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AN INVESTIGATION INTO THE TOPOLOGY OF EXOGENOUS FEEBLE-MINDED CHILDREN

by Eugene G. Brailsford

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CURRICULUM STUDIORUM

Eugene Gerald Brailsford was born April 21, 1936, in Fort Macleod, Alberta. He received the Bachelor of Arts degree in psychology from the University of Alberta, Edmonton, Alberta, in 1959. He received the Master of Arts degree in psychology from the University of Alberta, Edmonton, Alberta, in 1962. The title of his thesis was The Use of the Trail Making Test with Brain-Damaged and Normal Children.

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INTRODUCTION

It has been almost thirty years since Lewin first applied concepts of physics and mathematics to the formulation of a dynamic theory of personality, a quasi-physiological theory in which he topologically represented the interplay of forces within the person, and the interaction of these forces with the external environment. Lewin was able to provide ingenious experimental verification for many hypotheses which followed from the theory. However, knowledge gained from subsequent investigations in other areas of psychology raises doubts as to the validity of his findings and later refinements in experimental methodology provide the means of subjecting his findings to closer scrutiny.

The present study has as its purpose, the closer scrutiny of one particular aspect of his theory: his topological conceptualization of the feeble-minded child.

The first portion of this thesis is concerned with a general description of Lewin's theory and how it was applied by Lewin to describe the topology of the feeble-minded child. Means of refining certain methodological difficulties are presented, and a hypothesis is advanced regarding the topological organization of the exogenous feeble-minded child.

The experimental design is next described. An attempt is made here to control certain factors not controlled by Lewin.

The presentation of the results is followed by an interpretation of their significance. Certain possible limitations of the study are discussed. Suggestions for further research are advanced.

CHAPTER I

A DEVELOPMENT OF LEWIN'S TOPOLOGICAL REPRESENTATION OF MENTAL DEFICIENCY

This chapter will concern itself with presenting a general description of Lewin's field theory of personality, followed by a more specific discussion of the theory as Lewin thought it applied to the feeble-minded child. Certain methodological shortcomings of previous research carried out by Lewin and his collegues, concerning psychical satiation in feeble-minded children will be discussed, and the means by which the present study attempted to deal with them will be revealed. Finally, the application of Lewin's theory to exogenous feeble-minded children in particular will be discussed, and a topological conception of the exogenous feeble-minded child will be proposed.

1. Lewin's Topological Representation of Personality.

In his field theory of personality, Lewin[1] topologically conceptualized the dynamic interaction of the person with his environment. He conceptualized the person by employing two jordan curves (figure 1) to represent the

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1 K. Lewin, Principles of Topological Psychology, New York, McGraw-Hill, 1936, xv-231 p.

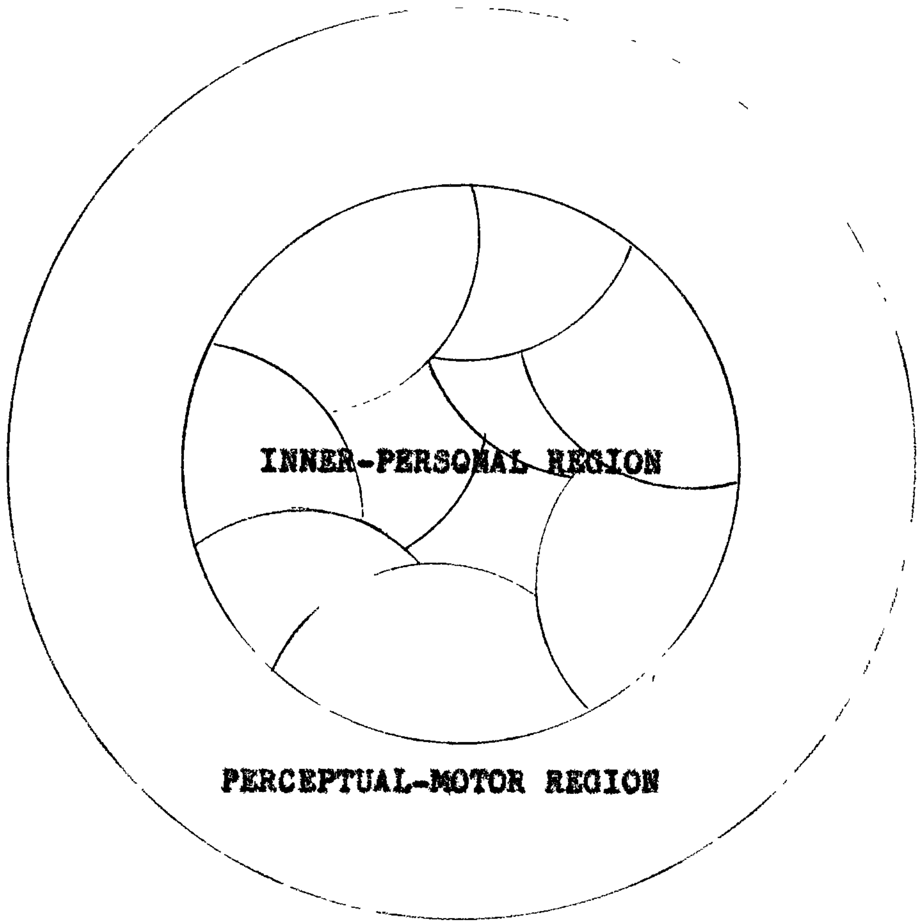

Figure 1.- Lewin's Topological Conception of the Person.

afferent and efferent aspects of a person's behavior, and designated them the "inner-personal region" and the "perceptual-motor region", respectively.

The inner-personal region he divided into cells or regions, each containing one psychological fact. The degree of relationship between two cells was represented by the number of cells intervening between them, the permeability of the boundaries separating them, and the fluidity of each cell. Thus, two closely related facts would be contained in adjacent, relatively fluid cells which had relatively more permeable membranes. Each cell was said to be a dynamic unity, and a change in one cell would cause changes in surrounding cells.

Lewin believed each cell to be capable of being in a state of tension. For example, certain characteristics, such as the presence of an environmental goal which is the object of a particular region, would be connected with a high state of tension in that particular region. This tension, according to Lewin, could be dealt with in two ways: 1) by reaching the goal through a connection between the high tension cell and the perceptual-motor region, causing the release of the tension through purposeful behavior or uncontrolled affectional discharge; 2) by lowering the tension level through drawing the tension off into adjacent regions with permeable boundaries, that is, by obtaining substitute satisfaction, or sublimation.[2]

2. Lewin's Topology of the Feeble-Minded Child.

Lewin's topological representation of the feeble-minded child[3] was somewhat different from the above description of the normally functioning adult. While he believed children to have fewer inner-personal cells than adults, he felt that feeble-minded children had fewer inner-personal cells than normal children, and that the boundaries separating these cells were far less permeable (figure 2).

This comparison had the implication that there is less communication between cells in the inner-personal region of feeble-minded children, and that difficulty is experienced by them in draining off tension, because of the less permeable cell boundaries.

