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The Use of Prochlorperazine with Brain-Damaged Children

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THE USE OF PROCHLORPERAZINE WITH BRAIN-DAMAGED CHILDREN

by

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LIFE

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

The problems presented by the brain-damaged child are among the most challenging in psychopathology. Among these problems, that of treatment for the brain-damaged child whose symptomalogy does not include either a convulsive disorder or a problem of neurogenic motor incoordination is prominent.

Treatment of this disorder, and diagnosis for that matter,[1] continue in many ways to be rudimentary. Several factors mitigate against optimal treatment, not the least of which are the following: treatment is essentially long-term and very often requires special school placement; the lack of any clear concept of pre-injury behavior, such as is possible with the adult patient, may result in setting the goal of treatment at a point beyond the child's fundamental capacities; it is very often difficult to determine how much of the brain-damaged child's behavior is neurogenic in origin and how much is psychogenic; finally, while there is an apparent increase in interest in the

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[1] The diagnosis of organic brain damage continues to be something of a problem, whether the approach is neurologic or psychologic. Similarly, techniques of assessment for the child continue to lack refinement, partly because of a relative lack of investigation in this area, and partly because what has been learned from the adult patient cannot be directly related to an understanding of the child. (Cf. Footnote 2.) Anent the problems of diagnosis with the adult, utilizing psychologic test data, cf. A. J. Yates, (1954). Yates' comments regarding the qualitative tests of organic brain damage, such as the Goldstein series may well apply to such qualitative tests of organic damage in children as the Marbleboard Test.

brain-damaged child's several problems, much of the investigative work to date has been confined to the adult. In regard to this latter point, it is superfluous to point out that there are apparently basic differences between similar injuries in the child and the adult.[2]

Nonetheless, therapeutic techniques have been developed for the brain-damaged child. As with the adult, many of these techniques are psychologic in nature, i.e., a combination of education and psychotherapy. (Cf. Strauss and Kephart, 1955; Strauss and Lehtinen, 1947). Certainly, for such known brain disorders as epilepsy and cerebral palsy, chemotherapy or physical therapy have proven beneficial.[3] But for many children whose brain disorder is not

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[2]In this connection, Hebb comments: "It appears, therefore, that an early injury may prevent the development of some intellectual capacities that an equally extensive injury, at maturity, would not have destroyed. To complete the picture, it should be said again that this relationship does not hold--at least to the same degree--for all intellectual capacities; and sensory and motor capacities after damage to the infant brain tend to reach a higher level than that attained after destruction of the same regions at maturity." (Hebb, 1949, p. 292). Hebb's explanation for the discrepancy he observes is of interest: "Physiologically, the matter may be put as follows: some types of behavior that require a large amount of brain tissue for their first establishment can then persist when the amount of available tissue has been decreased." (Hebb, 1949, p. 293). Why certain functions in the damaged "infant brain" should develop to a higher level, however, is not clear.

[3]"The control of seizures usually depends more upon proper medication than on any other single factor. Choice of medication depends on the seizure pattern, the type of electroencephalographic abnormality, the side effects of the drugs. . ." (Chao, Druckman, and Kellaway, 1958, p. 120). "For many years the bromides and phenobarbital were essentially the only two anticonvulsant drugs employed in the treatment of epilepsy. In 1938 a new and most important era was begun in the treatment of convulsive disorders with the introduction of 5.5-diphenylhydantoin sodium (Dilantin Sodium). . . Since that time many new drugs have been developed and successfully used in the treatment of epilepsy." (Livingston, 1954, p. 183). For cerebral palsy, on the other hand, "The treatment of all forms of cerebral palsies of children is highly unsatisfactory. . . Medicinal treatment has practically no effect. . . The surgical procedures do not offer great hope. More can be expected from massage, warm baths, passive motion and actual exercise. . . Persistent reeductional methods patiently carried out promise more genuine results than any other form of treatment" (I. S. Wechsler, 1952, pp. 536-537).

expressed in convulsions or motoric incoordination, adequate and relatively short-term treatment has been lacking.

But, "a remarkable surge in interest in drugs which affect the mental aspects of behavior [resulted from the discovery] in 1947, of the unusual psychotomimetic properties of lysergic acid diethylamide." (Pennes, 1958, p. xiii). In the early years of this decade, attention was focused on a group of drugs now commonly subsumed under the term "tranquilizers." Originally developed for the control of vomiting and nausea,[4] it was soon observed that these drugs seemed to have an ameliorative effect upon distressing psychologic states. Further investigation of this observation led to reports of dramatic success in major psychoses, particularly in schizophrenia, and in certain of the psychoneuroses.[5] As a consequence, the use of ataractic drugs became widespread. One of these drugs, chlorpromazine hydrochloride, received considerable attention, and ultimately its use with children for various reasons was

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[4]Many of the tranquilizing drugs are still classed as antiemetics.

[5]". . . tranquilizing medication, particularly with chlorpromazine, is most effective in manic states. . . Depression is at the other end of the scale of effectiveness of the new tranquilizing drugs. Not only are chlorpromazine, reserpine, and related drugs entirely ineffective in most cases of depression, but they are actually contraindicated since they may aggravate the condition." (Alexander, 1958, pp. 65-66). "Several new drugs have come into prominence and fall into the category of 'tranquilizing' medication. The most prominent of these are chlorpromazine, reserpine, and meprobamate. Although these medications are effective in allaying excitement and tension in any psychiatric state, they are of greatest value in the schizophrenias, in the acute psychotic excitements, and in manic states; they are of least value in the depressive phase of the Manic-Depressive illness" (Kraines, 1957, p. 450).

reported. "The unique tranquilizing effect of 'Thorazine'[6] provides greater accessibility and ease of management of hostile, hyperactive, emotionally or mentally distrubed children than has heretofore been possible. . . 'Thorazine' has effectively controlled the following behavioral symptoms arising from a variety of emotional and organic disorders: assaultive, antisocial behavior. . . chronic restlessness. . . hyperkinesia" (Thorazine Reference Manual, 1958, p. 34). "Chlorpromazine has been of profound help in behavioral disturbances of childhood. Effects are rapid and may be measured in terms of improved appetite, attention span, sociability, lessening of hyperactivity, fears, and nervousness" (Kinross-Wright, 1956, p. 37). However, relatively few of the reports on the use of the ataractic drugs with either children or adults include evaluation of these drugs by means of psychologic examination.

In view of the reported results with children presenting symptoms of behavioral dysfunction "arising from a variety of emotional and organic disorders," the possibility was raised that the child with organic brain disorder of the type previously described might also benefit from the use of these drugs.

Accordingly, the purpose of the present study is to evaluate the use of one of the ataractic drugs, prochlorperazine,[7] with the brain-damaged child.

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[6]Chlorpromazine, Smith, Kline and French. "'Thorazine' is 10-(3-dimethylaminopropyl)-2-chlorphenothiazine." "Pharmacologically, it is believed that 'Thorazine' acts principally on higher neural centers in the general area of the diencephalon, selectively inhibiting the chemoreceptor trigger zone, the hypothalamus and the reticular substance" (Thorazine Reference Manual, 1958, p. 4).

[7]Prochlorperazine is a drug closely allied to chlorpromazine. For chemical description, structure and mode of action, cf. Chapter III.

The areas chosen for such evaluation were the child's response to certain psychologic tests, and alterations in behavior as reported by his parents. The psychologic tests selected had the purpose of evaluating possible changes in intrapsychic and interpersonal functioning, particularly those aspects of such functioning as are affected by disinhibition, defects in attention, and defects in concentration. Similarly, the report requested from the parent was related to such characteristics of overt behavior as impulsivity, hyperactivity, and emotional lability.

It is assumed that, by this means, a possible solution to the question whether the phrenotropic drugs might benefit the brain-damaged child could be obtained.

CHAPTER II

REVIEW OF THE LITERATURE

This review proposes to emphasize two major aspects of the literature related to the present study, viz., the effect of ataractic drugs, particularly in relation to various psychologic functions and disorders, and the behavioral aspects of organic brain damage in children. Literature having to do with two fundamental aspects of the research design for this study, i.e., the double-blind technique and the use of placebo, is also discussed.

The literature on the use of ataractic drugs is rapidly increasing. The application of these drugs to a wide variety of medical problems has been one factor stimulating research on their use in various medical specialities. However, the possibility that these drugs would prove to be a significant contribution to the problem of treatment of psychiatric disorders has resulted in the apparent revitalization of the field of psychopharmacology. As a consequence, available literature in the area of psychiatric and psychologic research with these drugs significantly exceeds reports of the use of ataractics in other medical problems. Further, the question of the effect of these drugs on normal human behavior has combined with interest in their psychiatric potential to produce a body of literature that is truly formidable.

In the effort to organize pertinent available literature on the ataractic drugs, it is possible to classify the various studies into two major categories viz., those studies that are concerned with the physiologic correlates of the

drugs, and those concerned with behavioral changes whether directly observed or reflected in psychologic test data. Of these two categories, the latter is of major interest to the present study, particularly research presenting data on the effects of the drugs on the behavior of children. The former category, however, is important for an understanding of the nature of these drugs, especially those studies having to do with the mode of action of the ataractics in the central nervous system.

Illustrative of the type of study that utilizes a psychiatric population but evaluates the drug in terms of physiologic changes in that of Hippius, Kanig, and Selbach (1959). These investigators, reporting on the use of phenothiazine derivitives and reserpine,[1] find that, following the administration of either or both of these drugs, "the serum proteins, when initially having abnormal values, become slowly normal, after a slight worsening between the first and third weeks of treatment. . . Clinical, physiologic, and biochemical studies show after administration of these drugs a suppression of metabolism is seen in the increase of globulin, of which a surplus was produced prior to treatment. The preponderance of trophotropic metabolism is manifested by an increase in albumin production prior to treatment" (Hippius, et. al., 1959, pp. 143-144).

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[1]Reserpine is described as a substance that liberates "5-hydroxytryptamine (serotonin) in the brain. . . Reserpine also shows some structural resemblance to 5-hydroxytryptamine. . ." (Berger, 1957, p. 685).

In relation to mode of action of the ataractics, Baird, Szekely, Wycis, and Spiegel, (1957) in their study of meprobamate,[2] report: "(1) Experimental studies in cats showed that the action of meprobamate is not limited to the diencephalon, but extends to forebrain ganglia (amygdala, caudate nucleus, pallidum) in varying degrees. (2) A dissociation in the effect on the pallidum and on the caudate nucleus may be observed, indicating differences in the susceptibility of these ganglia to meprobamate. (3) Lesions of the caudate nucleus may induce a supersensitivity of the pallidum to the action of meprobamate. (4) In children, a difference in the action of meprobamate upon various subcortical ganglia could also be noticed (for example, more pronounced effect upon the thalamus than upon the pallidum, particularly with mild sedation.) (5) Mild sedation induced by meprobamate or by reserpine may reveal asymmetries in the functional state of the basal ganglia in extrapyramidal disorders or subcortical seizure discharges in patients with convulsive disorders" (Baird, et. al., 1957, p. 884).

Schneider (1955) in an article on central sympathetic activity as influenced by amytal, reserpine, and chlorpromazine, reports that for reserpine and chlorpormazine, "there would appear to be some neurophysiological evidence that they act as depressants of the brain stem reticular formation ... The present study has demonstrated. . . that the hypothalamus is depressed in all subjects by amytal, and is similarly depressed by reserpine and chlorpromazine . . ." (Schneider, 1955, p. 8).

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[2]Meprobamate is derived from substituted propandiols. Cf. Berger, 1957, p. 884.

Freyhan (1958) while utilizing psychiatric patients in his study with prochlorperazine, reports on the electroencephalographic effects of the drug: "Prochlorperazine [sic] alters electroencephalographic patterns in what appears to be a highly consistent fashion. Alpha rhythm is replaced by beta activity which often continues for some time after discontinuation of medication. . . This replacement of alpha rhythm by fast, low voltage activity has not been observed with other drugs with such constancy. W. Borkowski who interpreted the E.E.G. records felt 'that the drug interplays on the central reticular system, thus producing increased activity which is recorded as beta activity'" (Freyhan, 1958, pp. 39-40).

The substance of these reports, then, is that the ataractics act principally in the mid-brain, especially in the brain stem reticular formation, rather than act directly on the cerebral cortex.

Research into behavioral changes following the use of ataractic drugs falls into two classifications: those utilizing some form of rating scale of improvement or a descriptive summary of improved behavior, and those reporting changes in terms of psychologic test data. The former type constitutes probably the most common sort of report in the literature on ataractics. Such research is almost exclusively concerned with a clinical population. By comparison, the use of psychologic tests as methods of evaluating the drugs is relatively infrequent.

Typical of the descriptive and rating scale method are the reports of Hollister, Elkins, Hiler, and St. Aerre (1957) and of Denhoff and Holden (1955). In a study of the effectiveness of meprobamate with the population of a psychiatric hospital, Hollister, et. al., utilized a rating scale they

describe as follows: "A rating of slight improvement implied little more than partial sedation of the patient. Moderate improvement indicated either behavioral changes that permitted the patient to participate in activities, programs or psychotherapy, or social improvement that permitted the granting of ground privileges or passes from the hospital. Marked improvement meant that the patient had changed greatly according to the above criteria and was being considered for release from the hospital" (Hollister, et. al., 1957, p. 791). Denhoff and Holden, in a study on the use of chlorpromazine with eighteen cerebral palsied children, report improvement in fifty percent of their subjects when the child received the medication as opposed to when a placebo was administered. These authors, however, describe the improvement as follows: "Both intelligent and mentally deficient children showed increased relaxation and lessened anxiety, were happier, less irritable, and easier to manage" (Denhoff and Holden, 1955, p. 332).

Similar reports, but of particular interest because the drug being evaluated is prochlorperazine, are those of Kline, Barsa, Bruckman, and Saunders (1958), Denber (1958), Goldman (1958), and Freyhan (1958). Each of these studies employed some method of rating the patient's response to the drug in terms of judgment of improvement. Kline's article reports on an evaluation of prochlorperazine in terms of dosage. His subjects were twenty-five psychotic patients for whom other ataractics had proven ineffective. "Moderate improvement was achieved in eight patients and slight improvement in five" (Kline,

et. al., 1958, p. 13). Furthermore, Tables V and VI[3] indicate that that group of patients for whom the final dosage was 120 mg. a day had a higher incidence of "Moderately Improved" subjects than the group whose final dosage was between 400 and 900 mg. per day. The authors, however, do not comment on this apparent difference.

