

Of animals and men: contrasting approaches to the study of animal behavior disorders in America (1930-1950)

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Abstract

Starting from the studies of H. S. Liddell, the experiments on behavior disorders in animals encouraged a great deal of interest during the 1930s, 1940s, and 1950s in the United States. Even though these studies were mainly carried out with non-human animals, the awarding of prestigious scientific prizes to some of these investigations paved the way to the conviction that the laboratory revolution would reach to Psychopathology. In this paper, we will explore the contrasting approaches to the study of abnormal behavior in animals carried out by H. S. Liddell, W. H. Gantt, Norman R. Maier, and Jules Masserman. In order to understand the significance of these research programs, we will focus our analysis not only in the divergent methodologies and theoretical constructs proposed to explain these phenomena, but also in some of the convergent arguments used to justify the relevance of these animal studies for the understanding of human psychopathology –i.e. the observed similarity between the symptoms of the experimental animals and the human patients, with special reference to the symptoms observed in the psychiatric casualties during the World War II.

Keywords: Abnormal behavior, experimental neurosis, animals, psychology, psychiatry, USA.

Resumen

A partir de los estudios de H.S. Liddell, los experimentos sobre los trastornos de conducta en animales suscitaron un gran interés en Estados Unidos durante el periodo comprendido entre 1930 y 1950. Aunque estos estudios se realizaron principalmente con especies no humanas, la concesión de prestigiosos premios científicos a algunas de estas investigaciones abrió camino a la convicción

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de que la revolución del laboratorio acabaría llegando a la psicopatología. En este trabajo vamos a explorar los diferentes enfoques en el estudio del comportamiento animal anormal que llevaron a cabo H. S. Liddell, W. H. Gantt, N. R. Maier, y J. H. Masserman. Con el fin de comprender el significado de estos programas de investigación, centraremos nuestro análisis no sólo en las metodologías y constructos teóricos divergentes propuestos para explicar estos fenómenos, sino que también analizaremos algunos de los argumentos convergentes que se utilizaron para justificar la pertinencia de estos estudios animales para la comprensión de la psicopatología humana, como por ejemplo la similitud observada entre los síntomas de los animales experimentales y los síntomas observados en las bajas psiquiátricas durante la Segunda Guerra Mundial.

Palabras clave: Conducta anormal, neurosis experimental, animales, psicología, psiquiatría, EEUU.

This paper forms part of a general project exploring the historical significance of studies into animal behavior disorders conducted in the USA between 1930 and 1950. In our previous works, we focused our interest on some specific aspects of these studies. Thus, for example, we looked back at the story of Nick, the neurotic dog studied by W. H. Grant for 12 years at the Henry Phipps Psychiatric Clinic (Ruiz y Sánchez, 2004); we analyzed the conditioned reflex test that Gantt used in the study of psychiatric patients at the Phipps Clinic (Ruiz y Sánchez, 2010); finally, we explored the role that this type of research played in the origin of the psychosomatic approaches that characterized North-American medicine during those years (Ruiz y Sánchez, 2007).

This study has a different aim. We want to provide an overview of these studies, contrasting the different approaches made towards this phenomenon by U.S. psychologists and psychiatrists between 1930 and 1950. To do so, we will focus our analysis on the work conducted by four North-American scientists: Howard S. Liddell (1895-1962), who graduated in Psychology at Michigan (1917) and read his Ph.D. at Cornell (1923), which was the university where he led his entire scientific career; William H. Gantt (1892-1980), psychiatrist, founder and director of the Pavlovian Laboratory of the Henry Phipps Psychiatric Clinic of Johns Hopkins University, who was the only U.S. pupil to work at I. P. Pavlov's laboratory for a long period (1925-1929); Norman R. Maier (1900-1977) experimental psychologist from the University of Michigan; and Jules H. Masserman (1905-1994), psychiatrist and psychoanalyst who conducted his research at Chicago University and at the Northwestern University.

Our paper argues that the problematic and uncertain nature of the phenomenon of experimental neuroses required a strategy of methodological and also theoretical divergence which transcended the boundaries of Pavlovian physiology, and that this divergent strategy was accompanied, at the same time, by the convergence of rhetorical arguments supporting the idea that these studies made a significant contribution to the knowledge of human psychopathology.