3. Research into the Topology of the Feeble-Minded Child.

The above assumptions were supported by studies carried out by Kopke and Lewin[4] which dealt with the

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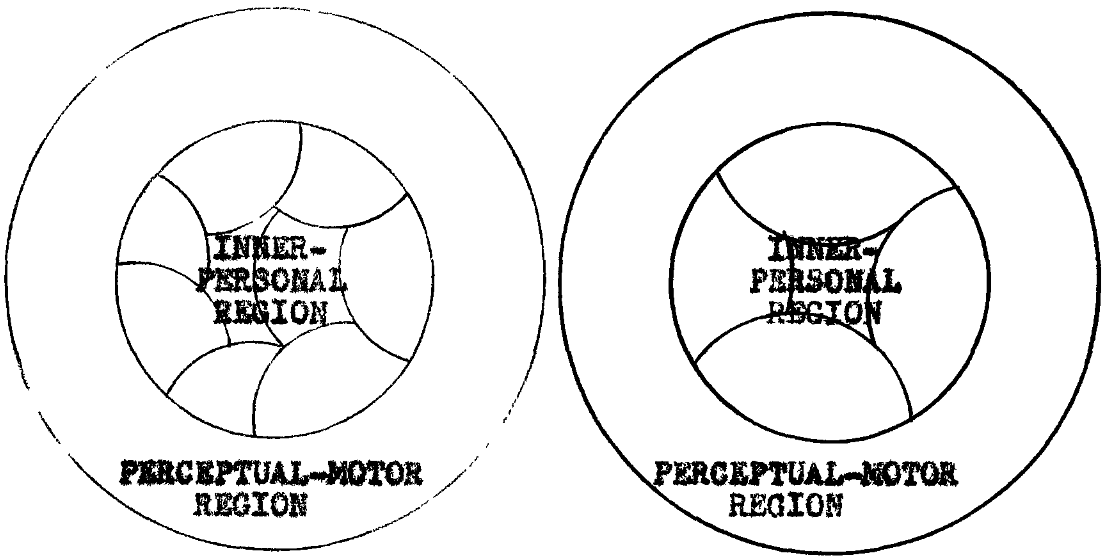
2 K. Lewin, A Dynamic Theory of Personality, New York, McGraw-Hill, 1935, viii-286 p.

3 Ibid.

4 Ibid.



The Normal Child The Feeble-Minded Child

Figure 2.- Lewin's Topological Comparison of the Inner-personal Regions of Normal and Feeble-minded Children.

substitute value of substitute action and the process of psychical satiation, respectively.

In a study of substitute value of substitute actions, Kopke presented a group of seven to eight year old normal children and eight to nine year old morons with a task. After the children were involved in the task, their activity was interrupted and they were presented with another substitute task, one of high substitute value. After completion of the second task, ninety-four per cent of the morons returned spontaneously to the first task and only thirty-three per cent of the normal children did so. Lewin believed that this indicated that normal children tended toward the complete discharge of tension in completing the second task, whereas "the tension system of the morons worked itself out with astonishing regularity" in a resumption of the first task, thus demonstrating the impermeability of cell boundaries in the inner-personal region of the feeble-minded child.

In a study of psychical satiation, a group of morons and a group of children of normal intelligence, aged nine to eleven years, were asked to draw simple moon faces until they had had enough of it. The children were then free to continue free drawing as long as they wished, that is, until total drawing satiation had taken place. The two groups of children were compared according to the number of moon faces drawn, the time taken to satiation of the moon face drawing task, the rate at which the faces were drawn, and the time taken for total drawing satiation.

On the basis of tabulated results, Lewin's conclusions were as follows:

> The times required for total satiation by normal and subnormal children thus appear on the whole not to differ essentially. The course of the satiation, however, shows certain typical differences. One is first struck by the fact that time is taken up with the drawing of moon faces, and that after satiation of this activity, they refused almost without exception to continue with free drawing. Normal children, on the other hand, are satiated with drawing moon faces much sooner. Yet all of these children were ready to continue with free drawing.[5]

Thus, Lewin felt this study further supported his contention that cells in the inner-personal region of the feeble-minded child were less permeable and that tension was therefore drained off more slowly.

4. A Critique of Lewin's Research.

Lewin's theory of personality was one of the first to stress the dynamic intra-personal nature of the individual's relation to his environment. It has become well accepted in the body of personality theory. Although it has been thirty years since its conception, it has not

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5 Lewin, A Dynamic Theory of Personality, Op. Cit.

become passe, but rather, it has set the trend toward present thinking in this area. Later research has shown that the hypothetico-deductive approach can be utilized in testing the soundness of Lewin's system. Kounin,[6] in a series of experiments concerned with rigidity, found evidence that supported several hypotheses derived from Lewin's topology.

However, since Lewin first presented his personality theory, advances in experimental design and refinements in diagnostic techniques tend to make his original studies in support of his theory somewhat questionable.

Selection of Scores.- There appears to be a possibility that the moon face drawing task employed by Lewin may not be a valid one for measuring psychical satiation. Lewin was concerned with measuring the time taken to drain off the tension in the inner-personal cell which contained the intention to draw moon faces. However, he noted, particularly in the feeble-minded group, that the main task was interrupted by "pauses for rest" and "interposed actions". These phenomena, consistent with Lewin's theory, would involve tension release in other cells not

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6 J. Kounin, "Experimental Studies in Rigidity: I. The Measurement of Rigidity in Normal and Feeble-Minded Individuals", Journal of Character and Personality, Vol. 9, 1941, p. 251-272.

directly concerned with the particular inner-personal cell being investigated, and would hence alter the period of psychical satiation, making it spuriously long. Further supporting this assumption is recent research involving reactive inhibition, a concept that has been shown to be very similar to satiation.[7,8] Kimble and Horstein,[9] Kimble,[10] and Eysenck,[11] in applying Hull's[12] two-factor theory of inhibition to human motor tasks, have shown that rest periods have a definite effect upon the build-up of reactive inhibition, and that they contribute toward the development of a further parameter, conditioned inhibition.

Another observation of Lewin's casts further doubt on the validity of his satiation-measuring task. He found

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7 C.P. Duncan, "On the Similarity Between Reactive Inhibition and Neural Satiation", American Journal of Psychology, Vol. 69, 1956, p. 227-235.

8 W.C. Becker, "Cortical Inhibition and Introversion-Extraversion", Journal of Abnormal and Social Psychology, Vol. 61, 1960, p. 52-56.

9 G.A. Kimble and E. Horstein, "Reminiscence as a Function of the Amount of Interpolated Rest", Journal of Experimental Psychology, Vol. 38, 1948, p. 239-244.

10 G.A. Kimble, "An Experimental Test of a Two-Factor Theory of Inhibition", Journal of Experimental Psychology, Vol. 39, 1949, p. 15-23.

11 H.J. Eysenck, "Reminiscence as a Function of Drive", British Journal of Psychology, Vol. 52, 1961, p. 43-52.

12 C.L. Hull, Principles of Behavior, New York, Appleton Century, 1943, x-422 p.

that although the feeble-minded children had many more "interposed actions" and "rest pauses" than the normals, they produced the moon faces at the same over-all rate as the normals. This would suggest extreme variability in their rate of production. Thus, their satiation times would not be comparable with those of the normals. In order for the satiation times of normals and feeble-minded children to be comparable, they must produce moon faces at a comparable rate.