Denber attempted to evaluate the intramuscular administration of prochlorperazine in varying doses for varying periods of time on a wide variety of psychiatric patients. He concludes that "The best results were obtained with the intramuscular preparation used for brief periods of time and at low doses" (Denber, 1958, p. 21). His result anent dosage is interesting in light of the data presented in Kline's study.

Goldman, in a report on the behavioral improvement in psychotic patients, concludes that "Proclorperazine /sic/ is an effective phrenotropic drug. It is useful in the treatment of acute and chronic psychotic states. . . Results. . . in psychotic states are comparable with those obtained from the use of other

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[3]Table V reports on improvement in patients classified as to diagnosis, which patients were receiving 120 mg. of prochlorperazine per day as their final dosage. Table VI is identical except that the patients reported on were receiving 400-900 mg. of prochlorperazine daily as their final dosage. Each table contains four categories related to improvement, viz., "Markedly Improved," "Moderately Improved," "Slightly Improved," and "No Improvement." Neither table indicates that any patient was markedly improved. In Table V, five of a group of twelve patients were classed as moderately improved, as opposed to three of thirteen reported in Table VI. In terms of percentage, the patients receiving the lower final dose had 41.67% of the group manifesting moderate improvement, while the group receiving the higher dose had 23.08% manifesting moderate improvement (Cf. Kline, et. al., 1958, p. 12).

effective phrenotropic drugs" (Goldman, 1958, p. 31).[4]

Freyhan's study, mentioned previously, is of further interest since 16 of his 113 patients presented either acute or chronic brain syndromes. Of the acute brain syndromes, all occurred "with alcoholic intoxication"; of the chronic brain syndromes, four of the seven patients presented problems of mental deficiency. The author reports that the response of all patients with chronic brain syndrome to prochlorperazine was either "Very Good" or "Good," while only 14.3% of those with acute brain syndrome fell into the category of "Unsatisfactory" response.[5] Two aspects of this report, however, are unclear. Freyhan mentions that "Evaluation is based on the degree of modifiability of target symptoms" (Freyhan, 1958, p. 34). Unfortunately, the author does not identify or illustrate what he means by "target symptoms" for the various diagnostic categories upon which he reports. Secondly, he mentions that "With the exception of acute brain syndromes and psychotic emergencies, new patients were

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[4]Elsewhere in this article the author includes some interesting subjective observations obtained from a patient who had previously received chlorpromazine: "One such patient who has better than average intelligence and can verbalize his observations effectively should be quoted. He states he feels better in many ways. He has much less of the depressive feelings he had from chlorpromazine and no sleepiness such as chlorpromazine produced. . . He has much better vision than he had while under chlorpromazine medication, and is able to drive his car more securely" (Goldman, 1958, p. 27).

[5]Freyhan identifies the various responses as follows: "'Very good' implies total disappearance of the target symptoms; 'good' refers to partial modification, and 'unsatisfactory' to failure" (Freynan, 1958, p. 43). The results in terms of this classification are contained in Table VII, p. 44, of this article.

thoroughly studied before therapeutic courses were started" (Freyhan, 1958, p. 34). How many psychotic emergencies or new cases of acute brain syndrome were included in the group of 113 patients, the author does not specify; nor does he indicate what effect the lack of thorough study for these cases had upon the identification of "target symptoms."

Research utilizing psychologic test data is not as common in reports on psychiatric populations as it is in studies of the response to ataractic drugs in normal, i.e., non-psychiatric, populations. Indeed, where psychiatric patients are evaluated, the use of psychologic testing methods for the purpose of determining response to the drug in question are comparatively rare. An example of this type of study is that of Whitehead and Thune (1958). These investigators attempted "to explore the effects of the drug chlorpromazine on several different aspects of the learning process and on verbalized social adaptation as these take place in a group of hospitalized chronic psychotic subjects. The learning variables sampled included serial verbal learning, retention of serial verbal material learned on the previous day, the acquisition of a motor skill, problem solving, and a somewhat related task involving verbalized social adaptation and judgment" (Whitehead and Thune, 1958, p. 379). Fifty-two chronic psychotic males were studied, the majority diagnosed as schizophrenic with several diagnosed as manic-depressive. The subjects were randomly assigned to one of two groups, experimental and control. "All Ss in the experimental group were placed on oral chlorpromazine for a period of two months. Dosage was gradually increased to about 800 mg. per day, usually over a period of about 35 days, and then gradually decreased until evaluation, at which time 36 Ss were receiving a minimum of 300 mg., and 16 Ss were receiving 200 mg. per day"

(Whitehead and Thune, 1958, p. 379). The control group received a placebo in place of the medication.

The authors conclude: "1. Chlorpromazine appears to have little effect on the learning processes per se. 2. Chrlopromazine has a significant effect on improving the responses of chronic psychotics to items judged to involve social adaptation. 3. Chlorpromazine significantly increases the number of chronic psychotic Ss who are motivated to cooperate in the testing procedure. 4. In spite of reports to the effect that chlorpromazine produces general psychomotor retardation, Ss receiving the drug learn a motor task at the same rate as Ss who are not receiving the drug" (Whitehead and Thune, 1958, p. 383).

Of the studies involving the evaluation of normal subjects by means of psychologic tests, those of Marquis, Kelly, Miller, Gerard, and Rapoport (1957), and of Reitan (1957) are representative. Both of these studies are concerned with meprobamate, and, in addition, Reitan reports on the effects of Ultran. This latter drug, as well as meprobamata, is chemically different from chlorpromazine and prochlorperazine.[6]

Marquis, et. al., investigated the effect of meprobamate alone and in combination with alcoholic beverage upon skills associated with automobile driving. Fifty adult subjects were examined "on five successive days, on each of which they received one of the following doses: (1) a placebo (lactose, 1400 mg.); (2) meprobamate (800 mg.); (3) dextroamphetamine sulfate (15 mg.); (4) meprobamate (800 mg.) plus alcohol (2 oz. of 86-proof whiskey); and (5) a

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[6]Ultran is derived from a group of butanediols (Reitan, 1957, p. 158).

placebo (lactose, 1400 mg.) plus alcohol (2 oz. of 86-proof whiskey) (Marquis, et. al., 1957, p. 701). "The order of presentation of the drug over the five day period varied from subject to subject in such a way that each of the doses occurred equally often at each stage of practice, and each treatment followed every other treatment with equal frequency. Each day the subject received a different treatment, so that at the end of the five day testing period he had received them all" (Marquis, et. al., 1957, p. 702). Of the subjects used, 36 were male and 14 were female with an age range of 21 to 50 years. While five of the subjects were patients in a neurosis center, the remaining were college students, non-psychiatric patients of a Veterans Administration hospital, and Veterans Administration employees. In response to the question, "'Have you or has any member of your family been bothered by fits, faints, or nervousness?' . . eight gave a personal history, three a family history, and two both a personal and a family history of such symptoms" (Marquis, et. al., 1957, p. 702). The authors felt that their experimental group "was a reasonably representative sample in terms of mental status of the types of persons at present receiving meprobamate" (Marquis, et. al., p. 702). Using a modification of the American Automobile Association's "Auto Trainer," the authors concluded that "none of the drug treatments produced a significant change on the speed of reaction, /for brake-pressing/ nor on any of the other driving test scores" (Marquis, et. al., 1957, p. 704). In order to evaluate the degree of anxiety, the authors obtained a measure of autonomic response utilizing amount of perspiration as an index. "The results of the perspiration measure were clear-cut. Perspiration was significantly greater under meprobamate, as compared with placebo. Dextroamphetamine sulfate and alcohol did not produce

any definite effect. The results with meprobamate were exactly contrary to expectation. . ." (Marquis, et. al., 1957, p. 706). The authors, however, question their use of perspiration as an index of anxiety since "It is unclear . . . whether the perspiration test is . . . a measure of anxiety, or whether it may be related more to muscular exertion or some other function" (Marquis, et. al., pp. 706-707). It would seem, at any rate, that whatever other function than anxiety may have produced the perspiration, this function was more prominent under meprobamate than under placebo. The authors, however, do not comment further along these lines. On the steadiness test, an adaptation of the Whipple Steadiness Test, the authors found that "With placebo and alcohol there was a significant impairment of steadiness. . . but not with meprobamate or dextroamphetamine sulfate. . . There was a suggestion that meprobamate tends to counteract alcohol" (Marquis, et. al., 1957, p. 707). On tests of visual function, i.e., acuity for both near and far vision, depth perception for distant vision, and vertical and lateral phorias for both near and far vision, no significant differences were obtained between the drugs and placebo. The authors conclude that "meprobamate alone, even in double the usual dosage, produces no behavioral toxicity. . . as measured by our tests of driving, steadiness, and vision. Meprobamate significantly increases sweating, an unexpected and unexplained finding. . . Our data give no grounds for preventing persons under the usual dosages of meprobamate from driving automobiles, or even from driving under meprobamate after drinking alcohol in amounts that would not ordinarily affect driving ability" (Marquis, et. al., 1957, p. 710). The authors comment on another study that provides more general evidence for the absence of deleterious effects of meprobamate on normal functioning. In

this study, one half of a class of 276 students in a college psychology course were given 400 mg. of meprobamate prior to a mid-term examination while the other half received a placebo. "Performance on the examination was not impaired for those who received meprobamate; indeed, it was slightly better, as might be expected, since it is obvious that anxiety and apprehension interfere with efficiency on examinations" (Marquis, et. al., 1957, p. 710).

Reitan concludes that, with his normal subjects,[7] his results "indicated significantly better performances on placebo than on either drug [meprobamate and Ultran]" (Reitan, 1957, p. 163). This conclusion, plus the finding by Marquis and his co-workers concerning the increase in perspiration with meprobamate as compared with dextroamphetamine, 86-proof alcohol, and lactose, points up the need for controls in evaluating the effectiveness of ataractics.

Reitan's study reports impairment of function as a result of heavy doses of either Ultran or meprobamate. However, his excessive doses were, for each drug, four times the clinically recommended dosage. Marquis, et. al., did not report impairment of function with heavy doses of meprobamate, but Marquis did not exceed double the usual dosage in evaluating the effects of excessive medication.

In evaluating the effect of just more than clinically recommended doses, Reitan utilized sixteen female out-patients with a mean age of 57.00. Reitan fails to identify the nature of the disorders for which these out-patients were

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[7] Twelve physicians or medical students with a mean age of 27.83.

being treated. He states, however, that "These subjects were selected because medical examination showed minimal findings with relation to severity, extent, and persistence of the patients' complaints" (Reitan, 1957, p. 162). One may conclude, therefore, that these subjects were essentially normal except for minor physical complaints. Reitan's findings with this group are more in keeping with those of Marquis, et. al.: "The results. . . of this investigation show no differences on the psychologic test findings that might not easily be attributed to chance [when the subjects received just more than clinically recommended doses of meprobamate and Ultran]. The results suggest that there is no impairment of speed of fine movements (finger tapping), alertness, attention, and accuracy of visuomotor coordination (visual time sense), simple or discrimination reaction time, correctness of responses in timed discrimination reactions, and of more complex problem-solving situations. . . after clinical doses of Ultran or meprobamate" (Reitan, 1957, p. 162).[8]

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[8]Reitan utilized eight tests to evaluate the effect of the drugs. He describes these tests as follows:

"FINGER TAPPING TEST. Speed of tapping the index finger of the preferred hand, measured in five 10-second trials.

"VISUAL TIME SENSE TEST. The subject was required to depress a key, which permitted a sweep hand to rotate on the face of a timer directly before him. The subject's task was to permit the hand to rotate 10 times and then stop it as close to the starting position as possible. The test was scored as the total amount of error in 20 trials.

"VISUAL TIME SENSE TEST -- ACCURACY OF RESPONSE. Some of the subjects would inadvertently let the hand revolve 9 or 11 times on an occasional trial, thus introducing a great deal of additional variance in the measure. We were interested in the accuracy of response as well as whether the subject could sustain his concentrated attention sufficiently well to let the hand rotate exactly 10 times. Therefore, the result was also scored with respect to the amount by which the subject had missed stopping the hand exactly at the top of

The results of the experiments of both Marquis, et. al., and of Reitan indicate that doses of meprobamate as high as 800 mg., even in combination with alcohol, fail to produce any appreciable positive or negative effect upon performance in the various tests of function employed. The same was true, according to Reitan, when the dose of Ultran did not exceed 400 mg., four times a

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the clock, regardless of the number of times the hand had rotated.

"SIMPLE REACTION TIME. This measurement was obtained by instructing the subject to raise his finger from a key as quickly as possible upon seeing a light appear in a small, round window before him. The score was obtained in units of 1/100 seconds elapsing between the time of the stimulus and response in a total of 10 trials.

"DISCRIMINATION REACTION TIME. The subject was instructed to lift his finger from a key as quickly as possible when a green light appeared in a window before him but to refrain from lifting his finger if the light was red. A reaction time score was obtained in 1/100 second units in a total of 20 trials with the red and green lights randomly interspersed.

"DISCRIMINATION REACTION TIME -- FALSE RESPONSES. The number of errors, or responses to the red rather than only the green light, was also recorded on each series of trials.

"SPOKES TEST, PART A. In this test, 20 circles were arranged in a circular pattern (7 inches in diameter) with a starting point at the center. Each circle contained one number from 1 to 20. The position of each number was originally determined from a table of random numbers. The subject's task was to run his finger from the starting position to number 1 and back to the start, and so on until reaching number 20. The score was obtained by the time required to complete the task.

"SPOKES TEST, PART B. This test also consisted of 20 circles arranged in a circular pattern, but each circle contained a number or letter which was distributed randomly. The subject's task was to alternate between numbers and letters, proceeding with both the numerical and alphabetical series in order . . . The score was obtained by the time required to complete the task" (Reitan, 1957, pp. 163-164).

day.