DEFINING THE BOUNDARIES

Although it has sometimes been claimed that Jean-Marc Gaspar Itard (1775-1838), the French doctor who educated the *wild savage of Aveyron*, was the first to produce an experimental neurosis in 'the little savage' (Pethes, 2007), the current idea of this disorder has its origins in the work of I. P. Pavlov (1849-1936), and more specifically in the experiments conducted in 1912 by Maria N. Eroféeva, and in 1914 by Nataliia R. Shenger-Krestovnikova. In both experiments, the animals started to show abnormal reactions, symptoms similar to a severe neurosis. According to Pavlov, the dogs studied by Shenger-Krestovnikova exhibited the following symptoms:

The hitherto quiet dog began to squeal in its stand, kept wriggling about, tore off with his teeth the apparatus for mechanical stimulation of the skin, and bit through the tubes connecting the animal's room with the observer, a behavior never happened before. On been taken into the experimental room the dog now barked violently, which was also contrary to its usual custom; in short it presented all the symptoms of a condition of acute neurosis (Pavlov, 1960, p. 291).

Pavlov interpreted these symptoms in terms of a hypothetical physiology of the brain hemispheres. For Pavlov, when excitatory and inhibitory brain waves collide severely, the system of positive and negative conditional reflexes responsible for maintaining the balance between the environment and the organism is disrupted, and the result may be a constellation of neurotic symptoms. The regular and balanced reactions observed in the conditional reflexes of a normal dog give way to the imbalance, chaos and variability of a neurotic dog. In Pavlov's words:

(...) we are forced to presuppose some struggle between two opposing processes, ending normally in a certain equilibrium between them, in a certain balance. This conflict and this balancing are not too easy for the nervous system... The animal often expresses this difficulty by motor disquietude, by whining and dyspnea. But in the majority of the cases the equilibrium is at last established... Only under special conditions does this conflict of the two processes lead to destruction of the normal nervous activity and then there originates a pathological state which may last for days, weeks, months, and perhaps even years (Pavlov, 1963a, p. 341).

In order to adequately characterize the Pavlovian research program into experimental neuroses three aspects of this investigative pathway should be highlighted: 1) the hypothetical nature of the physiological explanation invoked by Pavlov; 2) the existence of a relation, not necessarily of identity, between behavior disorders observed in

laboratory animals and the human clinical syndrome to which Pavlov refers –neurosis¹; 3) and the criterion of abnormality used: the abolition of conditioned responses. This last aspect is made clear in his definition of neurosis:

As Neurosis we understand a chronic deviation of the higher nervous activity, lasting weeks, months, and even years. For us the higher nervous activity is manifested chiefly in the system of conditioned positive and negative reflexes to any stimulus and partially, but to a lesser degree, in the general behavior of our animals (dogs) (Pavlov, 1963b, p. 73).

We could state, therefore, that the Pavlovian research program on pathological disturbances of the cortex resulting of functional interference was fairly clearly defined within the limits of brain physiology and with a technology, the conditioned reflex, which made it possible to study the dynamics of these pathologies.

TRANSCENDING THE BOUNDARIES

Divergent approaches

In America, the output of work into behavior disorders in animals, experimental neurosis included, reached its peak in the early 1940s. This productivity, which started in 1926 with Liddell's pioneer work on conditioning in sheep (Liddell, 1926), and with the establishment in 1929 of the Pavlovian Laboratory at Phipps Psychiatric Clinic under Gantt², has not been equaled since.

Both, Liddell and Gantt used Pavlovian techniques albeit with some methodological variations compared to the techniques used by the Russian physiologist. Gantt, like Pavlov, used the salivation reflex and his laboratory animal was the dog. However, Liddell used the motor conditioned reflex and studied a variety of animal species (sheep, goat, pig, dog, pony, etc). Both Liddell and Gantt recorded complex response patterns, for example, heart rate, general activity, breathing, head movement, etc., unlike Pavlov who recorded mainly the salivatory conditioned response (Gantt, 1944; Liddell, 1942).

1. «To make analogies between the neurotic state of our dogs and the various neuroses of man is to me, a physiologist not thoroughly acquainted with human neuropathology, a problem hardly attainable» (Pavlov, 1963b, p. 74).
2. See, Henry Phipps Psychiatric Clinic. Fiftieth Anniversary Celebration. Johns Hopkins Hospital, Box 124, Folder 1 Printed: Phipps Clinic Fiftieth Anniversary Celebration Brochure, Gantt Papers, The Alan Mason Chesney Medical Archives, The Johns Hopkins School of Medicine (hereafter AMC).