Reliability.- Lewin's study of psychical satiation did not include a test-retest reliability check on the performance of the children. If the individual's psychological situation at any one time can be represented topologically, then the individual's toplogical arrangement would not be appreciably different if he were to be placed in identical circumstances a short time later. More precisely, in terms of Lewin's study of psychical satiation, the time taken by the individual to satiate the second time the task was presented would be quite similar to the time taken on the first occasion. Lewin did not, however, verify this implication.

Generality of Conclusions.- There is also the question of how far one can extrapolate from Lewin's topological conception of feeble-minded children, to feeble-minded children per se. Lewin and his collegues used samples of children in the moron range of intelligence, "feeble-minded children of the usual kind"[13] - presumably endogenous feeble-minded children. However, the literature to date has dealt with two types of mentally deficient individuals on the basis of etiology of this condition: the endogenous feeble-minded child and the exogenous feeble-minded child. Burke,[14] for example, ascribes the chief cause of endogenous feeble-mindedness to the poor quality or genetic inferiority of the forebears. The etiology of exogenous feeble-mindedness, he ascribes to environmental factors which have stunted or damaged the individual's brain between conception and the end of the growing period. The latter condition has been estimated to exist in between fifteen and twenty per cent of the population of feeble-minded children.[15,16]

Studies have shown that there are marked differences between the exogenous and endogenous feeble-minded child. In a study comparing brain-injured and non-brain-injured mentally retarded children on several psychological

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13 Lewin, A Dynamic Theory of Personality, Op. Cit.

14 Noel H.M. Burke, "The Aetiology of Mental Deficiency", Medical Proceedings, Vol. 222, 1949, p. 280-282.

15 Ibid.

16 A.A. Strauss and N.C. Kephart, Psychopathology and Education of the Brain-Injured Child, Vol. II, New York, Grune and Stratton, 1955, x-266 p.

tests, Gallagher[17] rated the brain-injured child as being, among other things, hyperactive, lacking in attention, more uninhibited than the familial retardate. A survey of the literature describing the behavior of the brain-damaged child repeatedly emphasizes two characteristics of the brain-damaged child: 1) The child's overactivity; such adjectives as "organic driveness", "hypermotility", "restlessness", "emotional lability", are used to describe this characteristic. 2) The inability of the child to control this overactivity; as revealed by the use of such adjectives as "poor concentration", "short attention span", "impulsivity", and "distractibility".[18,19,20,21,22,23]

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17 James J. Gallagher, "A Comparison of Brain-Injured and Non Brain-Injured Children on Several Psychological Variables", Monograph for Research in Child Development, Vol. 22(2), Serial 63, 1957, 11-79 p.

18 E. Kahn and L.C. Cohen, "Organic Driveness: A Brain Stem Syndrome and an Experience", New England Journal of Medicine, Vol. 210, 1934, p. 748-756.

19 A.A. Strauss and L.E. Lehtinen, Psychopathology and Education of the Brain-Injured Child, Vol. 1, New York, Grune and Stratton, 1947, 206 p.

20 Strauss and Kephart, Op. Cit.

21 C. Bradley, "Organic Factors in the Psychopathology of Childhood", Psychopathology of Childhood, J. Zubin and P.H. Hock, Ed., New York, Grune and Stratton, 1955, p. 82-105.

22 L. Bender, The Psychopathology of Children with Organic Brain Disorders, Toronto, Ryerson Press, 1956.

23 H. Bakwin and R.M. Bakwin, Clinical Management of Behavior Disorders in Children, Second Edition, Philadelphia, W.B. Saunders, 1960, ix-597 p.

Strauss believes that the above behavioral syndrome can be explained physiologically in terms of damage to the cerebral cortex:

> All of our emotions, gestures and expressive movements are regulated to a great extent by the diencephalon (old brain). In the course of human development the cortex develops a softening and inhibiting power which controls excessive emotional reactions and hyperactivity. If this cortical modulation is disrupted by damage to the cortex, the diencephalon acts unchecked, resulting in emotional psychomotor disinhibition.[24]

This picture of the exogenous feeble-minded child little resembles the one advanced by Lewin to account for feeble-minded children in general. If Lewin had conceptualized the exogenous feeble-minded child topologically, his topological representation might conceivably have resembled that of figure 3. Note that this figure resembles that of Lewin's feeble-minded child in outline, with the inner-personal region having few cells. The boundaries separating the cells of the inner-personal region are impermeable, but the boundary separating the inner-personal region from the perceptual-motor region are extremely permeable, more permeable even than those of the normal child. This topological representation, then, accommodates the proposition that the exogenous feeble-minded child has a much less complex inner-personal region, but unlike the endogenous

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24 Strauss and Lehtinen, Op. Cit.

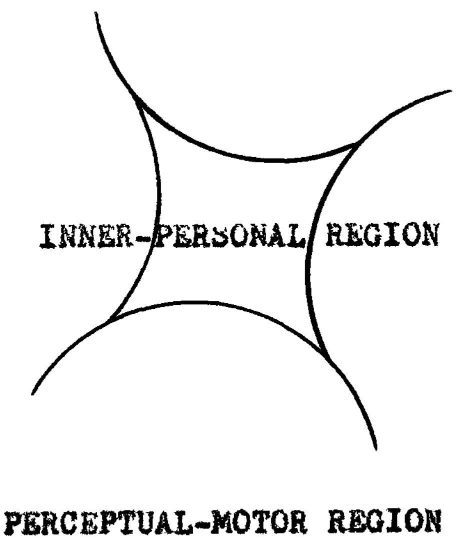

Figure 3.- A Proposed Topological Conceptualization of the Exogenous Feeble-Minded Child.

child, tension is allowed to dissipate rapidly through the perceptual-motor region boundary, causing satiation to take place in a shorter time. If this proposition is indeed correct, then Lewin's topological representation of the feeble-minded child would be applicable only to the endogenous feeble-minded child.

5. The Problem.

On the basis of the above criticism we can think of a research approach which might correct some of the shortcomings of Lewin's study of psychical satiation, and determine whether a refinement of Lewin's topological representation of the feeble-minded child as it applies to the exogenous feeble-minded child, is necessary. Such an approach would include the following steps: 1) a test of the reliability of the moon face drawing task as a measure of time taken to satiate; 2) the use of a better method of presenting the moon face drawing task, in order to eliminate certain uncontrolled parameters inherent in Lewin's method; 3) a comparison of satiation times in different types of mental deficiency.

Reliability.- The reliability of the moon face drawing task as a measure of satiation could be ascertained by obtaining a reliability coefficient from a comparison of test-retest times.

The Use of a Better Method.- A more accurate measure of satiation could be obtained if the children could be made to draw on paper at a constant rate, without resting. Wolff[25] has obtained good results by developing a modified kymograph method of constant-speed presentation of the drawing paper. Using this method to measure satiation in adults, he obtained a correlation of time with units, of .65.

A Comparison of Different Types of Mental Deficiency.- The relative differences in satiation times could be ascertained by administering a standard measure of satiation to carefully selected groups of exogenous feeble-minded, endogenous feeble-minded, and normal children.