Studies of the use of ataractic drugs with children ordinarily have to do with non-psychiatric populations. Of the research utilizing psychologic test data, the value of the ataractics with problems of mental retardation seems to have received the most attention. Ison (1958), for example, using state school patients, reported on the effect of chlorpromazine on Wechsler scores. Sixty-two such patients were used, this group being broken into control and experimental groups. Four categories of retardation were identified: familial, undifferentiated, brain-damaged, and mongoloid. The age range of each group was wide; 8-9 to 48 years for the experimental group and 10 to 42 years for the control group. Each group had 16 males and 15 females. The experimental method was as follows:

1. The Wechsler Adult Intelligence Scale or the Wechsler Intelligence Scale for Children was administered, whichever was appropriate.
2. Fifty mg. of chlorpromazine, bid., was administered to the experimental group for 31 days. The control group received identical appearing placebos.
3. The subject was re-examined with the appropriate intelligence test after 31 days.

Ison concludes that "In general, it can be said that the findings were not very positive. In the present sample the t-tests of only Digit Symbol and Comprehension even approached statistical significance. Digit Symbol reached the 1 per cent level of significance, while Comprehension reached the 5 per cent; however, it can be pointed out that there was a fairly uniform trend toward greater improvement on retest scores for the experimental group than for the

controls" (Ison, 1958, p. 546). Of interest are the author's comments on the brain-damaged group: "In the brain-damage group there appeared a more striking difference between the experimental and control groups' results. . . differences on both Information and Comprehension reached the 1 per cent level of confidence while the difference on the verbal IQ approached significance at the 5 per cent level" (Ison, 1958, p. 546). It should be pointed out, however, that 6 of the 11 subjects in the brain damage group were spastic cerebral palsies, and that the positive results reported by the author may have derived principally from the spastic group since he states: "It seems plausible that the relaxing qualities of Thorazine would be most marked among the brain-damaged, especially spastics" (Ison, 1958, p. 546). Denhoff and Holden's study reported comparable results with their group of cerebral palsied children, although they did not specify how many of their "improved" children manifested spastic cerebral palsy as opposed to athetoid cerebral palsy.

Bair and Herold (1955) administered chlorpromazine to ten subjects who "represented, in the opinion of the entire staff of the /Parsons State Training School, Parsons, Kansas/, the 10 most hyperactive students in the Training School. Their behavior was characterized by temper tantrums, boisterousness, fighting, overactive antics, and sometimes destructiveness to property" (Bair and Herold, 1955, pp. 363-364). A control group of ten subjects was matched to the experimental group for age, sex, and IQ, but not for behavior. The authors report a mean increase in IQ of 10.4 for the experimental group and 2.5 for the control group, using the Columbia Mental Maturity Scale, after the experimental group had received chlorpromazine for a period of sixty days. They conclude: "The differences between the mean increase in IQ in the two groups is

statistically significant at the 1% level of confidence. . . The rise in IQ of the experimental group was phenomenal. This increase may be attributed to the removal of severe emotional and nervous disorders that had prevented the students from functioning at their true level of mental ability" (Bair and Herold, 1955, p. 363). It should be pointed out that the authors failed to match the control group with the experimental group in terms of behavior. Their description of the behavior of the experimental group suggests the possibility that this group was comprised of subjects with some degree of organic brain damage. To evaluate the effects of the medication, it would seem that a control group presenting similar behavioral characteristics would have been desirable.

A study by Freed and Peifer (1956) is of interest to the present research for several reasons. First of all, three of the children used were diagnosed as having organic brain disease: "Twenty-five children, 20 male and 5 female, ranging in age from 7 to 15 years were treated from 4 to 16 months. While all were overactive and apparently emotionally distrubed, almost half were combative with their classmates or teachers. Five had not been allowed to return to school. From a diagnostic classification, 18 exhibited primary behavior disorders, 2 were classified as psychoneurotic, 2 as ambulatory schizophrenics, and 3 as reactive behavior disorders associated with organic brain disease" (Freed and Peifer, 1956, p. 22). Secondly, the use of an extensive battery of psychologic tests is reported: "Initially, a battery of psychological tests was given. It comprised the Wechsler Intelligence Scale for Children, Wide Range Achievement Test, Rorschach Test, Children's Apperception Tests [sic] or Symonds Picture Test, House-Tree-Person Test, Bender-Gestalt Test and, in some cases, the Vineland Social Maturity Test. This battery was repeated at the

termination of the reported period of observation" (Freed and Peifer, 1956, p. 22).[9] Finally, a comment on placebo is worth noting: "The responses to placebo medication were interesting in that five patients continued to maintain their improved status while on placebo. This raises the important question, 'To what extent can the positive response be attributed to the development of a therapeutic inter-personal relation resulting from kindly attention from a therapist, school counselor and, possibly, others in the child's environment'" (Freed and Peifer, 1956, p. 24). Also, "In five patients enuresis had been one of the complaints. Improvement in this symptom ranging from diminution to complete cessation was reported in each of the patients. No explanation is offered at this time. It is our impression that the improved mother-child relationship was a more potent mitigating factor than possible alterations in the autonomic innervations to the genito-urinary tract" (Freed and Peifer, 1956, p. 24).

Unfortunately, while an extensive battery of psychologic tests was administered in this study, the reports of results from these tests are meagre. The presentation of specific data along these lines occurs in the form of a case study, viz., the case of an eleven year old boy: "A comparison of the battery of psychological tests before and after. . . treatment is instructive. . . The IQs were the same -- 87. The memory spans, however, changed, showing

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[9]The use of projective techniques in the evaluation of an ataractic in this study is one of the rare instances where such psychologic test data is presented.

marked improvement. Before it was four digits forward and none in reverse. After, it was seven forward and three in reverse. Both Rorschach's [sic] showed him to be psychotic with the potential for uncontrolled and explosive behavior. P. responses increased from one to four and there was an absence of bizarre and uncontaminated responses present initially. Fk responses appearing in the second test would suggest development of awareness of his problem. The FM responses showed diminished hyperkinetic activity in this content. Finally, the Wide Range Achievement Test showed reading to be 1.4; spelling, 1.5; and arithmetic, 3.1; the previous readings all being at the baseline of 1.0" (Freed and Peifer, 1956, p. 23). The presentation of data in this case study leaves certain questions unanswered. First of all, the report of Fk does not seem altogether consistent with either chronological or presumed mental age. Secondly, the interpretation of this score would depend upon its relationship to other scores in the determinant continuum of the test. The appearance of Fk is not always, as implied in the above quotation, an "unmixed blessing," although in this case the authors' interpretation must be accepted since their interpretation presumably involves a consideration of other Rorschach variables. Of more questionable value is the report of change in memory span. While such a change obviously occurred, the method of presentation implies that the study means to point up only what is favorable as a probable result of the use of chlorpromazine in this illustrative case. By way of clarification, it is assumed that the child's chronological age was somewhere between 11 years, 0 months, and 11 years, 3 months at the time of the pre-medication test with the Wechsler Intelligence Scale for Children. This assumption is made since the authors do not report the child's exact age. Since his raw score on the Digit

Span sub-test is 4, his Scaled Score for the presumed age range is 2. Assuming that eleven sub-tests were administered to obtain an IQ of 87, the remaining sub-tests must have resulted in a mean Scaled Score of 8.0.[10] The report of this case indicates that the child received medication for eight months. On this basis, in terms of the assumption concerning his chronological age, he was between 11 years, 8 months and 11 years, 11 months chronologically at the time he was re-examined. His raw score on the Digit Span sub-test, following eight months of treatment with chlorpromazine, is 10 which results in a Scaled Score of 10. Again assuming that eleven sub-tests were administered, the remaining sub-test Scaled Scores must have resulted in a mean of 7.2 in order to result in an IQ of 87. The obvious question is, what were the results of the sub-tests other than Digit Span? At least one, and perhaps more than one, resulted in scores inferior to that obtained on the pre-medication examination. This factor, however, is not commented on in the case report.

The conclusions concerning psychologic test results in this study are as follows: "The comprehensive picture obtained from the study of the retest results outlined certain conclusions and suggested other trends in personality functioning: (1) The basic character picture remained the same, the same types of defenses were utilized, and the core conflicts persisted. (2) Although the intelligence quotients were significantly unchanged, there was usually evidence of improved intellectual functioning (increase in F responses, M. replaces FM

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[10]Cf. D. Wechsler, 1949, p. 26. Since the assumed Scaled Score for Digit Span is 2, the remaining ten sub-tests must total 80 to result in a Total Scaled Score of 82, which Scaled Score results in an IQ of 87.

responses). This had to be evaluated with an appreciation of the changes that can be expected in the normal intellectual growth of the child. . . Facilitation of the learning process is suggested by improvement in the Wide Range Achievement Test and in the memory spans. (4) There is a trend toward greater self-acceptance and an associated urging toward closer interpersonal relationships. (5) Trends were also noted in the strengthening of emotional controls both quantitatively and qualitatively, e.g., Rorschach responses scored as evidences of hostility were replaced by those indicating only agression, e.g., fighting cats were replaced by crawling cats" (Freed and Peifer, 1956, p. 23).

A final aspect of interest in this study is an apparent qualitative difference between reported changes in terms of psychologic test results and observed changes. Behaviorally, "Improvement in varying degrees was noted in 21 cases -- 84%, and was marked in 70%. Diminution in hyperactivity was the outstanding phenomenon. Combativeness was reduced considerably. There was definite improvement in willingness to learn" (Freed and Peifer, 1956, p. 25). On the other hand, the results of the psychologic tests are summarized as follows: "The psychological testing suggested that the learning process was facilitated. Trends toward increased emotional control were evidenced although the basic personality seemed unchanged" (Freed and Peifer, 1956, p. 25). While there is apparently no fundamental difference between behavioral report and interpretation of psychologic test results, the latter is seemingly more conservative than the former.

As to the psychopathology of organic brain damage in children, probably two authors are outstanding: Alfred Strauss and Lauretta Bender. Strauss, in conjunction with Laura Lehtinen and with Newell C. Kephart and other collabor-

ators, produced two volumes on the psychopathology and education of the brain-injured child (Strauss and Lehtinen, 1947; Strauss and Kephart, 1955). Bender (1956) in a book on the psychopathology of children with brain disorders, presents what amounts to a collection of articles she has previously published on this defect. Some of the chapters in this book, however, are published for the first time, while many of the previously published sections are revised and expanded.

For the most part, Bender seems concerned with the post-encephalitic child, while Strauss, although discussing etiology, tends to consider all children with organic brain damage as presenting certain symptoms regardless of etiology. In fact, Strauss tends to ignore such factors as location of damage, age at which damage occurred, and extent of damage. As to other authors on this subject, they incline toward the theories of Strauss and Bender. For example, Anderson (1956) tends to emulate Strauss in her discussion of behavioral symptomatology.

Strauss defines the brain-injured child as "a child who before, during, or after birth has received an injury to or suffered an infection of the brain" (Strauss and Lehtinen, 1947, p. 4). This definition seems to be sufficiently broad as to cover all possible infantile brain disorders with the possible exception of idiopathic epilepsy. As a consequence, Strauss' concepts of the basic behavioral disorders would seem to apply to any brain-damaged child regardless of etiology, time of injury, or location and extent of damage, except for the type of epilepsy noted above.

As to the behavioral disorders of the brain-injured child, Strauss emphasizes distractibility, disinhibition, intensity of response, and

perseveration, while postulating a visual-perceptual distrubance as the fundamental defect.

As to distractibility, ". . . definite structuring of the field in both the perceptual and conceptual areas is one of the difficulties which the brain-injured child experiences to a marked degree. He is unable to achieve such a structuring or to maintain it once he has achieved it. His field is primarily unstructured (all elements may be present, but there is no consistent relationship of parts to parts or of parts to whole) and, where he can achieve structuring, such structuring is labile and breaks down easily in spite of his efforts to hold it together. This lack of structure would have the effect of increasing the relative intensity of extraneous stimuli on the one hand, and of reducing the driving force of goal activity on the other hand. Under such conditions it would be expected that the individual would tend to respond to a variety of extraneous stimuli and lose track of the task at hand. We would describe such behavior as 'distractibility' . . . Such distractibility is extremely characteristic of the brain-injured child. It is often the most obvious of his difficulties. He finds it impossible to engage in any activity in a concentrated fashion but is always being led aside from the task at hand by stimuli which should remain extraneous but do not. . ." (Strauss and Kephart, 1955, p. 135).

Disinhibition is considered "akin to the problem of distractibility in the brain-injured child. . . This type of child makes responses which are not adequate to the situation and which the normal child does not make because he recognizes their inadequacy. Of course, those disinhibited responses which attract the most attention are those which are socially disapproved. The child,

irritated by the action of another, will hit him or throw something at him. . . After the incident is over he may be able to explain why he should not have behaved in this manner but at the time he has no such explanation available, and furthermore, in another similar situation, he will behave in the same manner even though he has shown himself to be aware, on the verbal level, of the inadequacy of his response" (Strauss and Kephart, 1955, p. 136).

Strauss points out that ". . . increased intensity of response is characteristic of the brain-injured child. Whatever overt activity he engages in is apt to be entered into with greater intensity than is the case in the normal child. His behavior appears driven in the sense that he expends more energy in its accomplishment than is normal. All of his activities are characterized by great intensity and a great expenditure of energy. . ." (Strauss and Kephart, 1955, p. 139). This description is essentially that of "catastrophic reaction," as previously expressed by Strauss, although apparently more temperate; viz., "Another behavior manifestation characteristic for brain-injured children should be mentioned. This is the 'catastrophic reaction,' a reaction which is similar to the one observed by Goldstein in brain-injured adults. . . Because of his hyperactivity and disinhibition, the brain-injured child appears to be elated; it is astonishing, as sometimes happens, to see him burst into explosive crying when confronted with a difficulty" (Strauss and Lehtinen, 1947, p. 84).

As to perseveration, ". . . in the brain-injured child this problem of changing rapidly from an evaluation of one set of relations to the evaluation of another set of relations is most difficult. He does not have the structuring available with which to deal with any given set of relations and finds it difficult to develop such a structuring in any one given situation. His difficulties

are, of course, greatly increased when we ask him to develop such structures in many different fields within a short period of time. Frequently, therefore, he is faced with a demand for response for which he has no structure available and for which he is not able in the time allowed to develop a structure. At the same time, response is demanded. How can he meet this difficulty? He responds on the basis of a structure which he has developed previously and which has remained largely intact ever since the response [sic] for which it was developed. He will, therefore, respond to the present stimulus with the response appropriate to the last stimulus or some former stimulus. We know this type of behavior as perseveration. The present response is appropriate to a previous stimulus and appears to be left over from the previous situation" (Strauss and Kephart, 1955, p. 140).