Maier and Masserman, on the other hand, used instrumental learning techniques. Maier used the «jumping apparatus» that Lashley (1930) had designed. He trained animals to jump over stimulus boards. If the animal chose the correct board it moved back allowing the animal to land on a platform where it obtained a food reward. In contrast, the incorrect stimulus board was closed with a latch and if the animal jumped over it, it did not open and the rat fell into a net (Maier, 1939).

Masserman used a task where an animal (cat), in the presence of a light and audible signal, had to lift the lid of a food tray to obtain a piece of food. Later, when the cat tried to open the tray, this response was punished with an aversive stimulus (an air blast at the animal's head or an electric shock) (see Masserman, 1943).

Obviously, the procedural differences mentioned above helped to discover new conditions producing abnormal animal behavior. To the traditional, difficult discriminations and the use of painful stimuli described by Pavlov, other new etiological factors were added by American researchers, as the restriction of voluntary movements (Liddell), natural emotional shocks and changes in conditioning routines (Gantt), forcing the animal's response to insoluble discriminations (Maier) and the punishment of consummatory responses (Masserman).

This methodological diversity also produced a wide range of theoretical proposals that went beyond the boundaries of Pavlovian brain physiology and proposed new interpretive frameworks. Thus, for example, Liddell and Gantt formulated psychobiological conceptions that contemplated the animal as a whole and studied the effects that these pathologies had in different physiological systems and in their interactions.

The case of Liddell is interesting because he stated that Pavlovian technique is essentially a method of producing experimental neurosis:

Since all types of Pavlovian Conditioning develop in the animal increasingly rigid control of its emotional reactions to danger *all conditioning is difficult conditioning* and will, if long continued, lead to emotional disaster. (Liddell, 1956, p. 81, italics in the original).

This emotional rigidity, Liddell assumed, concealed a tense expectancy. For this, he used Henry Head's term 'vigilance'. Liddell thought that when the capacity for maintaining intense and unremitting vigilance is exceeded, the pent-up nervous tension thereby released will disrupt the operation of the conditioning machinery and lead to chronic states of neurosis (Liddell, 1950).

In his explanation of behavioral disorders, Gantt proposed two new principles of nervous breakdown: 1) schizokinesis, that implies a cleavage in response between the emotional and visceral systems and the skeletal musculature, and has its origins in observations, especially in cardiac function, suggesting that cardiac conditioned

responses are formed more quickly than motor ones, are of comparatively weaker intensity, and are more resistant to extinction, and 2) autokinesis, which means the internal development of responses on the basis of old excitation, as seen in the spontaneous restoration of extinguished conditioned responses and the appearance of signs of experimental neurosis long after the causal conflict has been removed. Gantt was of the opinion that these two principles depend much upon constitutional predispositions (Gantt, 1953).

Masserman's position was expressed in four «psychobiological principles of behavior» which formed the basis of his biodynamic system. In his words:

(...) all behavior is fundamentally motivated by the physiological requirements of the organism –principle of motivation–, (...) the interactions between organism and environment are in continual state of flux and mutual adjustment –principle of adaptive nature of behavior–, (...) behavior is not necessarily a direct fulfillment of elemental biological needs but... may take the form of symbolic expression and substitutive satisfactions –principle of substitutive or symbolic behavior– (...) and finally when the meanings of the perceptive fields become confused or the motivations conflictful, the behavior of the organism becomes hesitant, vacillating, inefficient, inappropriate, or excessively symbolic and substitutive. In the field of human psychopathology these characteristics will be readily recognized as corresponding to so-called 'neurotic' manifestations (...) similar aberrations of behavior should develop in lower animals subjected to confusions of field meanings and conflicts of motivation (...) –principle of the vicissitudes of behavior– (Masserman, 1943, p. 19-21).

Finally, although by the end of the 1950s many psychologists had come to the conclusion that the convulsive phenomena observed in Maier's experiments were not neurotic but primarily a response to loud noise of high frequency, Maier's studies called the attention of the media after receiving the 1000\$ Award of The American Association for the Advancement of Science (Dewsbury, 1993). Let us look at his work.

