions of divers degrees of perturbations. The paralytic or inhibitory process which we observe in the cases of flustration and frustration, in which the antecedent psycho-physical process fails to come to a focus, leaves the individual in a state of mental confusion and distraction minus the normal crystallization into volition.

Definiteness of orientation, of direction, and of focus of expressed volition depends upon a clean-cut singleness of goal. Conversely, to the extent that thought is confused and disconcerted it is diffuse, ill-defined, and correspondingly weak. The most perfect expression of individual volition is that of highest definition and most exclusive direction. These elements involve the final focus.

The typical hyperesthetic individual is characterized, not only by indecision, irresolution, vacillation, inconstancy, fickleness, caprice, unreliability, irresponsibility, disloyalty, and treachery, but by imperfections of the mechanism of volition synthesis. This, however, is as unstable as is the individual's character in general. Excessive motility on one occasion and complete inhibition on another is the expression of the instability.

A typical feature in the hyperesthetic is the inability to mature an elaborated reaction when disconcerted even by trivial perturbations. Such an individual is characterized as fussed or panic-stricken whenever anything occurs that might ex-
cite activity, as flight or a combative response in a normal person; and they exhibit frustration or a mental confusion, which involves frustration, or perhaps a physical inhibition of all motor initiation, and thus the defeat of the voluntary acts.

Such types of physical and mental incapacity are serious obstacles in the way of all hyperesthetics, as soldiers. They are especially incapacitating at times of surprise and under the usual stress of emergency. Incapacity to endure the strain, stresses, and concussive shocks of warfare may cause the mentioned incapacities to be increased to such degrees, and coordinate volition may as a consequence be so deficient that delinquency may result. Presence of mind in emergency is indispensable in the army and navy, and in after civil life it is a most valuable asset. It is antithetical to those discoordinations, disaggregations, and dissociations of mental unity which spell incapacity to the individual.

Individuals rendered hyperesthetic from all causes, are more or less prone to experience super-stress on all occasions demanding emergency resourcefulness. Each effort is thwarted by a spasmodic reaction which may be succeeded by a tetanic or rigid contractile state. The greater the exigency making demands upon the memory, or upon the mental capacity involving sustained attention and application, solving more or less difficult problems, etc., and the greater the effort made to comply, the greater is the exhibited proclivity to be attended by spasmodic response phenomena and by a tetanic state continuing with the incidental stress. When these cases are permitted to continue uncorrected for a length of time, they become habitual, and chronicity supervenes under the law of repetition. These individuals become confirmed victims of frustration.

Frustration is of interest and importance to the army medical service owing to its victims being disqualified for aircraft and other military service in general requiring either morale or capacity for emergency resourcefulness. A man who is overcome with sterile emotion, or is, as it were, frozen stiff and immobile during periods of sudden emergency stress, is much better off well in the rear of army fighting lines. The production of frustration states, as part and parcel of war neuroses, is a subject of prime importance. The incidence of shell shock may, in the milder cases, leave the victim apparently little the worse for the experience, yet on the first occasion of its repetition or in the stress of an urgent emergency, he may fail at the crucial moment to signal, defend or retire, as the occasion demands.

Apparently the term war shock, in its broader sense, is made to cover a wide field of mental and physical manifestations resulting from the violent factors of war. By some writers it is caused to cover practically all of the resultant manifestations covered by the more general term war psychoneuroses of other writers. It is, however, true that concussive forces of lesser import, but of the same general order, produce obscure injuries which are not closely allied to those of major importance, and that lines of demarcation between the two are difficult to draw.

The production of a complete flaccid paralysis in one part or case, a state of painful cramp rigidity or contracture in another, of hyperesthesia or anesthesia, of exaggerated or lost reflexes, and tremors, according to their location, are indicative
of the degree of affectation. In general, the distal extremities are most profoundly affected, and the fingers or toes are the parts which become cyanotic, when a case exhibits it other than as of general circulatory failure. Anesthesia is also most exhibited in the distal extremities and in cases where it is not universally peripheral. The degree of its extension toward the torso bears an approximate relation to the extent of the affectation. In this connection it is of interest and importance that Dr. Sollier explores his cases for anesthesia in the direction extending from the distal extremities toward the torso and begins his treatment on the sensitive side of the line of demarcation, extending it from that point toward the extremity.

**Treatment.**—A distinct and most noteworthy advance has been made by Dr. Sollier in this therapeutic procedure, which we can best appreciate when we recall how much time has been lost in past years in subjecting completely anesthetic tissues to stimuli of all the five forms of physical energy, namely, mechanical, electrical, thermal, photic, and chemical, they necessarily exhibiting no reaction and therefore attaining no therapeutic result. By his wise procedure of beginning his physical stimuli above the anesthetic area where reaction is attainable, the influence upon the more distal contiguous anesthetic areas is rendered potent. Progressive extension of the resanguinification toward the distal ends of the extremities carries with it restoration of sensation, and motor capacity gradually follows with the application of massage, manipulations, and exercises which are rapidly followed regardless of the hyperesthetic and even painful reactions that are thus produced.