6. Summary and Hypothesis.

The preceding discussion has dealt with Lewin's topological representation of feeble-minded children. Lewin believed that the topological structure of the feeble-minded child is one that features a relative impermeability of cell boundaries, as compared with that of the normal child. In support of Lewin's contention is his

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25 Wirt M. Wolff, "Satiation and Co-satiation: A New Method", American Journal of Psychology, Vol. 73, 1960, p. 612-614.

study of psychical satiation that revealed that feeble-minded children satiate more slowly than normal children.

The writer presented evidence that, in effect, the exogenous feeble-minded child would tend to satiate more quickly than the normal child, thus indicating that his topological structure would feature more permeable perceptual-motor cell boundaries than those of the normal child.

The writer approached this problem by formulating the following general hypothesis, in the null form:

> There will be no significant difference in the topological structures of the inner-personal regions of normal, endogenous feeble-minded, and exogenous feeble-minded, children.

More precisely, the experimental hypothesis was stated in the following null form:

> There will be no significant difference in the performances of normal, endogenous feeble-minded, and exogenous feeble-minded, children, on a satiation task of moon face drawing.

CHAPTER II

EXPERIMENTAL DESIGN

This chapter will discuss the population that was used in the present study. The means by which the experimental groups and the control group were selected, and the characteristics of the groups, will be described. The instrument used in the present study to measure satiation, the task, and the task instructions will be revealed. Finally, the statistical operations by which the data are to be analyzed will be presented.

1. The Population.

The Experimental Groups.- The experimental groups were composed of endogenous and exogenous retardates, resident at the Ontario Hospital, Smiths' Falls, Ontario.

In selecting the group of exogenous feeble-minded children, particular attention was paid to Bradley[1] who has stressed the following five sources of information which should be utilized in arriving at the diagnosis of brain-damage in children:

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1 C. Bradley, "Organic Factors in the Psychopathology of Childhood", Psychopathology of Childhood, J. Zubin and P.H. Hoch, Eds., New York, Grune and Stratton, 1955, p. 82-105.

1. Behavior patterns
2. Performance on psychological tests
3. Past medical history
4. Neurological examination
5. Electroencephalogram

Taking these sources into consideration as much as practical circumstances would permit, the exogenous feeble-minded children were selected through careful perusal of the files in accordance with the satisfaction of the following criteria:

1. psychological testing which revealed an I.Q. of between 50 and 70, and indications organic impairment;

2. a developmental history of injury to, or infection of, the brain, occurring during or subsequent to birth;

3. a neurological examination which revealed positive findings;

4. a psychiatric diagnosis of "encephalopathy due to post-natal injury";

5. an abnormal encephalogram; and

6. age - between eight and thirteen years.

The endogenous feeble-minded children were selected in accordance with the following criteria:

1. psychological testing which revealed an I.Q. of between 50 and 70;

2. a developmental history revealing that one or both parents were retarded, and which did not reveal any signs of past neurological trauma;

3. a psychiatric diagnosis of "cultural-familial mental retardate"; and

4. age - between eight and thirteen years.

The control group consisted of elementary school children who fulfilled the following criteria:

1. psychological testing which revealed an I.Q. between 90 and 110;

2. a school history which revealed no incidence of school failure;

3. in the opinion of the child's teacher, the child was "normal"; and

4. age - between eight and thirteen years.

A comparison of the ages and intelligence quotients appears in Tables I and II, respectively, page 21 and 22. The variance of the groups was shown to be homogeneous, indicating that the use of a "t" test for significance of differences between groups, is appropriate. The mean ages of the groups were not significantly different. The mean intelligence levels of the endogenous and exogenous groups of feeble-minded children were not significantly different. There was a significant difference between the mean I.Q. ratings of the two groups of feeble-minded children, and the I.Q. rating for the normals.

Table I.-

A Comparison of Mean Ages of the Control Group and the Experimental Groups.

Group	N	Mean Age	Variance	f	t
Normals Endogenous F.M.	30 18	11.5 11.9	3.24 1.69	1.91[a]	0.88[a]
Normals Exogenous F.M.	30 14	11.5 10.8	3.24 2.25	1.44[a]	1.36[a]
Endogenous F.M. Exogenous F.M.	18 14	11.9 10.8	1.69 2.25	1.33[a]	2.20[a]

a Not significantly different.

Table II.--

A Comparison of Mean I.Q.'s of the Control Group and the Experimental Groups.

Group	N	Mean I.Q.	Variance	f	t
Normals	30	108.0	54.76	1.42[a]	18.06[b]
Endogenous F.M.	18	61.8	38.44		
Normals	30	108.0	54.76	1.15[a]	20.68[b]
Exogenous F.M.	14	55.6	47.61		
Exogenous F.M.	14	55.6	47.61	1.23[a]	2.63[a]
Endogenous F.M.	18	61.8	38.44		

a Not significant.
b Significant beyond the .001 level.

The individual characteristics of the children in the three groups are listed in Appendix 1.

2. The Procedure.

The Task.- The task was administered individually to each subject in the population. It consisted in having the subject draw moon faces continuously until he had had enough of it. The task was administered to the exogenous and endogenous feeble-minded children a second time, one week later.

The Instrument.- A modified Rapidgraph pen recorder was used to present the subject with drawing paper, at a uniform rate. The recorder's top shielding and pens had been removed, and a metal sheet was fitted flush with the surface of the tracking paper. A 3" x 2½" opening in the steel plate and two adjustable steel coverings, held in place by a magnet, afforded the alternate exposure of three separate drawing tracks, 1½" x 3". Standard tracking paper was used for the drawing of the moon faces. The recorder was geared to move the paper at a speed of two millimeters per second.

The Instructions.- Prior to the administration of the moon face drawing task to the experimental and control groups, a pilot study was done using four retardates who were selected at random from a suitable population of congenital retardates at the Ontario Hospital, Smiths' Falls, in order to perfect the actual test instructions. In the actual study, the subjects were given the following instructions:

> This machine is used for drawing faces, like this one (demonstrates). See. Two eyes, a nose and a mouth. You make one. That's right. Now we have no more paper left. But if I turn on the machine (turns machine on) we always have enough paper. We must draw the faces while the paper is moving, like this (demonstrates). You do it. That's right.
>
> Now here is what I want you to do. I am interested in seeing how many faces you can draw and how well you can draw them. I am going to start the machine, and I want you to keep drawing faces until you have had enough, until you are finished. I will be sitting over there (behind subject) and I want you to tell me when you have had enough.

The subject was then left with two H.B. lead pencils, and timing was begun.

3. The Statistical Analysis.

The raw data consisted of the time taken by each subject to satiate, and the number of moon faces drawn within that time period.

Reliability.- The reliability of the moon face drawing task was computed by obtaining a Pearson product-moment correlation between the times taken on the first and second administrations of the moon face drawing task to the endogenous and exogenous groups of feeble-minded children.

Comparability of Obtained Scores.- In order to determine whether time scores and unit scores were comparable measures of satiation, (i.e., to ensure that either reflects satiation differences within each group) a Pearson product-moment correlation coefficient was obtained, between time taken to satiate and number of moon faces drawn, in all groups, on all trials.

Differences between Groups.- The differences between the three groups in respect to satiation times, were statistically evaluated, taken two at a time. Because time is an interval measurement, a parametric "t" test was used to determine the significance of differences between the groups.

Results were considered significant at the .01 level.