Maier (1939, 1949) produced some of the most striking examples of aberrant behavior using the Lashley jumping apparatus. When the discrimination problem was made insoluble by presenting the food reward in a random manner, most subjects developed abnormal fixations taking the form of position or symbol stereotypes. These fixations were strikingly rigid and persistent. From this kind of experiment, Maier proposed a theory of «frustration-instigated behavior» which stated that this kind of behavior cannot be explained by the usual concepts of goal-oriented learning:

It is found that animals that acquire their responses under frustration cannot substitute them for other responses. In other words, they cannot learn new

responses even when the situation ceases being insoluble. Not only are they unable to adopt new responses, but they are unable to drop their inadequate position responses. This is true even if they are punished each time they express their old responses (...) This rigid behavior is in contrast to that of animals that have acquired their position responses under conditions of motivation. These animals readily learn new responses when training conditions 'are changed, and they are constructively influenced when being punished for errors (Maier, 1948, p. 213-214).

The methodological and theoretical divergence we have just described was also reflected in the divergence of therapeutic proposals that were made. Thus, although in some cases Pavlov's indications for treating these disorders pharmacologically were followed, and substances such as bromides, amytal, nembutal, cortin, alcohol, or metrazol were used to alleviate the observed symptoms, in others cases more psychotherapeutic techniques were attempted. Thus, Masserman proposed a set of therapeutic procedures that had a common characteristic in that they all tended to eliminate the specific motivational conflicts that had been induced in the neurotic animals and thereby ameliorated the resultant anxiety and its aberrant behavioral expressions. One of these procedures, called *reassurance and persuasion through transference relationships*, had a clear psychoanalytical taste, and was described by Masserman in the following terms:

(...) to permit the development of a dependent confidence in the experimenter, who customarily cared and fed for them, and to utilize this relationship to diminish the insecurities and anxieties the animals later developed in the motivationally conflict situation (Masserman, 1943, p. 73).

Maier found one single effective procedure for altering the «abnormal fixations» described in his research, a form 'directive therapy' in which the experimenter guides the animal in making the correct responses. In Maier's words:

The guidance procedure consisted of preventing the animal from practicing the fixated response, and at the same time, guiding the animal by the hand so as to force it to jump to the correct window (Maier and Ellen, 1952, p. 109).

For their part, Gantt and Liddell also defended psychotherapeutic measures: resting and the friendly contact with the experimenter have greater beneficial effects than drugs. So, for instance, one newspaper published an article about Gantt studies with neurotic dogs which proclaimed:

The presence of a human being in the room with the dog reassures him so that he does not show the anxiety symptoms as long as the person is with him... Prolonged rest on the farm has had a beneficial effect³.

Convergent arguments

Despite the divergence of approaches previously described, all the authors studied in this paper used a convergent rhetoric when justifying the importance of their studies. Obviously, the main convergent argument was the importance of the laboratory for the studies of abnormal behavior, a field of knowledge that was in need of experimental approaches. This idea had already been defended by Pavlov when he wrote:

(...) the decision, or the conditions favorable to a decision, of many important questions of etiology, the natural systematization, the mechanism and finally the treatment of neuroses in the human being lies in the hands of the animal experimenter (Pavlov, 1963b, p. 74)

Indeed this group of American psychologists and psychiatrists had taken this charge so seriously that after reviewing the works of Liddell, Gantt, Maier and Masserman, an influential comparative psychologist at that time concluded in the following terms:

Just as animal research has proven useful in experimental surgery, pharmacology, and physiology, so can comparative studies in behavior contribute to the solution of problems confronting the psychiatrist (Beach, 1953, p. 387).

Besides of this general justification, from our point of view, two rhetorical arguments were also used, both with a heavy contextual 'load', which should not go unmentioned: 1) the repeated reference to the symptomatic similarity observed in neurotic animals and the psychiatric cases studied during the Second World War, and 2) the substitution of the old Pavlovian physiological language with a new language, that of stress, that emerged from the works of Hans Selye (1907-1982). Allow us to give some examples of what we are proposing.

As for the frequent references to the symptomatic similarity between the disorders observed in laboratory animals and war neuroses, we must not forget that the period we are analyzing was marked by the Second World War. In this context, it is no wonder that references to the effect of war, violence and chaos permeate all this literature. The

3. In the Realm of Science: A Dog Can Worry; that's Why it Nestles Close» by John J. O'Neill. Herald Tribune, April 24, 1938. Box 5, Folder 13 Clippings 1929-1945, Gantt Papers, AMC.

similarity between neurotic symptoms in dogs and nervous upheavals in soldiers was suggested to Gantt by Dr. Victor Rosen, a military psychiatrist⁴. In a letter sent to Gantt, Rosen explicitly mentioned the relationship between animal's symptoms and the symptoms observed in some soldiers after a battle: «I have a few boys on my ward from Guadalcanal who remind me of [your dogs] with his tachycardia, panting and pollakiuria». This resemblance, Rosen wrote, was not simply a mere equivalence of symptoms, the lives of these soldiers were, like those of these animals, full of «unresolved conflicts and difficult differentiations» and the symptoms were not noticeable «until there was an overwhelming threat to their personal integrity»⁵.