The best results in these cases are obtained in those in which anesthetic paralysis of an extremity has existed for a minimum period of time. It is therefore important that provisions be maintained to treat these cases properly in the shortest possible time after incurring the shock complex. Especially those cases which can never safely be returned to the trenches obtain the best results from the earliest possible treatment. This, I understand, is already generally recognized and provisions are under way to carry out the promptest treatment possible.

Hypnotic suggestion is of value only in the milder cases of war neuroses, as anything like an exclusive treatment. For the re-establishment of circulatory equilibrium, it is less prompt and efficacious than the physical measures. It is, however, in all cases a valuable accessory treatment for the control of hysterical phenomena, as symptomatically treated.

It should be emphasized that the circulatory failure of shock is least exhibited immediately following the primary deflection of the blood from the superficial and capillary to the deep and venous system. Following this initial event, supervenes progressive circulatory failure and acidosis as a sequence of superficial tissue asphyxia and splanchnic venous stasis. These events should be intercepted at the earliest possible moment. To accomplish that end, not only should brisk frictional rubbing or brushing of the surfaces of the body be promptly resorted to, but hypodermic injections of adrenalin or ergotin should be administered repeatedly until contraction of the dilated splanchnics is attained sufficient to reestablish circulatory compensation. Following this a pro-
gressive system of exercises, first passive and resistant, and secondly active and gymnastic in character, may be carried out to surprising advantage. Machine massage and gymnastics are contraindicated.

The shorter the period and the less the extent of circulatory discompensation obtaining in individual cases the less will be later losses of motor coordination. These cases are, however, best treated by a series of reeducation drills of those movements which appear most difficult of volition after the acquirement of the so-called shock neurosis. Those cases in general that are not amenable to a happy treatment outcome will be those unsuccessfully treated in their earlier stages, and those in which vital tissue integrity is damaged beyond repair.

For recondensation and retoning of dilated venous walls adrenalin will be found more powerful and prompt, but more transient in action than ergotin, which will be found more reliable, safer, and more enduring in its action. The latter is especially preferable for repeated use. By the use of ergotin, wisely administered, many of the symptoms typical of war shock, including the tachycardia, will disappear early and thus greatly simplify the after-treatment. Cardiac and circulatory failure will in most cases be averted by early restoration of general tissue condensation and tonicity, in which the heart as well as the vascular walls participate.

Hyperesthesia, emotional instability, tachycardia, insomnia, passionate outbursts, epileptoid attacks, spasmodic and tetanic proclivities, contractures, functional paralyses, etc., are more or less benefited or eliminated by the hypodermic administration or ergotin in a series of daily or more frequent doses, as introduced by Livingston a number of years ago. Separate treatment for the nausea, sense of precordial gripping and oppression, gaseous distention and dilatation of the stomach, etc., is not usually required.

Cold baths, wisely administered, will prove valuable in these cases; and on occasions when the patients do not exhibit reaction glows to warm towel drying and brisk rubbing of the body surfaces, they can be accelerated by carbonizing the bath water, or adding pine needles or mustard sufficient to produce mild rubescence. Thermatic hot-air, vapor, steam, and water baths are distinctly harmful in ultimate results, and should be resorted to only in emergencies and in the absence of better methods.

We would emphasize the importance of the earliest possible attention to the newly experienced cases of war shock by prompt rectification of the induced disequilibrium of the general circulation and followed by such other corrections of exhibited derangements as may be indicated in individual cases. These fundamental disorders may be adjusted without explaining to the patient possible consequences of deficiency of the treatment, or neglect, other than on his own part, and without relaxation of military discipline. In those cases where a radical rehabilitation of the normal circulation is promptly attained, the case may, after more or less treatment by cold baths and exercises, be returned to duty, while those suffering actual structural injury, and who remain incapacitated after circulatory restoration, should be sent to the rear for repair and rehabilitation of tissue integrity. The most serious cases should
be invalided home. The latter class are not infrequently so shattered physically that they are quite incapacitated for ever again withstanding the intense anxiety, stress and shock of battle. Their recovery demands prompt and complete removal from the war zone, but not release to independent civil life. These cases should now be entered upon the new phase of rehabilitation which is at once to save them from social delinquency, and prepare them by a combined physical and industrial reeducation for future usefulness and self-support.

Prophylaxis.—A proper regard for prophylaxis against the war-wrought neuroses as a class must begin at the cantonment, in exercising discrimination in the determination of the time duration of the period of training and physical hardening necessary, preparatory to the production of a stable and well-poised soldier, who can be depended upon in the presence of the perturbing and discoordinating exigencies of the battlefront. It is obvious that from the viewpoint of the physiologist, the custom of giving all men the same time duration of training is a mistake. Not only do men differ greatly in their aptitude for the manual of arms and field maneuvers, but even more greatly do they differ in their condition of physical hardness or softness. The ultra-soft recruit may require from one to two years to become as hardened as another at the end of six months. The soft recruit may, however, at a later period, be made as hard, enduring and efficient as his originally hardy comrade, by a corresponding prolongation of his training. With that greater hardihood also, he would thus become correspondingly more tolerant and resistant of the exhaust-

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