CHAPTER III

RESULTS

The discussion of the results will be divided into three parts. The first part will evaluate the reliability of the moon face drawing task as a measure of psychical satiation in endogenous and exogenous feeble-minded children. The second part will deal with the evaluation of the moon face drawing task time score as a measure of satiation in the three groups. The third part will involve an appraisal of the experimental null hypothesis: that there will be no significant differences in the performances of normal, endogenous feeble-minded and exogenous feeble-minded children, on a satiation task of moon face drawing. Individual results are listed in Appendix 2, page 50.

1. Reliability.

Examination of the data contained in Table III indicates that the moon face task used in the study was a reliable one. The times taken by each group to satiate varied little on the two trials. The trial 1-trial 2 times correlated highly, indicating a high level of consistency of performance.

Table III.-

Mean-Times and Test-Retest Coefficients of Correlation of Task Times for Endogenous and Exogenous Feeble-Minded Children.

Group	Mean Time 1st Trial/mins.	Mean Time 2nd Trial/mins.	Correlation of Times, Trial 1, 2
Endogenous Feeble-minded	19.80	22.92	.75[a]
Exogenous Feeble-minded	7.00	6.93	.95[a]

a Significant beyond the .005 level.

2. Comparability of Time Scores.

Intra-group Time-unit Comparisons.- Reference to Table IV indicates that there is a significant relationship between times taken to satiate and number of moon faces drawn, within each group. This suggests that within each group, the time score reflects the quantity of moon faces produced.

Inter-group Time-unit Comparisons.- Reference to Table V reveals that the endogenous and exogenous feeble-minded children produced moon faces at rates not significantly different from each other. The normals produced moon faces at a significantly faster rate than the other two groups. Thus, while it appears that the time scores of the two experimental groups are comparable, with each other, they are not comparable with the control group. However, no rest pauses or interposed activities were observed in the three groups as they performed the moon face drawing task, and the disparity between the normals and the feeble-minded children in rate of drawing is probably a reflection of the normals' higher intellectual ability. The apparatus thus appears to have controlled consistency of application to the task, but was unable to control the speed of performance, which is possibly dependent on level of intellectual ability.

Table IV.-

Mean Number of Units, Mean Times and Time-Unit Correlation Coefficients for Normal, Endogenous and Exogenous Feeble-Minded Children.

Group	Mean No. Units 1st Trial	Mean No. Units 2nd Trial	Mean Time 1st Trial (mins.)	Mean Time 2nd Trial (mins.)	r: Time-Units 1st Trial	r: Time-Units 2nd Trial
Normal	421		32.31		.89[a]	
Endogenous Feeble-minded	143	154	19.8	22.9	.96[a]	.90[a]
Exogenous Feeble-minded	48	47	7.0	6.9	.99[a]	.98[a]

a Significant at beyond the .005 level.

Table V.-

A Comparison of Rates of Moon Face Drawing Between Exogenous Feeble-minded, Endogenous Feeble-minded and Normal Children.

Group	Average Rate/min.	S.D.	t
Exogenous F.M. 1st trial	6.6	1.88	0.43[a]
Endogenous F.M. 1st trial	7.1	2.05	
Exogenous F.M. 2nd trial	7.3	2.98	0.30[a]
Endogenous F.M. 2nd trial	7.4	2.54	
Endogenous F.M. 1st trial	7.1	2.05	7.67[b]
Normals	12.4	3.09	
Exogenous F.M. 1st trial	6.6	1.88	7.60[b]
Normals	12.4	3.09	

a Not significant.
b Significant at the .001 level.

3. Satiation Time Differences Between Groups.

Table VI indicates that there was a significant difference in the satiation times between exogenous feeble-minded and normal subjects, with the normals taking significantly longer to satiate, despite the fact that they produced moon faces at a significantly higher rate (Table V).

A comparison of satiation times of endogenous and exogenous feeble-minded indicates a similar trend, with the endogenous feeble-minded taking longer to satiate than the exogenous feeble-minded, although the difference is not significant at the required level.

There was no significant difference in satiation times of the normals and endogenous feeble-minded.

Table VI.-

A Comparison of Satiation Times Between Groups (1st trials).

Group	N	Mean Satiation Time/min.	S.D.	t
Normals	30	29.91	12.93	6.44[a]
Exogenous F.M.	14	7.03	9.93	
Normals	30	25.91	12.93	1.51[c]
Endogenous F.M.	18	19.76	19.70	
Endogenous F.M.	18	19.76	19.70	2.36[b]
Exogenous F.M.	14	7.03	9.93	

a Significant at the .001 level.
b Significant at the .05 level.
c Significant at the .20 level.

SUMMARY AND CONCLUSIONS

In a study of satiation time differences in normal and feeble-minded children, on an open-end moon face drawing task, Lewin found the feeble-minded children to take substantially longer to satiate than the normals. He interpreted this finding as an indication that the feeble-minded child's behavior is more rigid and perseverative than that of the normal child, and that tension in the feeble-minded child is released more slowly. He illustrated this topologically by contrasting the inner-personal regions of the normal and feeble-minded child (figure 2, p. 5). The feeble-minded child was shown as having less permeable inner-personal cell boundaries than the normal child.

The present study was prompted by subsequent research findings which have cast doubt on the validity of Lewin's findings, and the interpretations which have followed from them. Lewin noted that the feeble-minded children had numerous "rest pauses" and "interposed activities" during the course of satiation. Recent research has indicated that these phenomena cause satiation to take a spuriously long time to occur. The validity of Lewin's measurement of satiation time in this group was therefore questioned.

The homogeneity of Lewin's feeble-minded group was also questioned. He did not differentiate between endogenous and exogenous etiology in the feeble-minded children used in his study. The development of more refined diagnostic techniques has indicated that the exogenous feeble-minded child is considerably more impulsive and distractible than the endogenous feeble-minded child. This has suggested that Lewin's topological conception of the feeble-minded child is not applicable to both endogenous and exogenous feeble-minded children. In fact, such behavior is indicative of more rapid tension release in the exogenous feeble-minded child, with the topological implication that inner-personal region cell boundaries bordering on the perceptual-motor region in such a child would be more permeable and not less permeable, as Lewin had concluded of feeble-minded children in general.

Accordingly, the present study, in replicating Lewin's study, sought to control the above two parameters. An attempt was made to eliminate "rest pauses" and "interposed activities", and to distinguish between the satiation times of endogenous and exogenous feeble-minded children. The satiation times of normal, endogenous and exogenous feeble-minded children were compared, using an open-end moon face drawing task, and a constant speed method of paper presentation.

The null hypothesis, that there will be no significant difference in the performance of normal, endogenous and exogenous feeble-minded children on a satiation task of moon face drawing, was rejected in part. The normal children took a significantly longer time to satiate than the exogenous feeble-minded children. The endogenous took a longer time to satiate than did the exogenous feeble-minded children, but the difference between these two groups only approached significance.

These results are clearly at variance with those obtained by Lewin. They indicate that, with the removal of distractibility as a variable which influences satiation time scores, the satiation timesof the normal and endogenous feeble-minded children are not significantly different. The satiation times of the normals and exogenous feeble-minded children under this condition were significantly different, only in the opposite direction from that obtained by Lewin.

The different results that have been obtained under more rigid experimental control would appear to indicate that Lewin's theory of the feeble-minded child does not hold, and that a different explanation of the feeble-minded child is required.