Many psychiatric reports featured behaviors similar to those described by Maier. One of them referred to situations of being forced to choose between undesirable alternatives during combat, as occurred in the psychologist's experiments:

This is the situation of the patriotic soldier who must choose between advance in the fear of a grave personal danger or retreat to the social ridicule of cowardice. He is forced to choose one of two undesirable alternatives (Russell, 1950, p. 101).

Maier himself made analogies between the problems of his rats and contemporary world difficulties at his time. This is how the psychologist from Michigan finished one of his articles:

To what extent are we reading motives into the frustrated behavior of nations with which we come in conflict? (...) To what extent are our behaviors frustrated reactions rather than problem-solving reactions? Can a frustrated world solve its problems? (...) If therapy is needed, who or where can one find a disinterested party that can make the diagnosis? The frustrated person rationalizes and justifies his feelings and actions, and for this reason, the patient cannot easily treat himself. Is this also true of the behavior of nations? (Maier, 1948, p. 216).

Masserman, for his part, also recognized a direct relationship between the result of his experiments with neurotic cats and the war psychiatric casualties. So for instance, he thought that one of the therapeutic procedures he used in his animal experiments, the one called *forced solutions*⁶, could also be used in those cases of soldiers suffering of war neuroses. In Masserman words:

4. Victor Rosen was included in the first generation of former Gantt collaborators of in the Pavlovian Laboratory at Phipps Clinic.
5. Rosen to Gantt, February 16, 1943, Box 53, Folder 11, Gantt Papers, AMC.
6. «(...) in this method, the animal's feeding inhibition were overcome by forcing it mechanically into the vicinity of attractive food at the height of its hunger; once feeding occurred, the animal's anxiety

(...) experience in war psychiatry has shown that an airplane pilot who, although uninjured, exhibits excessive anxiety after a crash, can frequently be kept from developing a chronic and disabling neurosis by being forced either physically or by press of custom and authority to fly another plane immediately. Similarly, acute anxiety states in normally dependable soldiers are often be treated in front-line stations by authoritative methods of reassurance and persuasion, followed by direct return to duty as soon as possible (Masserman, 1943, p. 206-207)

Finally, Liddell established a direct correspondence between the etiology of experimental neuroses in animals and mental upheavals in soldiers. According to him:

The soldier *subjecting himself* to severe restraints must endure, often for long periods, the hazards of loneliness, monotony, confusion, and overstimulation. To these are often added severe deprivations and hardships including exhaustion and pain. Under such conditions his emotional reactions are surprisingly similar to those of our sheep and goats subjected to arduous conditioning (Liddell, 1956, p. 85, Liddell's emphasis).

Let us now move on to the second convergent rhetorical argument that we had mentioned above, and that was to do with a subtle but significant change in the language used by this group of authors. This change consisted of abandoning the physiological language rooted in 19th century reflex physiology, particularly Pavlovian language, and replacing it with another that included a new terminology, that of stress, less hermetic than the previous one and more comprehensible for clinicians. Thus, by 1950 it was obvious that the labels «experimental neurosis» and «stress» were almost interchangeable:

In speaking of 'experimental neurosis' one has in mind, as a rule, the type of behavior change studied in animals by the method of the conditioned responses, developed by Pavlov... and utilized in this country by Gantt, Liddell, Maier, Masserman, and others... In such experiments the 'stress' consists classically in the inability of the animal to discriminate between two conditioned stimuli (...) The behavior manifested by the animal is similar to human behavior under conditions of severe frustration and anxiety (Schiele & Brozek, 1948, p. 31).

Even Selye himself in some of his works referred to Liddell experiments doing a transposable use of these two terms. So, for instance:

and the ancillary behavioral aberrations rapidly diminished» (Masserman, 1943, p. 206).