Anent the disorder in visual-perception, Strauss comments: "At the moment it would appear that the chief deficiency faced by the brain-injured child is his incapacity to see simultaneously. It seems probable that he always sees successions and only rarely can combine these into simultaneous impressions. One may consider, therefore, that forced responsiveness to stimuli, distractibility, foreground-background distrubances, perseverations and the like can be traced to this primary disturbance. . . It would appear that these difficulties are primarily a result of interference with the patterning activity of the brain, that they result from interference, not with specific functions, but with more generalized functions concerned with the development of patterns of excitation" (Strauss and Kephart, 1955, pp. 142-143).

In general, Bender's formulation of the behavior of the brain-damaged child is similar in many ways to that of Strauss. For instance, "There is another

kind of hyperkinesis in which a general restlessness prevails. This restlessness may be unpatterned, without any particular purpose. But there may also be continuous grasping and groping, taking objects and dropping them, running from one person to another, clinging to a person, pinching, pulling, breaking and tearing. We know this type of hyperkinesis pretty well from our experience with post-encephalitic children. This type of hyperkinesis is due to a lesion either of the striopallidal system or of the substantia nigra" (Bender, 1956, p. 38). Again, "The above cases illustrate some specific behavioral responses of brain-damaged children. One of these is the social factor and the inability to compete or identify with the normal children of their own age. The recognition that in some way they are different from most children their own age, and the consequent frustration may result in bewilderment and withdrawal and to aggressive outbursts directed against themselves or against the environment. There are also perceptual difficulties, spatial disorientation, and memory defect, all of which lead to learning problems, especially when competing with normal children in school" (Bender, 1956, pp. 103-104). Finally, "Children with brain pathology show the involved mechanisms in a clearer way. They most frequently show a general motor retardation often combined with impulse disturbances" (Bender, 1956, p. 24).

One of Struass' comments, however, seems to meet some disagreement in Bender's formulation. Strauss states: "It is important to point out that . . . we have been concerned only with those aspects of behavior which are <u>peculiar to the brain-injured child</u> and which appear to be <u>directly related</u> to his

damage" (Strauss and Kephart, 1955, p. 142).[11] The first point to be mentioned is that Strauss evidently means to imply that secondary emotional problems, while they do frequently occur in the brain-damaged child, have not been considered in his treatment of the subject. That such problems do exist, Bender certainly agrees with and devotes considerable attention to them in her book. It is, however, the idea that certain behavioral characteristics are peculiar to the brain-damaged child that does not seem to coincide with Bender's thinking; nor, in fact, that these behavioral characteristics are directly related to the damage. "The problem arises whether these disturbances [wide emotional outbursts, far-going withdrawals, seclusiveness, paranoid trends, hallucinations] . . . are the immediate expression of lesions in the brain. . . Generally speaking, modern psychology no longer believes that any symptomatology is the direct result of a defect" (Bender, 1956, pp. 43-44). As to the exclusiveness of symptomatology, Bender comments: ". . . children with various biological problems have a number of common psychological problems. These common problems may include: 1) difficulties in patterned behavior in impulse, motor, perceptual and integrative areas with a tendency to disorganization and

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[11] Italics mine.

regressed or retarded maturation. . ." (Bender, 1956, p. 123).[12]

Finally, Strauss tends to imply that his presentation of the behavioral syndrome of the brain-damaged child exhausts the possibilities in this area. One symptom in this constellation, that of hyperactivity, seems to be agreed upon by most authors despite some dispute as to its origin. The converse, hypoactivity, however, is considered a possible symptom of organic brain damage by both Bender and Anderson, apparently contrary to the formulation of Strauss. "Having said that hyperkinesis characterizes encephalitis, let us modify this statement by saying that the encephalitic child shows disturbances in the output and patterning of the impulses. Some children, rather than being hyperkinetic, are apathetic and may appear mentally defective. Other children show an alteration between these two extremes" (Bender, 1956, p. 129). Anderson states: "Early in the /brain-injured/ child's life, there may be either hypo or hyperactivity. Later. . . there seems to be hyperactivity. Not understanding what goes on, not being able to follow directions, not catching on, being forever

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[12] In fairness to Strauss, a subsequent comment of his should be noted: ". . . behavior may be observed in non-brain-injured children which closely approximates that described. . . although of other origin" (Strauss and Kephart, 1955, p. 142). Nonetheless, this statement infers that, while somehow like the behavior of the non-brain-injured in certain instances, the behavior of the brain-injured child is still sufficiently unique as to be peculiar to him. Also, Bender's concept of "various biological problems" should be mentioned "Our experiences have led us to include the following with the biological or organically determined behavior disorders: childhood schizophrenia, language or learning retardations or lags (including reading disabilities), motor lags (the so-called congenital cerebral palsies), the mental defects or congenital developmental deviations, epilepsies, inflammatory encephalitis (both virus and pyogenic), burn encephalopathies and traumatic encephalopathies (including birth injuries, prematurity and anoxias)" (Bender, 1956, p. 123). Not everyone would agree that all of these disorders are necessarily "organically determined," however.

on the outside, not being able to respond to the characteristic human emotions, not having imaginative capacity, and a hundred and one other handicaps would encourage irritability. There may also be some actual neurologic disturbance which enters the picture" (Anderson, 1956, p. 115).

Nontheless, despite possible contradictions among theoreticians concerning the behavior of the brain-injured child, there is fundamental agreement that the brain-damaged child presents problems of behavior of sufficient severity as to affect adversely his adjustment to society unless such problems can be ameliorated.

Two aspects of the research design for the present study warrant brief attention. The first is the use of a placebo with the control group; the second is a method very frequently associated with the use of placebo, the double-blind method.

Much attention has been focused on placebo-effects in recent literature. Of particular interest are those reports that consider the psychologic aspects of such research, among which are those of Fischer and Dlin (1956), and of Trouton (1957). Fischer and Dlin report on a group of seventy-five patients with psychosomatic symptoms. Part of this group received a pill depressing the function of the autonomic nervous system, another part received a placebo, and a third part received no medication. "All three groups received analytically-oriented psychotherapy. The identity of the potent pill and of the placebo was unknown to the investigators" (Fischer and Dlin, 1956, p. 511). Among the authors' conclusions are the following comments: "The pill group and the placebo group could not be differentiated by numbers of improved patients. The group receiving psychotherapy alone had the highest rate of improvement. Most

patients reacted emotionally to both pill and placebo....The 'potency' of the placebo is derived from, and is a part of the emotionally invested doctor-patient relationship. Its therapeutic ranges are the extremes of practical psychotherapy. Most patients did better in our hands without placebo therapy.. ..Specific indications for placebo therapy are not yet available, but placebo therapy should be an adjunct to psychotherapy. It is concluded that placebo therapy should be the secret of the therapist, that a substance conceivably influencing some somatic symptom be used as the placebo, and that placebo therapy be time-limited to periods of increased stress..." (Fischer and Dlin, 1956, pp. 511-512).

Trouton reviews various studies on the use of placebos, and then attempts to relate the findings of these studies to psychological theory. Among the studies he reviews, one of particular interest is a report attempting "to compare the personalities of those whose post-operative pain was consistently alleviated by saline injections with those whose pain was consistently unaffected thereby. The group studied consisted of 162 post-operative patients who had required morphine or a similar narcotic to be prescribed for their pain" (Trouton, 1957, p. 347). "...[P]sychological data on the consistent reactors and consistent non-reactors were obtained, by interviews, questionnaires filled in by nurses on surgical wards, the Wechsler-Bellevue vocabulary sub-test, and lastly (and according to some authorities, least) the Rorschach. The tests were all done at the end of the patients stay in hospital, and the interviews and questionnaire earlier in their stay" (Trouton, 1957, p. 347). "The Rorschach data differentiated the groups in certain ways. For instance, the reactors gave more responses, especially relating to 'insides.' They were also

considered on the basis of the Rorschach interpretation to be less mature and 'more dependent on outside stimulation than on their own mental processes' and, although more anxious and dependent than the non-reactors, they were less rigid and more able to cope with these drives" (Trouton, 1957, p. 348).[13]

In commenting on another study, Trouton mentions that those who react to placebos were found to be "...less likely to have a history of previous neurotic traits or to have a hysterical or inadequate personality, but more likely to have 'unelaborated anxiety'" (Trouton, 1957, p. 349).

In an article on the comparison of placebo with a short-term psychotherapy, Gliedman, Nash, Imber, Stone, and Frank (1958) came to conclusions in some ways similar to those reported in Trouton's review. First of all, Gliedman found that symptom reduction from placebo compares favorably with that obtained from short-term psychotherapy. He continues: "The results generally affirm the power of the placebo as described by Beecher. Further, they indicate that the symptoms which seem most susceptible to this approach are those which can be assumed under his heading of the 'reaction or processing component of suffering.' This is indicated by the preponderance of anxiety and depression in the reactor groups, as well as the greater tendency for psychic symptoms to show relief than for somatic ones. It seems clear that there is much validity for

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[13]Trouton, however, criticizes the value of the Rorschach, stating that "...the composite portrait of the placebo reactors and non-reactors based on it is...questionable. According to Eysenck...when 'used as a "global" test of Personality, subjectively interpreted and evaluated...it appears to be almost entirely useless, and the experimental studies of the test used in this fashion nearly always give negative results'...." (Trouton, 1957, p. 348).

the consideration of the reaction to illness as illness also.... Beecher suggests that this 'reaction phase' is very responsive to drug action in general and presumably represents the main site of activity for placebo" (Gliedman, et. al., 1958, p. 922).

The implications of the remarks of Trouton, of Gliedman, et. al., and, to a lesser extent, of Fischer and Dlin for the use of placebos in research are apparent. The possibility of a typical "placebo reactor," defined either in terms of basic personality or in terms of the type of stress undergone, would seem to have some bearing on research utilizing placebos; indeed, any research with the ataractic drugs using any method of investigation would seem to be affected by this possibility. Assuming a typical "placebo reactor" personality, or a typical stress situation that would elicit a "placebo reaction," any double-blind research study utilizing a placebo as a control would have to rule out such subjects as would react positively to placebo. Failure to do so would run the risk of over-loading one or the other or both research groups with such subjects. Under these circumstances, any positive or negative effect obtained in these studies would have to be viewed more critically than the results themselves might warrant. As to the present study, these remarks apply also since no attempt was made to identify and eliminate any possible "placebo reactors." Whether this vitiated the results obtained must, of course, remain fundamentally a moot question.[14]

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[14] An effort was made in the present study to identify "placebo reactors" in the control group utilizing as criteria the Rorschach data obtained and relating these data to the material contained in Trouton's report. Cf. Appendix VI.

As to the use of the double-blind technique, this method is currently widely used in research. Certain factors, however, mentioned by Tuteur (1958) are worthy of note. Referring to the use of the double-blind method in hospitalized patients, he comments: "A critical review of the so-called 'double-blind' study reveals pitfalls and inadequacies of this method of investigation which in the past has [sic] created an unwarranted security in many investigators. The 'worsening' of patients conditions while on placebos is demoralizing to patients and personnel and the ethics of such a procedure in a patient who is in dire need of active treatment can be questioned. It is imperative that the compound under investigation and the placebo have identical appearance and taste, since even the disturbed patients...are able to distinguish the two drugs by it [i.e., by the taste], thus jeopardizing the most carefully planned and conscientiously carried out project. Side effects occurring on the compound reveal the identity of the active and inert drug group" (Tuteur, 1958, p. 922). In the present study, the two most pertinent of Tuteur's criticisms are, first of all, the difference in taste between the drug and the placebo, thus possibly indicating to the subject that the pills are not the same, and, secondly, the signal from possible side-effects that the one pill is active and the other inactive. These two possibilities were obviated in the present study by having one group receive prochlorperazine and the other receive the placebo. Because of this it was less likely that the parent or the subject would know which of the pills was being taken by the taste alone; it was also less likely that side-effects would act as a signal that an active drug was being used in place of a previously or subsequently given placebo.

CHAPTER III

SUBJECTS AND PROCEDURE

Nineteen subjects were obtained from various sources[1] with a diagnosis of organic brain damage, either established or presumed. Children with epilepsy or cerebral palsy, and children under some current drug treatment for brain disorder were excluded. The reasons for these exclusions are, respectively: the ataractic drugs may precipitate convulsions in the epileptic;[2] the types

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[1]University of Illinois, Research and Education Hospitals; Lt. Joseph P. Kennedy, Jr., School for Exceptional Children; St. Luke's Hospital; Chicago Board of Education; and the Evanston Junior Women's League, Fund for Perceptually Handicapped Children.

[2]"The effect /of chlorpromazine/ in epilepsy is unpredictable. According to some observers it increases the frequency of episodes and aggravates associated disturbances. Others have seen the disappearance of grand mal and a return of the electroencephalogram to normal" (Bakwin, 1956, p. 246). "The effect of the medication itself must be borne in mind in evaluating the abnormality of the electroencephalogram following drug treatment. It has been shown, for example, that the barbiturates, Mesantoin, and, to a lesser degree, meprobamate, chlorpromazine and similar drugs, produce fast activity in the electroencephalogram which may be quite pronounced. Also such drugs in large amounts may increase slow activity or produce slow activity where it was not present before" (Chao, et. al., 1958, p. 117). "In all 21 epileptic patients the intramuscular injection of chlorpromazine hydrochloride increased the abnormal brain wave potentials and completely disorganized the record. The frequency of the slow wave discharges decreased and their amplitudes increased. These abnormalities lasted 50 to 90 minutes after the injection" (Denber and Merlis, 1956, p. 142). In this connection, it is interesting to note that "These tranquilizers /of the autonomic suppressant class, i.e., the phenothiazines, reserpine, and the diphenylmethanes/ lower the convulsive threshold to electroshock and to certain chemical convulsants. . ." (Berger, 1957, p. 696).

of psychologic tests used in this study could not be readily employed with the cerebral palsied child; and, finally, it would be obviously impossible to include children receiving both another ataractic and prochlorperazine.[3]

Of the nineteen subjects obtained, sixteen were male and three were female. The mean age of the group was 9.61 years with an age range of 6.00 - 12.75 and a standard deviation of 1.97. Each subject was randomly assigned to one of two groups, the experimental group receiving prochlorperazine in tablet form and the control group receiving an identical appearing placebo.[4] Nine children were thus assigned to the experimental group and ten were assigned to the control group. No effort was made to match the two groups for such variables as age, sex, intelligence, or socio-economic status. However, only children between the ages of 6.00 and 12.99 were used in the study.[5]

The administration of the drug and the placebo was fixed. Each child began with one tablet a day for three days, followed by two tablets per day for seven days and by three tablets per day for the remaining twenty-one days. Each child received, therefore, a total of eighty tablets in a period of thirty-one days. The prochlorperazine was in 5 mg. per tablet form. The gradual

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[3]Such limitations radically reduced the number of children available for this study.