Comparing the satiation time of the normal children with those of the endogenous feeble-minded children, it is not possible to say that there is any difference in the rate of tension release in the two groups. Hence, topologically, no difference in permeability in the boundary separating the perceptual-motor region from the inner-personal region can be postulated. This does not deny Lewin's contention that the behavior of the feeble-minded child is rigid. It merely contra-indicates the impermeabity of this boundary as a factor in such rigidity. It may be that rigidity in the feeble-minded child is a function of a smaller number of inner-personal cells, which results in his having fewer behavioral alternatives to choose from.

Comparing satiation times of the normal and endogenous feeble-minded groups with that of the exogenous feeble-minded group leads to the conclusion that tension is released much more quickly in the exogenous feeble-minded child. Topologically, this would imply that the boundary between the perceptual-motor region and the inner-personal region is more permeable in this child. This confirmed the proposed topology of the exogenous feeble-minded child illustrated on page fourteen. The impulsive and distractible behavior of the exogenous feeble-minded child is easily explained with reference to such topology, for it allows for the easy release of tension in motor activity, and for the easy simultaneous impingement of external stimuli upon the inner-personal region.

The topological organizations of the normal, endogenous and exogenous feeble-minded child, as indicated in the results of the present study, are illustrated in figure 4, p. 38.

Several limitations of the present study should be pointed out. One of the main limitations of the study is the use of institutionalized feeble-minded children as subjects. This introduces many variables which make generalization of results to community surroundings a rather tenuous procedure. Both groups were living in the same situation and, hence, were theoretically equated. Even so, Zigler[2,3] has found evidence that the environmental deprivation experienced by institutionalized children results in greater task motivation and spuriously high satiation times. If it had been possible, the recruiting of non-institutionalized retardates would have been a preferable procedure, since this would have permitted more general application of the conclusions of the present study.

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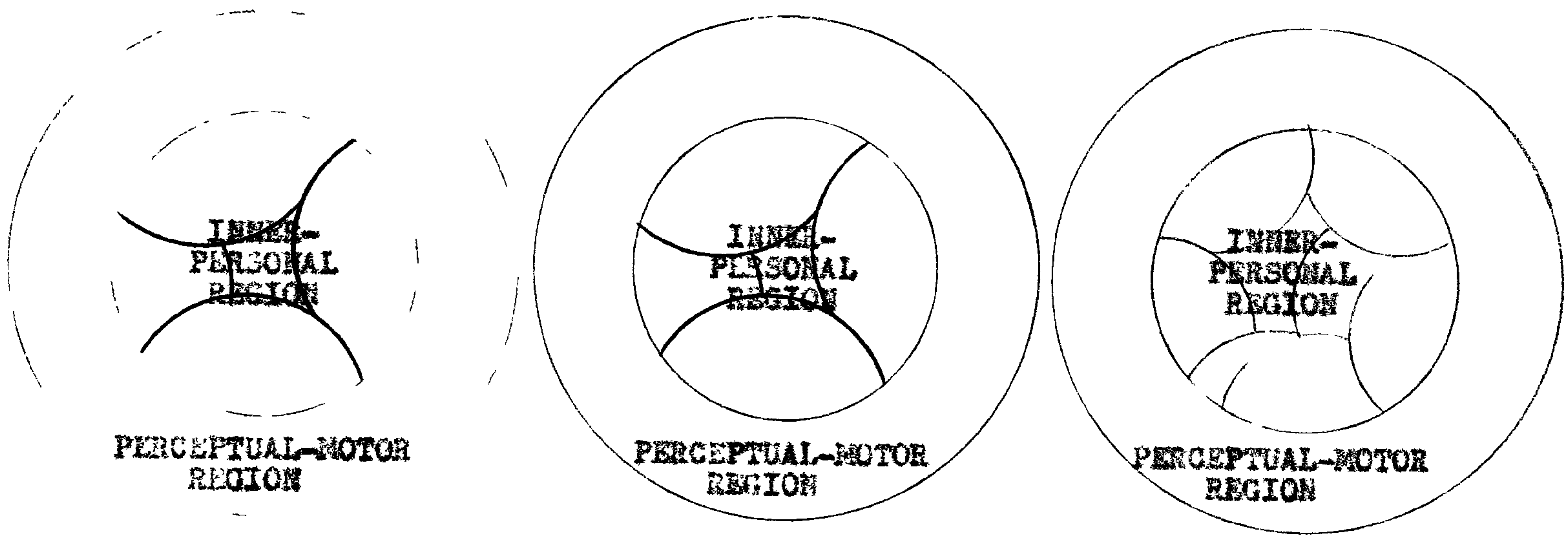
2 E. Zigler, "Rigidity and Social Reinforcement Effects in the Performance of Institutionalized and Non-Institutionalized Normal and Retarded Children", Journal of Personality, Vol. 31, 1963, p. 258-269.

3 ———, "Social Deprivation and Rigidity in the Performance of Feeble-minded Children", Journal of Abnormal and Social Psychology, Vol. 62, 1961, p. 413-421.



Exogenous Feeble-minded Child | Endogenous Feeble-minded Child | Normal Child

Figure 4.- Topological Conceptions of Normal, Endogenous and Exogenous Feeble-minded Children, Based on the Results of the Present Study.

Another limitation of the study is the difficulty which exists in differentially diagnosing the etiology of mental deficiency. It might well be that in the future, refined diagnostic techniques will show that brain damage underlies all mental deficiency, and differs only in degree. Even so, the consequences of the relative differences in amount of brain damage is of educational and psychological importance.

Another possible limitation to the study is that the satiation task was not appropriate for measuring satiation in exogenous children, in that it reflected merely perceptual-motor difficulties, and not satiation. However, Gallagher,[4] in a study, applied a series of tests of perception, conceptual ability, language, and learning, along with behavioral observations, to exogenous and endogenous defectives. He found evidence in the factor analysed data to indicate that impulsivity and distractibility were the only highly loaded factors, and that the other factors merely reflected these variables.

Other research tends to confirm the finding of the present study. Comparisons of brain-damaged and normal

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4 James J. Gallagher, "A Comparison of Brain-Injured and Non Brain-Injured Children on Several Psychological Variables, Monograph for Research in Child Development, Vol. 22(2), Serial 63, 1957, 11-79 p.

subjects on measures of kinesthetic figural after-effects[5] and visual after-images[6] have shown that satiation develops more quickly in brain-damaged individuals than in normals.

The results of the present study suggest further research into the validity of Lewin's topology. The present study examined the relative permeability of boundaries between the perceptual-motor region and the inner-personal region in normal, endogenous and exogenous feeble-minded children. The next logical step would be to employ the more accurate method of satiation measurement used in this study, to the task of determining the relative permeabilities of the inner-personal cells in these three groups of children.

Two approaches seem suited to this type of study. The first is a modified replication of Lewin's study of "the substitute value of substitute action" (c.f. p. 6). In this study the efficiency of a substitute task in drain-off the tension aroused by interruption of the original task could be measured. The greater such efficiency, the more permeable the boundaries between the inner-personal regions.

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5 G.S. Klien and D. Krech, "Cortical Conductivity in the Brain-Injured", Journal of Personality, Vol. 21, 1952, p.118-148.