Interestingly, in animals a typical *experimental neurosis* can be produced by nervous stress. In sheep, if conditioned reflex experiments are so arranged that the animal is called upon to solve a problem beyond its capacity (e.g., to distinguish between two closely similar conditioned stimuli) the resulting frustration can lead to an apparently permanent neurosis. This may manifest itself by extreme excitement, uncooperative behavior, and spontaneous, nervous twitching movements. It is particularly interesting from the G-A-S⁷ point of view that cortical extract allegedly exerts a therapeutic effect in these experimental neuroses (Selye, 1953, p. 242, Selye's emphasis)

This rhetorical conflation of both terms may well have helped to take this work closer to the recently born psychosomatic conceptions that recognized that emotions played an important role in illness. In fact, Gantt and Liddell were members of the advisory and editorial board of the journal *Psychosomatic Medicine* from its inception in 1939. In the invitation letter, the managing editor of the journal, Helen Flanders Dunbar, expressed to Gantt what his contribution to this field could be:

We would be especially interested in any contribution you would like to submit for publication –whether article or review, because we feel that the experimental approach has been too little stressed in this field⁸.

Thus, the classical idea of experimental neuroses that had emerged in the context of a Pavlovian type physiology was transformed in the hands of American scientists into a more holistic and integrative psychobiological conception that stressed the ties between mind and body, and emphasized the role of emotions in the pathogenic processes.

CONCLUSION

A first obvious conclusion is that the North-American scientific community took an interest in experimental neuroses, but adapting them to their own scientific traditions. Scientific ideas emerge and develop in wider contexts, which are not interchangeable. Thus, the phenomenon of experimental neurosis whose definition had been made within the limits of Pavlov's physiology was redefined and reinterpreted as «behavior disorders» when it was transferred to a new context, that of American psychobiology.

In this new context, the research programs of Liddell, Gantt, Maier and Masserman were not only of theoretical interest, but also had clinical significance for the

7. «General-Adaptation-Syndrome».

8. Dunbar to Gantt, November 28, 1938. Box 70, Folder 4 Correspondence with Journals, American Psychosomatic Society 1938-1950, Gantt Papers, AMC.

practitioners. Therefore, it is no surprise that many Funding Agencies, both governmental (National Research Council, National Institute of Mental Health) and private (Rockefeller Foundation and Josiah Macy Jr. Foundation) provided funding to support these studies. The Rockefeller Foundation, for example, believed that the potential of the work by Gantt and Liddell consisted of clarifying «some of the fundamental biological processes in human maladjustment, through... studies of animals whose lives are carefully controlled and conditioned» (Pressman, 1998, p. 195).

However, despite the interest that the subject of experimental neuroses raised in clinicians, the contributions of Liddell, Gantt, Maier and Masserman did not form part of the *core* of learning theory at the time. There are two reasons that may explain this: 1) these authors did not follow the experimental designs used normally by psychologists, nor did they use statistical analyses. They preferred to study individual subjects over long periods of time. This case-study methodology had the approval of the psychiatrists but it did not satisfy the methodological requirements of the psychologists⁹; 2) Liddell, Gantt, Maier and Masserman were not greatly enthusiastic about Pavlovian theoretical constructs that were the basis of the theories of Clark L. Hull which were clearly dominant at that time.

In addition, these authors argued that the pathological behaviors they were studying were qualitatively different to normal behaviors. In other words, they had to be explained with a different set of principles. As Gantt, for instance, said:

It is important to recognize that the laws of psychopathology are not always the same as the laws of normal behavior. The spontaneous development of the neuroses... and their persistence is evidence that the pathological conditions arise according to laws differing from the physiological... (Gantt, 1944, p. 196).

In a similar vein, Maier considered the aberrant responses instigated under frustration as different in kind from the behavior that may be described as goal oriented:

The studies of abnormal behavior in the rat lead to a new theory of frustration. They demonstrate that behavior elicited during a state of frustration has certain unique properties, and that these properties make frustration-induced behavior different in kind from that produced in a motivated state. This basic separation between motivated and frustrated behavior is in contrast to the view which postulates that all behavior has a motive (Maier, 1948, p. 214).

9. «The admirable longitudinal approach of these authors ... as seen in the complete case histories... is unfortunately marred by the absence of any statistical treatment» (Broadhurst, 1960, p. 171).

However, the idea that pathological behavior was qualitatively different to normal behavior had been challenged by a group of psychologists representing Hull's approach to learning which dominated North-American psychology at that time. Thus, Neal E. Miller's (1909-2002) theory about conflict (1944), the work of Orval H. Mowrer (1907-1982) about anxiety (1939), and the work of Joseph Wolpe (1915-1997) into experimental neuroses (1952) seemed to demonstrate that there were not such qualitative differences between pathological and normal behavior, instead the behavior disorders studied by Gantt, Liddell, Maier and Masserman were learned behavior irrespective of whether one regarded them as abnormal or not.

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