[4]Both the prochlorperazine and the matching placebo were supplied by the Smith, Kline and French Laboratories, Phila., Penn.

[5]The mean age of the experimental group was 10.08 years with a range of 6.00 - 12.75 and a standard deviation of 2.25. The mean age of the control group was 9.10 with a range of 7.00 - 11.67 and a standard deviation of 1.56.

increase in dosage was designed to avoid possible adverse side-effects from the drug. The dosage was held constant for the experimental group regardless of age, weight, or severity of symptoms. This was done largely because of the recent development of prochlorperazine, and the recommendations of the Smith, Kline and French Laboratories were followed.[6] Another factor influencing this decision was the lack of close supervision available during the period of medication.

Prochlorperazine is described as "a high phenothiazine derivative with a profound effect on the higher neural centers in the general area of the diencephalon, selectively inhibiting the chemoreceptor trigger zone, the hypothalamus and the reticular substance" (S.K.F. Products, Prices, Terms,

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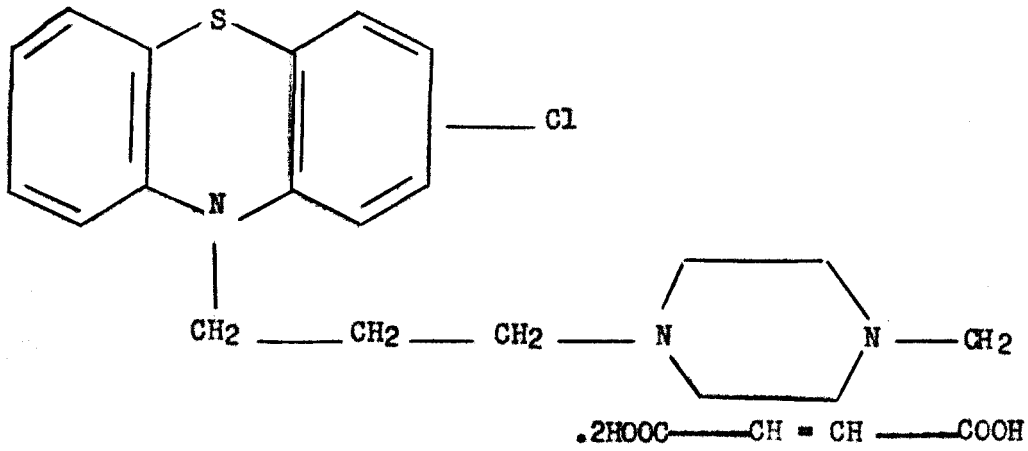
[6]The Smith, Kline and French handbook recommends that for children between 6 and 12 years of age who are being treated with Compazine tablets for behavior disorders, "the starting dosages. . . should not exceed a total initial dose of 10 mg. daily." Further, for children 6 to 12 years of age, the total "daily dosage should not exceed 25 mg" (S.K.F. Products, Prices, Terms, Descriptions, 1958). Other studies report considerably higher dosages, however, e.g., Allen (1957), in reporting on the use of prochlorperazine with twenty-three female mental defectives "most [of whom] were between the ages of 10 and 12 years," states that none received "over 25mg., t.i.d." within the two month period of the study (Allen, 1957, p. 19). It should be pointed out, however, that Allen's group was institutionalized, and therefore presumably under close medical supervision. For the purposes of this study, the comment of Jabour, et. al., is pertinent: "Our experience with prochlorperazine. . . demonstrated the difficulties involved in establishing safe dosages for children" (Jabour, Sheffield, and Montalvo, 1958, p. 98).

Descriptions, 1958, p. 13). Its chemical name is "2 - chloro - 10 (3 - [1 - methyl - 4 - piperazinyl] - propyl) - phenothiazine" (Jordan, 1958, p. 269), and its chemical structure is as follows:



The study was double-blind. Neither the parents nor the psychologist knew whether the child was receiving prochlorperazine or placebo. Further, the consulting neurologist, after completing his examination and determining that no contraindications to the use of the medication existed, simply indicated to his secretary that the child could be included in the study. The secretary then selected either the medication or the placebo. Records as to which subject received which type of tablet were kept by the secretary. In this way, a possible selective factor was obviated, i.e., the possibility that the neurologist, because of his profession, might tend to prescribe prochlorperazine for those children he felt might more likely benefit.

The possibility of alternating the subjects on the placebo and the medication was considered but rejected in view of the lack of knowledge concerning the carry-over effects of prochlorperazine. However, five such children were so alternated, three from the control group and two from the experimental

group. The results from this group are contained in Appendix V.

Before the administration of the drug and on the day of its termination, a battery of psychologic tests was administered to each child: the Wechsler Intelligence Scale for Children, the Rorschach Ink Blot Test, and the Raven Progressive Matrices, Form 1938. In addition, the parent (s) was interviewed on the day of termination to determine what, if any, change in the child's behavior they had observed, i.e., whether in the parent's opinion the child had improved, remained the same, or gotten worse.

The Wechsler Intelligence Scale for Children was selected because it provides discrete scores on a variety of tasks, each of which can be treated as a continuous ordinal measure. The Verbal Scale, Performance Scale, and Full Scale IQs obtained from this test may also be treated in this fashion.

The Rorschach Ink Blot Test was selected to provide information regarding possible changes in personality organization following a therapeutic approach. It was assumed that those behavioral characteristics of the brain-damaged child as have been suggested in the literature may be reflected in the Rorschach results, and that any alteration in personality structure resulting from the proposed treatment may also be reflected.

The Raven Progressive Matrices was selected as an additional measure of intelligence, but one that would not require verbal or linguistic skill on the part of the subject. Also, this test is more dependent upon skills associated with visual function than is true in the Wechsler Intelligence Scale for Children. Since a defect in visual perception is emphasized by certain authors as characteristic of the brain-damaged child, the results obtained with the Raven in comparison with those obtained with the Wechsler were assumed to be of pos-

sible value.

The Form 1938 of the Raven Progressive Matrices was selected in preference to the Form 1947 since norms for all ages in both groups were available in the former, while the latter contains norms only to 11 years of age.

The Mann-Whitney U Test was selected to evaluate the obtained differences on the various sub-test scaled scores for each child on the Wechsler Intelligence Scale for Children, and to determine whether the differences were significantly different for one of the groups.[7] The Verbal Scale, Performance Scale, and Full Scale IQs of this test were similarly treated. Specifically, the scaled scores for each of the sub-tests and for the scale IQs for the Wechsler Intelligence Scale for Children were computed for each child for both groups for the test and re-test examinations. The degree of increase or decrease in sub-test scaled score and in the scale IQs for each child was then ascertained. These results were then evaluated by means of the Mann-Whitney U

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[7] When at least ordinal measurement has been achieved, the Mann-Whitney U Test may be used to test whether two independent groups have been drawn from the same population" (Siegel, 1956, p. 116). The formulae for computing U and z are as follows:

$$U = n_1 n_2 + \frac{n_1 (n_1 + 1)}{2} - R_1$$

$$z = U - \frac{n_1 n_2}{2} \Big/ \sqrt{\left(\frac{n_1 n_2}{N(N-1)}\right)\left(\frac{N^3 - N}{12} - \Sigma T\right)}$$

where n_1 = the number of cases in the smaller of two independent groups; n_2 = the number of cases in the larger; R_1 = the sum of the ranks assigned to the group whose sample size is n_1; $N = n_1 + n_2$; T = the number of observations tied for a given rank = $t - t/12$. (Cf. Siegel, 1956, pp. 116-127).

Test. This statistical procedure was selected since the two groups were independent and since the Mann-Whitney U Test "is one of the most powerful of the nonparametric tests" (Siegel, 1956, p. 116).

Chi-square was utilized to evaluate the results of the Rorschach Ink Blot Test and the parental report of behavioral change.[8]

The Mann-Whitney U Test was also used to evaluate the results of the Raven Progressive Matrices which was administered individually in both test sessions. Many of the results obtained with this test, however, fell below the reported percentile norms for the child's age. Also, an accurate percentile rank could be obtained only by interpolation for many of those subjects whose raw score was above the lower limits for his age (Raven, 1938). For these reasons, it was decided to treat only the raw score data obtained from the Raven. A similar technique with the results of the Revised Stanford-Binet Intelligence

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[8] "To test the significance of a difference between two groups, the best procedure is to make a cut at some suitable score, and compare the number of cases in each group falling beyond the cut, using chi-square" (Cronbach, 1949, p. 406). Cronbach also states: "Chi-square is generally useful for small samples, but it is important to apply corrections when the number of cases is below 50. This is especially important when the expected frequency in any cell of a 2 x 2 table is five or lower, under the null hypothesis. In applying chi-square to the 2 x 2 tables, one should as a standard practice apply Yates correction." (Cronbach, 1949, p. 397). Since, in the present study, the Rorschach results were evaluated by means of ascertaining post-treatment changes in the various scoring categories as compared with pre-treatment results, 3 x 2 tables for chi-square became necessary to take account of those subjects whose scores did not change. Accordingly, the formula for chi-square used in the present study incorporates Yates correction for continuity as follows:

$$X^2 = \sum_{l=1}^{r} \sum_{j=1}^{k} (O_{ij} - E_{ij} - 1)^2 / E$$

(Cf. Siegel, 1956., p. 64 and p. 104

Scale, Form L, is reported by O'Brien (1953).[9]

Before proceeding to a consideration of the results of this study, the data obtained from the initial examination of the subjects will be considered briefly.

While, as pointed out previously, no attempt was made to match the groups for intelligence, Table I indicates a close similarity between the groups in this respect in terms of the results obtained in the initial examination. This is particularly true of the Full Scale IQ obtained from the Wechsler Intelligence Scale for Children.

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[9] "It was possible, however, to convert all of the intelligence test scores to month values. . ." (O'Brien, 1953, p. 113). Because it was not possible to compute a mental age for the children used in O'Brien's study, the author assigned scores on the basis of the total number of months successfully completed by each child on the Revised Stanford-Binet Intelligence Scale, Form L.

TABLE 1

Initial Examination:

WISC[a] Results

Group	WISC Scale	Mean	S.D.
Compazine[b]	Verbal Scale	67.33	18.29
	Performance Scale	63.22	17.60
	Full Scale	62.55	17.02
Placebo[c]	Verbal Scale	63.10	11.15
	Performance Scale	68.90	16.28
	Full Scale	63.00	15.02
Compazine-Placebo Combined	Verbal Scale	65.16	13.97
	Performance Scale	66.21	17.15
	Full Scale	62.79	14.38

[a]Wechsler Intelligence Scale for Children

[b]Experimental Group

[c]Control Group

There is, however, a difference in the Verbal Scale and Performance Scale IQs obtained from the two groups, the experimental group obtaining a higher mean score on the Verbal Scale than the control group, and the latter obtaining a higher mean score on the Performance Scale. The question therefore was raised as to whether the two groups had been drawn from the same population. Therefore, an analysis of variance, utilizing the method outlined by Kogan (1948

was applied to the Verbal and Performance results for the two groups. The results of the analysis are contained in Table II.

TABLE II

Analysis of Variance for Verbal and Performance Scale IQs of the WISC for the Experimental and the Control Groups

Source of Variation	Sum of Squares	df	Variance Estimate (V)
Between Groups (G)	4.94	1	4.94
Between Tests (T)	11.60	1	11.60
G x T Interaction (GT)	232.65	1	232.65
Among Subjects (S)	9694.11	18	538.56
Intra-subject (I)	8991.37	16	561.96

The estimate of variance based on G x T interaction is considerably smaller than either the estimate derived from inter-subject variability or that derived from intra-subject variability.[10] It is reasonable to infer that there is no difference between the results of the two groups on either the Verbal or the Performance Scales of the Wechsler. Moreover, the analysis gave no reason to suspect that the two groups came from different populations with respect to

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[10] $V_{GT}/V_S = .43$

$V_{GT}/V_I = .42$

either of the two scales.[11]

In terms of mean raw score related to mean chronological age for each group, the Raven Progressive Matrices yielded no apparent difference between the two groups, as may be seen by inspection of Table III.

TABLE III

Initial Examination:
Raven Results
(Raw Score)

	Mean	S.D.
Compazine	13.8	2.57
Placebo	14.5	3.17
Combined	14.2	2.93

It should be noted, however, that the percentile rank for both the experimental and the control groups is between 10 and 25.[12] This rank is superior to the percentile rank correspondent to the mean Full Scale IQs for each group on the Wechsler Intelligence Scale for Children. Each Full Scale mean IQ for the two groups on the WISC falls below the first percentile.[13] The difference

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[11] $V_G/V_{GT} = .008$

[12] Percentile rank was computed by relating mean raw score to mean age for each group. It was not possible to compute mean percentile rank by the usual method of $\Sigma X/N$ since accurate percentile ranks were not available for the majority of subjects, as noted previously.

[13] Cf. D. Wechsler, 1949, p. 15.

in percentile ranks, however, may be understood as relating to the degree of chance success possible on each of the two tests. It was noted that on the Raven Progressive Matrices many of the subjects obviously guessed and that not infrequently a given subject would select the same spatially located multiple-choice solution for several successive figures. This possibility of chance success is apparently more of a factor in the Raven than in the WISC. It was decided, however, to retain the obvious chance successes obtained on the Raven for two reasons: (a.) it was not always possible to determine exactly when a subject was guessing, and (b.) it was assumed that the number of chance successes would offset one another in the two groups so that a comparison of change following the experimental period was still possible.