6 P.A. Cooper and H.L. Deabler, "Diagnosis of Organicity by Means of Spiral After-Effect", Journal of Consulting Psychology, Vol. 19, 1955, p. 299-302.

The procedure would be as follows: 1) Start each subject on a drawing task of satiation. 2) After a short interval, alter the task by requiring the subject to draw something different. 3) After a period of time, return the subject to the original task, and measure the time taken to satiation.

A second approach to the measurement of permeability of the inner-personal region cell boundaries would be the determining of relative co-satiation times in the three groups.

The procedure here would be to administer a number of different satiation drawing tasks in succession, and measure the times taken to satiation, on each task. In those subjects with permeable inner-personal region cell boundaries, the successive satiation times would quickly diminish, whereas in those subjects whose satiation times showed little difference, the inner-personal region cell boundaries would be relatively less permeable.

A further point of departure from the present study might be to compare satiation times in normal, endogenous and exogenous feeble-minded children who are equated for mental age. The present study compared the three groups, matched for chronological age. Satiation time differences were thus interpreted as being a function of differences in intellectual levels. It would be interesting to determine whether satiation time differences exist in the three groups when mental age levels are equated. If such differences exist, this would indicate that the level of physical development is also a factor in determining the topology of the individual.

If level of physiological development is a factor in determining satiation time differences, perhaps the next logical step would be to measure satiation times in the three groups, composed of individuals within a wide age range and, by an analysis of variance design, determine the relative influence of intelligence and level of physiological development, in determining satiation times.

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Strauss, A.A. and N.C. Kephart, Psychopathology and Education of the Brain-Injured Child, Vol. 2, New York, Grune and Stratton, 1955, x-266 p.

Deals with the perception, language development, concept formation and behavior disorders in the brain-injured child of normal intelligence. Of particular relevance is the physiological description of brain damage.

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Wolff presents a purer method of measuring satiation, using a modified kymograph method of constant-speed presentation of paper. Highly related time and unit scores were obtained using this method.

APPENDIX 1

INDIVIDUAL CHARACTERISTICS OF CONTROL AND EXPERIMENTAL GROUPS

APPENDIX 1

INDIVIDUAL CHARACTERISTICS OF CONTROL AND EXPERIMENTAL GROUPS

A. **Exogenous Feeble-minded Subjects.**

1. **Age:** 11-1
   Neurological: Organic Speech Defect
   I.Q.: Binet: 51
   History: Brain damage suffered in fall.
   Diagnosis: Encephalopathy due to postnatal injury.

2. **Age:** 9-8
   Neurological: Abnormal E.E.G.
   I.Q.: Binet: 59 (indic. of B.D.)
   History: B.D. suffered at birth (home delivery)
   Diagnosis: Encephalopathy due to postnatal injury.

3. **Age:** 13-4
   Neurological: Abnormal E.E.G.
   I.Q.: WISC: 62
   History: Epilepsy
   Diagnosis: Encephalopathy due to postnatal injury.

4. **Age:** 10-9
   Neurological: Abnormal E.E.G.
   I.Q.; WISC: 54
   History: High fever and convulsions in infancy.
   Diagnosis: Encephalopathy due to postnatal injury.

5. **Age:** 9-3
   Neurological: Abnormal E.E.G.
   I.Q.: WISC: 49 (indic. B.D.)
   History: Cyanosis at birth
   Diagnosis: Encephalopathy due to postnatal injury.

6. **Age:** 12-4
   Neurological: Abnormal E.E.G.
   I.Q.: WISC: 46 (indic. B.D.)
   History: Organic Speech defect.
   Diagnosis: Encephalopathy due to postnatal injury.

7. **Age:** 8-0
   Neurological: Abnormal E.E.G.
   I.Q.: Binet: 48+
   History: Birth trauma.
   Diagnosis: Encephalopathy due to postnatal injury.

8. Age: 8-3
I.Q.: Binet: 53 (indic. B.D.)
History: Use of forceps, convulsions, at birth.
Diagnosis: Encephalopathy due to postnatal injury.

9. Age: 12-0
Neurological: Abnormal E.E.G.
I.Q.: Binet: 45+ (indic. B.D.)
History: Vascular occlusion.
Diagnosis: Encephalopathy due to postnatal injury.

10. Age: 11-0
Neurological: Abnormal E.E.G.
I.Q.: WISC: 60
History: Difficult birth
Diagnosis: Encephalopathy due to postnatal injury.

11. Age: 11-9
I.Q.: WISC: 68
History: Convulsions
Neurological: Abnormal E.E.G.
Diagnosis: Encephalopathy due to postnatal injury.

12. Age: 11-6
I.Q.: Col. Ment. Meas.: 63
History: Anoxemia at birth
Diagnosis: Encephalopathy due to postnatal injury.

13. Age: 10-5
I.Q.: Binet: 56
History: Anoxemia at birth
Diagnosis: Encephalopathy due to postnatal injury.

14. Age: 12-8
Neurological: Abnormal E.E.G.
I.Q.: WISC: 63
History: Premature birth.

B. Endogenous Feeble-minded Subjects.

1. Age: 11-10
Neurological: Negative
I.Q.: WISC: 60
History: Mother mentally retarded.

2. Age: 11-0
I.Q.: WISC: 58
Neurological: Negative
History: 4 sibs. ment. retarded.
Diagnosis: Familial mental retardate

3. Age: 13-6
I.Q.: Binet: 55
Neurological: Negative
History: Father, mother mentally retarded.
Diagnosis: Familial mental retardate.

4. Age: 10-7
I.Q.: WISC: 57
Neurological: Negative
History: Father, mother mentally retarded.
Diagnosis: Familial mental retardate.

5. Age: 11-4
I.Q.: WISC: 64
Neurological: Negative
History: 2 sibs. retarded
Diagnosis: Familial mental retardate.

6. Age 11-6
I.Q.: WISC: 66
Neurological: Negative
History: Mother retarded.
Diagnosis: Familial mental retardate.

7. Age: 12-4
I.Q.: WISC: 63
Neurological: Negative
History: Father retarded
Diagnosis: Familial mental retardate.

8. Age: 9-0
I.Q.: Binet: 55
Neurological: Negative
History: Mother retarded
Diagnosis: Familial mental retardate.

9. Age: 12-5
I.Q.: Binet: 65
Neurological: Negative
History: Mother retarded
Diagnosis: Familial mental retardate

10. Age 12-5
I.Q.: Binet: 65
History: Mother retarded
Neurological: Negative
Diagnosis: Familial mental retardate.

11. Age: 11-9
I.Q.: WISC: 69
Neurological: Negative
History: Father retarded
Diagnosis: Familial mental retardate.

12. Age: 10-0
I.Q.: WISC: 59
Neurological: Negative
History: Sibling retarded
Diagnosis: Familial mental retardate.

13. Age: 12-1
I.Q.: Binet: 62
Neurological: Negative
History: Sibling retarded
Diagnosis: Familial mental retardate.

14. Age: 12-0
I.Q.: WISC: 72
Neurological: Negative
History: 2 siblings retarded
Diagnosis: Familial mental retardate.

15. Age: 13-1
I.Q.: Binet: 61
Neurological: Negative
History: Mother retarded
Diagnosis: Familial mental retardate.

16. Age: 10-7
I.Q.: Binet: 46+
Neurological: Negative
History: Father, mother retarded.
Diagnosis: Familial mental retardate.