Nonetheless, the classification of intelligence for the subjects in the two groups on the basis of the means for the two tests of intelligence remains essentially at variance. The mean IQs for the two groups on the Wechsler Intelligence Scale for Children fall in the classification of mental deficiency, while the percentile ranks for the two groups on the Raven Progressive Matrices results in each case in a Grade IV- classification, i.e., "'definitely below average in intellectual capacity.'"[14]

The Rorschach Ink Blot Test was scored according to the method outlined by Klopfer and Kelley (1942). The results obtained for the two groups on the initial test are presented in Tables IV, V, VI, and VII.

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[14] A Grade V classification is described as "'intellectually defective,'" a description comparable to the classification of the two groups obtained from the WISC. Cf. Raven, 1938, p. 9.

TABLE IV

Initial Examination:
Rorschach Location
Categories

Location	Compazine		Placebo		Combined	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
W	8.33	2.00	7.80	2.93	8.05	2.54
D	1.89	1.66	2.10	1.76	2.00	1.73
d			.30*	.90	.16*	.77
Dd	.11*	.32	.40*	1.20	.26	.91
S			.10*	.30	.05*	.22

*Indicates that the mean is based upon the results of one subject.

TABLE V

Initial Examination:
Rorschach Determin-
ent Categories

Determinants	Compazine		Placebo		Combined	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
M	.22	.41	.50	.81	.37	.66
FM	1.78	1.23	1.00	1.61	1.37	1.51
m	.22*	.41	.20*	.60	.21	.52
F	5.33	2.08	7.70	2.54	6.58	2.62
C'	.78	1.32	.10*	.30	.42	1.11
FC	.22	.63	.20	.40	.21	.52
CF	1.11	1.21	.80	.98	.95	1.10
C	.78	1.03	.20*	.30	.47	.88

*Indicates that the mean is based upon the results of one subject.

TABLE VI

Initial Examination:
Rorschach Content
Categories

Content	Compazine		Placebo		Combined	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
H	1.00	1.00	.80	1.08	.89	1.07
Hd	.11*	.32	.90	1.76	.53	1.31
A	4.78	2.35	5.20	3.82	5.00	3.22
Ad			.40	.92	.21	.69
Aojb	.11*	.32			.05*	.22
At	.11*	.32	.30	.64	.21	.52
Obj	1.11	1.21	1.20	1.89	1.16	1.60
Pl	.44	.95	.30	.46	.37	.75
N	.44	.95			.21	.69
Geo			.10*	.30	.05*	.22
Art and Des	.11*	.32			.05*	.22
Clouds	.33	.47	.80*	2.40	.58	1.79
Fire	.11*	.32	.20*	.32	.16	.48
Abstract			.20*	.32	.11*	.45
Food	.22*	.63	.30*	.90	.26	.68
Card Des	1.44	2.83			.68	1.07
Wood	.11*	.32			.05*	.22

*Indicates that the mean is based upon the results of one subject.

TABLE VII

Initial Examination: F%
Sum C, A%, Total R,
and P Scores
for the
Rorschach

	Compazine		Placebo		Combined	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
F%	51.56	18.86	73.20	24.29	62.95	24.49
Sum C	2.39	2.03	1.20	1.19	1.76	1.75
A%	46.23	21.59	51.90	31.40	49.26	26.75
Total R	10.33	.82	10.70	1.68	10.50	1.35
P	1.89	1.28	1.00	.89	1.42	1.18

In terms of differences between means, the two groups differ most markedly in F and to a lesser extent in sum C. In the case of F, the difference is in favor of the control group, while, conversely, the difference in sum C is in favor of the experimental group. The difference between the groups in mean F is significant, as is the difference for mean F%, presumably.[15] However, since thirty-three tests of significance of difference between means were possible, including total R, P, and sum C in addition to location, determinant and content

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[15]It is presumed that the difference in mean F% is also significant since mean R for both groups are comparable and the S.D.s for each group are small for R.

The CR for the difference between means for F is 2.85 which results in a p between .02 and .01 where df = 17.

The CR for the difference between means for sum C is 1.49 which results in a p between .10 and .05 where df = 17.

categories, but excluding categories based on percentages, one may expect that in terms of probability a certain number of mean differences would be significant.[16] Furthermore, in Rorschach scoring method, a difference in one scoring category would lead one to expect possible differences in other categories since, for example, a reduced F would tend to be compensated by an increase in some other determinant category.

However, the implication from the Rorschach that the experimental group is characterized by increased emotional lability and decreased intellectual control of affect as compared with the control group is interesting.

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[16] Where 33 tests of significance are made and where the significance level is set at .05, chance probability for one significant difference to occur would be greater than .50. (Cf. Sakoda, Cohen, and Beall, 1954, 172-175).

CHAPTER IV

RESULTS

The post-treatment administration of the Wechsler Intelligence Scale for Children resulted in a mean Full Scale IQ of 65.33 with a standard deviation of 20.35 for the experimental group, and a mean Full Scale IQ of 66.00 with a standard deviation of 12.54 for the control group.[1] The Verbal Scale of the WISC resulted in a mean of 68.00 for the experimental group, and a mean of 65.40 for the control group, with standard deviations of 18.41 and 11.31 respectively. The Performance Scale resulted in means of 67.33 and 74.50 for the experimental and control groups respectively, with corresponding standard deviations of 21.17 and 17.61. As compared with pre-treatment results, each scale for both groups resulted in increased IQs; however, the experimental group manifests greater dispersion in the Performance and Full Scale results as indicated by the standard deviations, while the control groups standard deviation for the Full Scale decreased.

The data obtained from the Mann-Whitney U Test applied to the results obtained on the WISC are contained in Tables VIII and IX.

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[1] The results of the WISC for each child for each sub-test and the the Scale IQs together with the respective means and standard deviations are contained in Appendix I.

Table VIII shows the mean change in IQs for the Verbal, Performance, and Full Scales of the WISC. In addition to the fact that both groups manifested positive changes on all scale IQ results, as previously mentioned, it will be noted that the control group obtained consistently larger gains than the

TABLE VIII

Mean Changes and Results of the Mann-Whitney U Test for the Scale IQs of the WISC

Wechsler Scale	Mean Change Compazine	Placebo	U	z	p[a]
Verbal Scale	+ .67	+ 2.30	27.5	1.45	.15
Performance Scale	+ 4.11	+ 5.60	41.0	.33	.74
Full Scale	+ 2.78	+ 3.60	41.5	.29	.77

[a]Since no directional hypothesis was formulated for the present study, all reported probabilities associated with z are for two-tailed tests.

experimental group. This is particularly true with respect to the Verbal Scale results. The U values are, of course, in favor of the control groups. The values for z, however, do not result in probabilities that can be considered significant.

With respect to the data obtained on the sub-tests of the WISC, Table IX indicates that of twenty-two possible changes in sub-test mean, fifteen are in a positive direction, as opposed to six in a negative direction and one that

resulted in no change.[2] Of the positive changes, eight were obtained by the experimental group and seven by the control group. On the sub-tests comprising the Performance Scale of the WISC, the control group manifested positive changes on all five subtests; the control group, on the other hand, gained in mean sub-test score on three Performance Scale sub-tests.

Table IX shows the mean change in weighted scores for both groups for each sub-test of the WISC, together with the values obtained for U and z, and the probabilities associated with z. The differences in gain with respect to the Picture Completion and Coding sub-tests are the only ones that can reasonably be considered significant. In Picture Completion, the mean gain in weighted score for the experimental group is +1.33, as compared with a mean loss for the control of -.20. This difference, evaluated by means of the Mann-Whitney U Test, results in a z of 2.26 and a p of .02. It may be concluded from these data that the two groups are not drawn from the same population. The Coding sub-test resulted in a mean gain of +.44 for the experimental group, and a mean gain of +1.60 for the control group. This difference results in a z of 1.93 and a p of .05. Again, the conclusion that the two groups are not drawn from the same population in terms of these data seems warranted. From these results, it would seem that the experimental group improved significantly on the Picture Completion sub-test following medication, as compared with the control group. With respect to the coding sub-test, however, the converse appears true, i.e.,

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[2]As pointed out in Chapter III, changes in WISC results are on the basis of differences between pre- and post-experimental means. In Tables VIII and IX, + values indicate an increase in mean in post-experimental results; - values refer to a decrease in mean.

TABLE IX

Mean Changes in Weighted Score and Results of the Mann-Whitney U Test for the Sub-tests of the WISC

Wechsler Sub-test	Mean Change Compazine	Mean Change Placebo	U	z	p
Information	+ .22	+ .10	41.0	.35	.73
Comprehension	- .33	- .10	36.0	.79	.43
Arithmetic	+ .22	- .40	37.5	.64	.52
Similarities	+ .67	+1.00	43.0	.17	.87
Vocabulary	- .33	+ .10	38.5	.56	.57
Digit Span	- .11	+1.20	32.0	1.21	.23
Picture Completion	+1.33	- .20	19.5	2.26	.02
Picture Arrangement	+ .67	+1.30	38.5	.56	.58
Block Design	+ .67	+1.90	29.0	1.34	.18
Object Assembly	+1.00	.00	26.0	1.66	.10
Coding	+ .44	+1.60	22.5	1.93	.05

the improvement in the control group was significantly greater in this sub-test than that in the experimental group.

The Mann-Whitney U Test was also applied to the results obtained on the Raven Progressive Matrices. As indicated previously, only the raw score data

from this test were utilized.[3] The experimental group obtained a mean change of -1.67 in raw score on the Raven, while the control group obtained a mean change of +.50. The resulting U of 31.5 favors the control group. The corresponding value of z is 1.12 with an associated probability of .26. The probability associated with a z this size cannot be considered significant.

The means and ranges obtained for each group in the post-treatment Rorschach are contained in Tables X, XI, and XII.[4]

As may be seen from these tables, compared with the data reported in Tables IV, V, and VI, the relationships among the various scoring categories remain essentially the same for both groups. Certain shifts do occur, as, for example, the replacement of the unusual detail by white space in the experimental group. By and large, however, the relationships obtained in the pre-treatment examination continue unchanged. For example, mean F for each group increases, but the control continues to manifest a higher mean F than the experimental group. In fact, the mean F obtained by the control group shows a greater increase in this category than the increase obtained by the experimental group. As to sum C, both groups decrease in mean in this category by about the same amount, the experimental group continuing to manifest a higher mean sum C than the control group. The obtained mean values for sum C in the

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[3]The mean raw scores and standard deviations together with percentile ranks for both pre- and post-treatment examinations with the Raven are reported in Appendix II.

[4]The results of the Rorschach for each child for location, determinant, and content categories for pre- and post-treatment examinations are contained in Appendix III.

TABLE X

Means and Ranges for Post-Treatment Rorschach Location Categories

Category	Compazine		Placebo	
	Mean	Range	Mean	Range
W	7.44	3-11	6.90	2-10
D	3.22	0- 9	4.60	0-10
d			.40	0- 2
Dd			1.30	0- 9
S	.11	0- 1	.20	0- 1

TABLE XI

Means and Ranges for Post-Treatment Rorschach Determinant Categories

Category	Compazine		Placebo	
	Mean	Range	Mean	Range
M	.11	0-1	.50	0-2
FM	1.78	0-4	1.10	0-4
m	.22	0-1		
F	5.44	1-8	10.60	6-23
C'	1.11	0-8	.20	0-1
FC	.22	0-1	.30	0-1
CF	.67	0-2		
C	.89	0-2	.60	0-3

TABLE XII

Means and Ranges for Post-Treatment Rorschach Content Categories

Category	Compazine		Placebo	
	Mean	Range	Mean	Range
H	.56	0-2	.80	0-2
Hd			1.50	0-11
A	5.78	1-10	6.70	0-11
Ad	.11	0-1	.40	0-2
At			.40	0-2
Obj	1.22	0-5	.80	0-4
Pl	.56	0-3	.30	0-2
N	.11	0-1	.50	0-3
Geo			.20	0-2
Archit.			.10	0-1
Cl.	.22	0-1	1.00	0-9
Fire	.22	0-1	.30	0-3
Food	.22	0-2		
Card Des.	1.56	0-9	.50	0-3

post-treatment examination are 2.22 for the experimental group and 1.05 for the control group with ranges 0.0 - 5.0 and 0.0 - 4.5 respectively.

In the area of content, probably the most noteworthy change is in the number of content categories used by each group. While Table VI indicates that the experimental group utilized fourteen content categories in the pre-treatment

examination as compared with the control group's use of twelve, Table XII indicates that the experimental group decreased in number of content categories used to ten, while the control group increased to a total of thirteen.

As to the significance of the various changes obtained with the Rorschach, these were evaluated by means of chi-square. The results are contained in Tables XIII, XIV, XV, and XVI.

Table XIII indicates the number in each group who increased, decreased, or did not change for each location category for each of the two groups, together with the obtained chi-square.[5] As may be seen from inspection of this table, none of the obtained chi-squares can be considered significant.

TABLE XIII

Comparison of Frequencies of Change in Rorschach Location Categories

Category	Frequency						X^2
	Compazine			Placebo			
	+	-	NC[a]	+	-	NC	
W%	2	5	2	1	7	2	1.06
D%	5	2	2	7	1	2	1.06
d%	0	0	9	1	1	8	.20
Dd%	1	1	7	5	0	5	1.46
S%	1	0	8	1	0	9	1.83[b]

[a]NC = did not change.

[b]indicates that df = 1.

[5]For the .05 level of significance, when df = 2, $X^2 = 5.99$; when df = 1, $X^2 = 3.84$.

TABLE XIV

Comparison of Frequencies of Change in Rorschach Determinant Categories

Category	Frequency Compazine			Placebo			X^2
	+	-	NC	+	-	NC	
M	1	2	6	1	1	8	1.89
FM	3	3	3	3	3	4	1.14
m	2	0	7	0	1	9	1.05
F	3	4	2	6	3	1	.31
C'	3	2	4	1	0	9	.47
FC	2	1	6	1	0	9	1.21
CF	1	4	4	0	6	4	1.36
C	3	1	5	2	0	8	1.15

The results of chi-square for the determinant categories are contained in Table XIV. The change in frequency for each of the determinant categories is presented. Again, none of the obtained chi-squares is significant.