17. Age: 13-6
I.Q.: Binet: 63
Neurological: Negative
History: Mother retarded.
Diagnosis: Familial mental retardate.

18. Age: 13-8
I.Q.: Binet: 65
Neurological: Negative
History: Mother, father retarded.
Diagnosis: Familial mental retardate.

C. Normal Subjects.

1. Age: 13-4
I.Q.: Otis: 105
Teacher's impression: Normal

2. Age: 13-3
I.Q.: Otis: 106
Teacher's impression: Normal

5. Age: 13-7
I.Q.: Otis: 104
Teacher's impression: Normal

6. Age: 12-9
I.Q.: Otis: 105
Teacher's impression: Normal

7. Age: 12-4
I.Q.: Otis: 108
Teacher's impression: Normal

8. Age: 9-6
I.Q.: Otis: 96
Teacher's impression: Normal

9. Age: 12-3
I.Q.: Otis: 111
Teacher's impression: Normal

10. Age: 12-6
I.Q.: Otis: 89
Teacher's impression: Normal

11. Age: 12-0
I.Q.: Otis: 110
Teacher's impression: Normal

12. Age: 12-9
I.Q.: Otis: 102
Teacher's impression: Normal

13. Age: 12-1
I.Q.: Otis: 115
Teacher's impression: Normal

14. Age: 12-10
I.Q.: Otis: 116
Teacher's impression: Normal

3. Age: 13-9
I.Q.: Otis: 103
Teacher's impression: Normal

4. Age: 8-0
I.Q.: Otis: 108
Teacher's impression: Normal

18. Age: 11-11
I.Q.: Otis: 116
Teacher's impression: Normal

19. Age: 11-9
I.Q.: Otis: 114
Teacher's impression: Normal

20. Age: 11-6
I.Q.: Otis: 118
Teacher's impression: Normal

21. Age: 11-7
I.Q.: Otis: 115
Teacher's impression: Normal

22. Age: 12-0
I.Q.: Otis: 117
Teacher's impression: Normal

23. Age: 11-2
I.Q.: Otis: 123
Teacher's impression: Normal

24. Age: 11-11
I.Q.: Otis: 115
Teacher's impression: Normal

25. Age: 10-5
I.Q.: Otis: 107
Teacher's impression: Normal

26. Age: 10-3
I.Q.: Otis: 103
Teacher's impression: Normal

27. Age: 10-4
I.Q.: Otis: 104
Teacher's impression: Normal

15. Age: 9-7
I.Q.: Otis: 95
Teacher's impression: Normal

16. Age: 11-2
I.Q.: Otis: 112
Teacher's impression: Normal

17. Age: 11-1
I.Q.: Otis: 112
Teacher's impression: Normal

28. Age: 10-6
I.Q.: Otis: 99
Teacher's impression: Normal

29. Age: 10-2
I.Q.: Otis: 110
Teacher's impression: Normal

30. Age: 9-11
I.Q.: Otis: 110
Teacher's impression: Normal

APPENDIX 2

INDIVIDUAL SCORES OBTAINED BY CONTROL AND EXPERIMENTAL GROUPS

APPENDIX 2

Table VII.-

Individual Scores Obtained by Control and Experimental Groups.

	Trial 1		Trial 2	
	No. of Moon Faces	Time in Seconds	No. of Moon Faces	Time in Seconds
A. Exogenous Feeble-minded				
1.	8	75	9	115
2.	9	80	14	118
3.	27	145	37	133
4.	9	70	8	63
5.	26	180	33	203
6.	6	60	4	30
7.	269	2413	214	2251
8.	9	118	13	172
9.	60	478	48	390
10.	37	457	17	147
11.	12	149	10	140
12.	124	813	172	1363
13.	57	601	64	518
14.	20	265	14	182
B. Endogenous Feeble-minded				
1.	20	273	20	205
2.	52	701	91	841
3.	122	1040	59	528
4.	47	442	22	210
5.	52	433	57	675
6.	248	1255	399	1978
7.	28	330	15	222
8.	285	2808	189	2837
9.	85	1098	132	1771
10.	31	390	51	370
11.	207	1235	603	4277
12.	84	725	97	807
13.	363	2762	363	2707
14.	56	315	90	551
15.	52	334	70	428
16.	261	1904	196	1358
17.	47	532	84	704
18.	642	4895	424	4318

Table VII.- (Cont'd.)

Individual Scores Obtained by Control and Experimental Groups.

	No. of Moon Faces	Time in Seconds		No. of Moon Faces	Time in Seconds
C. Normal					
1.	395	2066	16.	611	2352
2.	452	2694	17.	507	2185
3.	600	2530	18.	395	1958
4.	22	160	19.	331	1699
5.	551	1806	20.	305	2434
6.	575	2050	21.	621	2552
7.	464	1988	22.	441	2382
8.	60	482	23.	420	2436
9.	617	2490	24.	247	1390
10.	417	1989	25.	393	1730
11.	309	1458	26.	473	2422
12.	836	3025	27.	401	2371
13.	501	2638	28.	424	1450
14.	697	2756	29.	480	2572
15.	82	478	30.	15	160

APPENDIX 3

ABSTRACT OF

An Investigation into the Topology of Exogenous Feeble-Minded Children

APPENDIX 3

ABSTRACT OF

An Investigation into the Topology of Exogenous Feeble-Minded Children[1]

Lewin, in his topological conceptualization of the feeble-minded child, postulated an inner-personal region containing fewer cells than that of a normal child. The boundaries separating these cells, he believed, are relatively more impermeable than those of the normal child, with the result that tension is released more slowly in the feeble-minded child.

In support of this theory he cited research which indicated that feeble-minded children satiated more slowly than normal children, on a satiation task of moon face drawing.

However, the moon face drawing task employed by Lewin did not control for certain "rest pauses" and "interposed activities" which he noted in the feeble-minded children. Recent pursuit rotor studies suggest that such things have a marked effect upon the course of satiation, and tends to lengthen the time required for complete satiation.

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1 Eugene G. Brailsford, doctoral thesis presented to the School of Psychology and Education of the University of Ottawa, 1965, viii-53 p.

Also, Lewin did not ascertain the etiology of mental deficiency in the subjects of his feeble-minded group, that is whether they were exogenous or endogenous feeble-minded children. A review of the literature revealed the impulsive, distractible nature of the exogenous feeble-minded child's behavior.

It was hypothesized that tension in the exogenous feeble-minded child is released more quickly, through less permeable perceptual-motor region boundaries, and that satiation would occur in less time. A satiation task of moon face drawing was presented to three groups of children - normal, exogenous feeble-minded and endogenous feeble-minded. A constant-speed presentation of the moon face drawing task prevented rest pauses and interposed activities from affecting recorded satiation times.

The normal children were found to require a significantly longer time to satiate than the exogenous feeble-minded children. Similarily, the endogenous feeble-minded children required longer to satiate than the exogenous feeble-minded children, although the difference only approached significance.

The implications of these findings were illustrated topologically.

Certain limitations in the study were discussed, and suggestions for further research in this area were advanced.