Table XV contains the obtained frequencies for changes in content categories and the associated chi-squares, none of which may be considered significant.

Table XVI contains a tabulation of data obtained for categories of the Rorschach that cannot be subsumed under the location, determinant, or content classifications. Some of these categories are common Rorschach scoring procedures; others resulted from combining certain scoring categories. However,

TABLE XV

Comparison of Frequencies of Change in Rorschach Content Categories

Category	Frequency Compazine			Placebo			X^2
	+	-	NC	+	-	NC	
H	0	2	7	1	2	7	1.86
Hd	0	1	8	3	1	6	1.89
A	5	2	2	7	1	2	1.06
Ad	1	0	8	1	2	7	1.66
Aobj	0	1	8	0	0	10	1.06*
At	0	1	9	2	1	7	1.66
Obj	2	2	5	4	2	4	.90
Pl	1	1	7	1	2	7	2.17
N	0	2	7	2	0	8	.25
Geo	0	0	9	1	0	9	1.06*
Art & Des	0	1	8	0	0	10	1.06*
Archit.	0	0	9	1	0	9	1.06*
Clouds	0	1	8	2	0	8	1.13
Fire	1	0	8	1	0	9	1.83*
Abstract	0	0	9	0	1	9	1.06*
Food	0	0	9	0	1	9	1.06*
Card Des	2	1	6	2	0	8	1.86
Wood	0	1	8	0	0	10	1.06*

*indicates that df = 1.

TABLE XVI

Comparison of Frequencies of Change in Rorschach Special Categories

Category	Frequency Compazine			Placebo			X^2
	+	-	NC	+	-	NC	
sum C	4	4	1	3	4	3	.38
M:sum C	4	2	3	3	5	2	.23
M+FM/R%	4	4	1	4	2	4	.47
m(m add)	1	3	5	0	2	8	1.15
F%	3	4	2	3	6	1	.68
A%	6	3	0	6	2	2	.32
No. Content Categ.	0	3	6	5	2	3	1.90
P	2	3	4	4	4	2	.33
Total R	2	3	4	6	0	4	1.11
Reaction Time	0	9	0	4	6	0	.22*

*indicates that df = 1.

certain of these categories require explanation. Change in M : sum C was based on the following interpretation of this ratio: If, following the experimental period, sum C had either become dominant over M, or had increased in dominance over M, the result was considered as an increase in sum C and recorded in the + column of the frequency tabulation. The converse was considered a decrease in sum C and entered in the - column. The classification, "No. Content Categ.," refers to an increase or decrease in the number of content categories utilized.

The entry, "m(m add)," refers to a combination of both main m scores and additional m scores into a single total.

The chi-squares obtained for changes in frequency for each of the classifications in Table XVI, however, cannot be considered significant.

As to reports of behavioral change, it was initially determined to avoid discussion with the parent(s) of the specific behavioral patterns of the children in the experiment. It was assumed that such a discussion might have a suggestive effect on certain of the parents, and that reports of changes in behavior following the treatment period might be biased as a result. The only discussion of behavior, therefore, occurred during an interview with the parent(s) on the day treatment for the child was terminated and after the post-treatment psychologic examination had been completed. During this interview, an effort was made to elicit information regarding behavioral changes. However, a scrupulous effort to avoid leading questions was made and a spontaneous report of behavioral change was sought. In every instance, this attempt seemed successful, the parental comments regarding behavior seemingly resulting from self-initiated reports rather than solicited ones.[6] These parental comments were classified as reflecting either improvement, lack of any change, or worsening of behavior.

Of the nine children in the experimental group, seven were reported in such a way as to consider their behavior improved from the standpoint of parental observation. One manifested no change, and one was considered to have

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[6]Parental reports of behavioral change are quoted in Appendix IV for each subject.

gotten worse. Of the ten children in the control group, five were reported as improved and five as unchanged. Applying chi-square to these reports, the resulting value for chi-square using a 3 x 2 table is 1.46. With df = 2, the p associated with a chi-square this size is between .50 and .30. Since it is reasonable to consider the one subject manifesting a deterioration in behavior as unimproved, a chi-square using a 2 x 2 table is possible.[7] The resulting chi-square is .45. With df = 1, the associated p is again between .50 and .30. The chi-squares obtained with either a 3 x 2 or a 2 x 2 table cannot be considered significant.

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[7]The formula for chi-square using a 2 x 2 table and incorporating Yates correction for continuity is:

$$X^2 = N(AD - BC - N/2)^2 / (A+B)(C+D)(A+C)(B+D).$$ (Cf. McNemar, 1955, p. 231.)

CHAPTER V

DISCUSSION AND CONCLUSIONS

The data obtained with the Wechsler Intelligence Scale for Children will be considered first. While the statistical analysis of the differences between the pre- and post-experimental results for the Verbal, Performance, and Full Scales of the WISC are not considered significant, the results obtained on the Picture Completion and Coding sub-tests manifest sufficient differences between the two groups as to consider these results significant. One of these differences, that obtained with Picture Completion, favors the experimental group, while the difference obtained on the Coding sub-test favors the control group. These differences may in fact reflect real changes in the intellectual functioning of the two groups as a result of the treatment each group received. However, a total of fourteen Mann-Whitney U Tests were applied to the WISC data. According to Sakoda, et. al., (1954), the probability of obtaining two significant results when fourteen statistical tests are used is between .10 and .20. The most reasonable conclusion, therefore, is that the differences obtained in the Picture Completion and Coding sub-tests are the result of chance.

As pointed out in Chapter IV, none of the differences in the remaining sub-tests of the WISC resulted in a finding that could be considered significant. However, the incidence of positive changes in the sub-tests and in the Scale IQs of the WISC requires some comment. It will be recalled that fifteen of the twenty-two possible changes in the means of the sub-tests were positive

as were the changes in mean for all six possible Scale results. The latter are of course intrinsically dependent on the former. It is interesting, nontheless, that while the control group accounts for seven of the fifteen positive sub-test changes, this group obtained a greater mean change for all three Scale IQs. This was true even for the Performance Scale IQ, although the experimental group showed a positive change for all five sub-tests of this Scale as compared with three positive changes for the control group. However, the mean gain per sub-test for the experimental group for the Performance Scale was lower than the mean gain per sub-test for the control group, +.49 to +.59. Nontheless, it was decided to compute Scale IQs on the basis of mean sub-test scores for each group for both pre- and post-experimental WISCs, i.e., the mean for each sub-test of each Scale for each group was regarded as an individual score. These results were accordingly summed and Scale IQs derived. By this means, a check of the reported mean IQs was accomplished, verifying the relative superiority of the control group. The resulting mean IQs by this procedure for the experimental group are as follows: Pre- experimental Verbal Scale IQ 67, Performance Scale IQ 61, Full Scale IQ 61; Post-experimental Verbal Scale IQ 67, Performance Scale IQ 67, Full Scale IQ 64. For the control group, the results are as follows: Pre-experimental Verbal Scale IQ 62, Performance Scale IQ 68, Full Scale IQ 62; Post-experimental Verbal Scale IQ 65, Performance Scale IQ 75, Full Scale IQ 67. These results reflect again the greater gains made by the control group.

The possibility of practice accounting for change in Scale IQs was considered. This possibility could not, of course, be evaluated in the experimental group. In the control group, however, the assumption was made that the

higher the pre-experimental Full Scale IQ, the more likely was a post-experimental improvement in Full Scale IQ as a result of practice because of the presumed greater learning ability. In order to evaluate this assumption grossly, the control group was split into two groups, viz., those whose pre-experimental Full Scale IQ was above the pre-experimental Full Scale mean of 62.4 for the control group, and those whose pre-experimental Full Scale IQ fell below this mean. As a result, there were five subjects with IQs in excess of 62.4 and five with IQs less than 62.4. The five with the lower IQs obtained a mean Full Scale increase of 4.6; the five with the higher IQs obtained a mean Full Scale increase of 2.6. These data run counter to the assumption stated, but they do suggest a possible relationship between IQ and improvement on re-test, at least insofar as the present group is concerned, viz., practice alone may result in increased IQ in brain-damaged, mentally retarded children, particularly among those with lower IQs.

One aspect of the WISC results with the experimental group remains to be considered. As pointed out in Chapter III, certain precautions were taken to avoid any possible bias in one or the other group in the study. Nonetheless, it turned out that in the experimental group, six of the nine children were in residential school placement as opposed to only three of the ten children in the control group in such placement. The possibility was raised that this uneven ratio of residential vs. non-residential school placement in the two groups may have been a factor in the results obtained. Accordingly, for each group, the residential pupils were compared with the non-residential subjects.

Considering the non-residential subjects first, the three such subjects in the experimental group obtained the following mean Scale IQs on the WISC

prior to the administration of prochlorperazine: Verbal Scale IQ, 78.67; Performance Scale IQ, 74.67; Full Scale IQ, 74.33. The pre-experimental WISC mean Scale IQs for the non-residential subjects in the control group are as follows: Verbal Scale IQ, 67.00; Performance Scale IQ, 76.11; Full Scale IQ, 68.14. The post-experimental mean IQs for these two groups are as follows: for the experimental non-residential group, Verbal Scale IQ, 82.33; Performance Scale IQ, 82.00; Full Scale IQ, 81.00; for the control non-residential group, Verbal Scale IQ, 67.86; Performance Scale IQ, 81.21, Full Scale IQ, 71.71. The changes in Scale IQ means for each of the groups is again consistently in a positive direction; however, the group manifests a greater change in each mean scale IQ than the control group. The changes in mean scale IQs for the non-residential experimental and control groups are, respectively, Verbal Scale +3.66 and +.86; Performance Scale +7.33 and +4.50; Full Scale +6.67 and +3.57.

As to the residential subjects, those in the experimental group obtained pre-experimental mean WISC results as follows: Verbal Scale IQ, 61.83; Performance Scale IQ 57.50; Full Scale IQ, 56.67. The post-experimental results for this group were, Verbal Scale IQ 60.83, Performance Scale IQ 60.00, Full Scale IQ 57.50. The changes in Scale means were -1.00, +2.50, and +.83 respectively. Correspondingly, the changes in mean results for the residential control group were +3.34, +3.67, and +3.67. The pre-experimental mean IQs for this latter group were, Verbal Scale IQ 56.33; Performance Scale IQ, 54.00; Full Scale IQ, 5100. The post-experimental means for this group were 59.67, 57.57 and 54.67, respectively.

As may be seen from the foregoing data, the non-residential experimental group manifested higher mean gains than any of the other three groups. Further,

the mean pre-experimental Full Scale IQ for these subjects is approximately seventeen points higher than the comparable mean for the remainder of the experimental group. While again statistical tests of significance on these data are not considered feasible because of the small numbers involved, the breakdown of results in these terms is provocative. A reasonable question, and one not considered initially in this study, is whether prochlorperazine acts more effectively the closer the brain-damaged child's intellectual potential approaches the norm. In this connection it is interesting to note that the mean change for the four subjects obtaining the lowest Full Scale IQs in the experimental group is +2.25 in terms of Full Scale IQ as compared with the mean change of +3.20 for the five highest; similarly, the mean change for subjects in the control group scoring a Full Scale IQ of less than 60 on the pre-experimental test is +1.33 as compared with a mean change of +5.67 for subjects scoring in excess of 60.

As indicated in Chapter III, the results obtained with the Raven Progressive Matrices seemed to be contaminated by chance success to the extent that any effort to evaluate changes in this test would be unwarranted. Further, any effort to compare the results of this test with those obtained on the Wechsler Intelligence Scale for Children would be equally fallacious. That chance successes were involved is obvious from inspection of the answer forms for this test. Most frequently, usually following Series A, the subject would begin to perseverate a response and complete the record in this fashion. This was true in both the pre- and post-experimental tests. However, since Series A of this test was evidently executed appropriately, it was decided to evaluate this series alone in terms of raw score values obtained. It was recognized

that such an evaluation destroyed the validity of the test as a test of intelligence, and that conclusions as to shifts in intellectual functioning could not be derived from this type of treatment. Yet, since this series was apparently valid, it was possible to compare the results obtained on it to determine whether any change had occurred in either group, and whether there was a significant difference in change between the two groups. The results of Series A were therefore evaluated by means of the Mann-Whitney U Test. The resulting U was 40.5 favoring the control group. The associated value for z was .38 and the corresponding probability for a two-tailed test was .70. The difference in gain between the two groups in Series A of the Raven Progressive Matrices cannot therefore be considered significant.

As may be seen in Chapter IV, the data obtained from the Rorschach Ink Blot Test do not manifest any differences between the two groups with respect to changes following prochlorperazine and placebo. In Chapter III it was pointed out that the groups differed in initial Rorschach results in both F% and sum C. These differences, however, were felt to be related to the probability of obtaining a certain number of significant differences when a series of tests of significance are performed on a given body of data.

Descriptively, it was indicated in Chapter IV that the relationships among the various scoring categories for each group remained constant from the pre-experimental to the post-experimental test in terms of mean scores, although certain changes did occur. For the experimental group, in terms of means, there was a slight increase in the use of FM and a decrease in the use of M and m in the area of movement. However, in both test and re-test, the FM category was dominant with M and m about equal. In the control group, in both

test and re-test, FM was also dominant, but there was a higher mean incidence of M than of m. The FM category increased slightly and the m category decreased slightly in the re-test with M remaining at the same level as in the initial test. The incidence of F for the experimental group showed a slight increase in the re-test over the initial test. There was a more marked increase in mean F for the control group, although this increase was not so marked in mean F%. This increase in mean F is probably related, at least in part, to the increase in mean R for the control group. In any case, the higher mean F of the control group, manifested in the initial test, still obtained in the re-test. Both groups utilized C' response in both test and re-test, but in both tests the experimental group had a higher mean score in this category and, in fact, showed an increase in the re-test where no change in mean was obtained with the control group. In the area of color responses, the experimental group manifested a dominance of CF + C over FC in both test and re-test. In the re-test there was a decrease in both mean FC and mean CF and an increase in C. Similarly, the control group showed a superiority in CF + C over FC in both test and re-test, but in the re-test there was an increase in mean FC and C and a decrease to Zero in mean CF. Both groups decreased in mean sum C on the re-test, but the experimental group continued to manifest a mean sum C approximately twice as large as that of the control group.[1]

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[1]It is of some interest that the initial Rorschach data for all the subjects in the present study seems to manifest certain deviations from normative data reported by Phillips and Smith. This is true whether mean CA or mean MA is considered for the present group. For example, in the area of location scores, as indicated above, the present group manifests a characteristic dominance of W over the remaining location scores, whereas Phillips and Smith report a characteristic dominance in D% for both six year olds and for nine and ten year olds. However, the present subjects approximate the data on

As to Manner of Approach, both groups in both test and re-test indicated a marked dominance in mean W% over the remaining location categories. In the re-test, there was a reduction in both groups in mean W%, but W% continued overly-emphasized. For the experimental group there was an increase in mean D% in the re-test, while for the control group there was an increase in both D% and the use of unusual details and white space.

In content categories, both groups utilized animal content for approximately half their responses in both test and re-test. As indicated in Chapter III, the experimental group utilized more content areas in the initial test and less in the re-test than the control group.

In terms of interpretation of these data, the control group continues to manifest less affective responsivity to stimulation than the experimental group, as pointed out in Chapter III, although there is a reduction in emotional lability and an increase in control manifested in both groups in the re-test.

Parental reports of behavioral change resulted in the finding that there was no significant difference between the two groups in this area. Such reports however must necessarily be considered in relation to the individual parent giving them. This is to say that such reports will vary in terms of such factors as interest in the child, level of sophistication, degree of expectation, etc. In this context, while each report was judged as objectively as possible as to whether it reflected improvement in the child or not, it is

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color responses for six year olds although differing widely from the data reported for nine and ten year old children. (Cf. Phillips and Smith, 1953).

interesting to note the differences in certainty regarding reports of improvement in those parents reporting this type of change. Direct quotations of these reports are contained in Appendix IV. With respect to degree of certainty, it was judged that five parents of the eight reporting behavioral improvement in the experimental group were relatively certain of their opinion, while only two of the five reporting improvement for the subjects in the control group manifested similar certainty. If those parental comments manifesting uncertainty are grouped with the comments indicating no change in behavior, a chi-square analysis of this classification using a 3 x 2 table results in a chi-square of 1.81. While, with two degrees of freedom, a chi-square of this size is still not significant, it is greater than the chi-square of 1.46 reported in Chapter IV and raises the possibility that the parental reports were possibly biased to discern improvement where no real improvement had occurred. A more likely possibility, however, is that a real improvement in behavior resulted from the use of prochlorperazine than from placebo despite the lack of significant findings. In this connection, certain data should be emphasized. First of all, a larger percentage of parents with children receiving the drug reported behavioral improvement. Seventy-eight per cent of the parents in the experimental group reported favorable behavioral change as compared with 50% of such reports from the control group. Secondly, it should be noted that five of the seven parents in the experimental group reporting such positive changes seemed certain of their judgment as compared with only two apparently certain reports of the five obtained from the control

group. Finally, of the five children who received both the drug and placeob,[2] all five parents reported improvement following the use of prochlorperazine while only two reported improvement following placebo. The implication from the foregoing comments is that there is probably a favorable behavioral change following the use of prochlorperazine in brain-damaged children. This probability may easily have been masked by the small number of subjects in the present study, and it is feasible to expect that with an increase in number, a more significant result in the area of positive behavioral change may have resulted.[3]

In summary, then, the present study indicates that, with the exception of the Picture Completion sub-test of the WISC, the use of prochlorperazine does not result in a significant change in either intellectual functioning or in personality organization. The significance of this result is questionable, however, since it may have been a chance result. Similarly, the improvement in the control group in the Coding sub-test may be interpreted as a chance result.

The real contribution of the present study seems to be in the area of behavioral change. As mentioned previously, the scarcity of appropriate

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[2] Cf. Appendix V.

[3] With respect to this possibility, it is worth pointing out that in the author's experience with approximately twenty children diagnosed as being brain-damaged, the report of positive behavioral change following prochlorperazine is more common than a change in intellectual functioning. These children, however, could not be utlized in the present study since in each case a significant impairment in communication precluded the use of such tests as the Rorschach and the WISC.

subjects for the present study may have resulted in a finding of no difference in behavioral change where in fact a real difference did occur. Obviously, a similar study along these lines utilizing more subjects and concentrating more on behavioral changes is necessary in order to evaluate this possibility.

Other research possibilities suggested by the present study include:

1. A more systematic investigation of the intellectual and personality characteristics of the brain-damaged child, particularly with an effort to distinguish those characteristics of his behavior that are neurogenic from those that are psychogenic.

2. The investigation of the "placebo reactor" in order to identify this personality, or the particular stresses that elicit this reaction, in the effort to clarify these personalities or circumstances so that future studies employing placebos may attempt to take account of this variable.

3. The relationship between obtained intelligence quotient and the possible effects of practice on subsequent uses of the same intelligence test within a relatively short period on the brain-damaged, mentally retarded child.

4. The possible effect of the ataractic drugs on non-cerebral palsied, non-epileptic brain-damaged children whose intellectual functioning is in the range of borderline mental deficiency and above.

Finally, it is apparent to the reader at this point that further research into the use of ataractics with brain-damaged children will have to employ more careful controls as to level of intellectual functioning and the possibility of placebo reactions than could be exercised in the present study. In addition, it seems that further research along these lines consider such variables as cause and location of damage and age at which damage occurred.

It is the sincere opinion of the author that recognizing such factors in future research will result in more meaningful findings than were possible in the present study.

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APPENDIX I

RESULTS OF THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

TABLE XVII

Sub-test Weighted Scores and Scale IQs for Each Subject: Experimental Group

Initial Test

	Verbal Scale						Performance Scale					Scale IQs		
Subject	Inform.	Comp.	Arith.	Simil.	Vocab.	Digit Sp.	Pict. Comp.	Pict. Arr.	El. Des.	Obj. Assemb.	Coding	Verb. Sc. IQ	Perf. Sc. IQ	Full Sc. IQ
A	4	6	4	4	4	4	5	1	5	6	3	65	58	58
B	3	5	0	3	4	2	6	2	0	7	3	55	60	51
C	4	2	6	5	4	7	4	4	7	1	3	66	57	58
D	3	5	1	4	6	3	1	6	4	9	1	60	62	57
E	1	0	0	0	1	0	3	0	0	2	0	45	44	46
F	9	6	4	8	5	9	5	5	8	3	3	80	64	70
G	7	7	5	6	9	4	8	7	8	6	2	77	74	73
H	14	14	6	9	9	10	11	12	12	10	9	103	106	104
I	3	2	1	4	4	4	1	0	1	2	0	56	44	46
Mean	5.33	5.22	3.00	4.77	5.11	4.77	4.88	4.11	5.00	5.11	2.66	67.33	63.22	62.55
S.D.	3.80	3.79	2.35	2.53	2.42	3.08	3.03	3.69	3.92	3.07	2.54	18.29	17.60	17.02

Re-test

A	4	5	4	6	3	3	2	4	7	6	4	63	62	59
B	4	5	0	3	5	2	8	2	3	8	2	57	66	56
C	4	2	6	4	4	5	4	3	7	1	3	63	55	56
D	4	4	2	3	3	4	5	6	6	10	2	58	71	61
E	0	0	0	0	0	0	4	2	0	5	0	45	46	46
F	7	6	4	9	4	9	5	5	6	2	3	79	60	67
G	7	7	5	10	9	5	11	7	9	8	4	82	85	82
H	14	13	8	12	10	10	14	13	12	13	10	110	117	115
I	4	2	0	2	5	4	3	1	1	2	0	55	44	46
Mean	5.56	4.89	3.22	5.44	4.78	4.67	6.22	4.78	5.67	6.11	3.11	68.00	67.33	65.33
S.D.	4.19	3.54	2.75	3.83	2.90	2.98	3.76	3.46	3.59	3.77	2.81	18.41	21.17	20.35

TABLE XVIII

Sub-test Weighted Scores and Scale IQs for Each Subject: Control Group

Initial Test

	Verbal Scale					Performance Scale						Scale IQs		
Subject	Inform.	Comp.	Arith.	Simil.	Vocab.	Digit. Sp.	Pict. Comp.	Pict. Arr.	Bl. Des.	Obj. Assemb.	Coding	Verb. Sc. IQ	Perf. Sc. IQ	Full Sc. IQ
J	2	0	2	0	2	4	0	0	2	2	3	47	44	46
K	4	2	4	5	5	4	7	3	8	2	1	62	60	57
L	4	3	4	2	4	4	6	2	4	0	1	60	48	50
M	6	6	1	2	5	5	5	6	4	10	2	63	68	62
N	6	6	11	6	5	7	12	7	7	10	6	80	89	83
O	5	6	4	6	5	4	4	5	7	9	3	69	69	66
P	4	6	4	3	4	9	4	4	4	8	4	69	64	63
Q	3	9	2	2	2	1	6	6	5	6	1	57	64	56
R	1	0	1	0	0	2	10	4	10	13	10	45	96	64
S	9	6	6	9	5	5	8	13	10	6	4	79	87	83
Mean	4.40	4.40	3.90	3.50	3.70	4.50	6.20	5.00	6.10	6.60	3.50	63.10	68.90	63.00
S.D.	2.15	2.84	2.81	2.77	1.68	2.16	3.19	3.32	2.68	3.97	2.66	11.15	16.28	15.02

Re-test

J	3	3	0	2	2	8	0	4	2	1	4	56	46	46
K	5	2	5	4	4	5	9	7	10	5	5	63	80	69
L	4	6	3	1	3	4	5	1	5	1	0	60	47	49
M	4	6	4	5	5	3	5	6	10	9	5	66	79	70
N	7	3	6	12	6	7	8	7	10	9	8	80	89	83
O	5	2	3	4	5	4	4	5	7	9	3	61	69	62
P	4	8	2	8	6	9	5	8	7	6	5	76	74	72
Q	3	4	4	4	3	6	5	6	7	5	4	62	65	60
R	1	0	1	0	0	2	10	5	13	14	10	45	103	67
S	9	9	7	6	6	9	8	14	9	9	5	85	93	88
Mean	4.50	4.30	3.50	4.50	4.00	5.70	5.90	6.30	8.00	6.80	4.90	65.40	74.50	66.60
S.D.	2.91	2.72	2.06	3.29	1.90	2.37	2.77	3.16	2.93	3.82	2.55	11.31	17.61	12.54

APPENDIX II

RESULTS OF THE RAVEN PROGRESSIVE MATRICES

TABLE XII

Raw Score and Percentile Rank for the Raven Progressive Matrices for Initial Test and Re-test: Both Groups

Compazine Subjects	Initial Test		Re-test	
	Raw Score	% Rank[1]	Raw Score	% Rank
A	14	< 5	11	< 5
B	12	< 5	12	< 5
C	15	< 5	12	< 5
D	14	10-15	12	5-10
E	11	< 5	12	< 5
F	19	10-25	13	< 5
G	16	25-50	13	<25
H	13	50	15	75
I	10	<10	10	<10
Mean	13.89		12.22	
S.D.	2.57		3.77	
Placebo Subjects				
J	14	10	9	< 5
K	7	<10	11	<10
L	14	< 5	11	< 5
M	20	25-50	24	50-75
N	16	25	17	25-50
O	13	10	11	<10
P	17	< 5	12	< 5
Q	14	25-50	14	25-50
R	14	10	19	10-25
S	16	25	22	50-75
Mean	14.50		15.00	
S.D.	2.93		4.94	

[1]The entries for the columns of percentile ranks are read as follows: the symbol, < , indicates that the raw score obtained by a given subject falls below the lowest percentile rank reported for his chronological age; when a raw score falls between two percentile ranks for a given CA, the range in percentile rank is indicated; when a raw score falls at a percentile rank for a given age, the percentile rank is given. Cf. Raven, op. cit., p. 12.

APPENDIX III

RESULTS OF THE RORSCHACH INK BLOT TEST

TABLE XX

Pre-Medication Results of the Rorschach for Each Subject, Both Groups

	Subjects																		
	Compazine											Placebo							
Rorschach Category	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Location																			
W	8	9	6	10	11	9	9	4	9	8	8	8	11	10	8	6	9	-	10
D	2	1	5	-	-	1	3	4	1	2	-	2	3	-	4	4	1	5	-
d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
Dd	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	4	-
S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Determ.																			
M	-	-	1	-	-	-	-	-	1	-	-	2	1	-	-	2	-	-	-
FM	2	1	4	2	-	-	2	2	3	-	-	3	1	-	5	1	-	-	-
m	-	-	-	-	1	1	-	-	-	-	-	2	-	-	-	-	-	-	-
F	5	4	5	6	2	5	10	7	4	8	7	3	7	9	5	6	10	12	10
C'	1	-	1	-	5	-	-	-	-	-	-	-	1	-	-	-	-	-	-
FC	-	-	-	-	-	-	-	-	2	-	-	-	1	1	-	-	-	-	-
CF	2	3	1	1	-	3	-	-	-	-	1	-	3	-	2	1	-	1	-
C	-	2	-	1	3	1	-	-	-	2	-	-	-	-	-	-	-	-	-
Content																			
H	1	-	2	-	-	1	2	-	3	-	2	1	2	-	-	3	-	-	-
Hd	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	1	-	7	1
A	6	4	8	5	-	2	7	5	6	-	3	5	10	6	11	4	10	-	3
Aojb	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
At	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	2
Obj	1	-	-	4	1	1	2	1	-	-	-	1	2	3	-	-	-	6	-
Pl	-	-	-	-	3	-	-	-	1	-	-	-	-	1	1	1	-	-	-
N	-	3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Geo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Art	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Clouds	1	-	1	-	-	1	-	-	-	8	-	-	-	-	-	-	-	-	-
Fire	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	-	-	-
Abstr.	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Food	2	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Card Des.	-	3	-	1	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wood	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XXI

Post-Medication Results of the Rorschach for Each Subject, Both Groups

	Subjects																		
	Compazine											Placebo							
Rorschach Category	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
Location																			
W	6	9	6	8	11	7	8	3	9	9	9	2	6	10	4	6	9	7	9
D	9	-	4	1	-	3	4	7	1	3	1	10	8	-	8	5	1	9	1
d	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	2	-
Dd	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	1	-	9	-
S	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-
Determ.																			
M	-	-	-	-	-	-	1	-	-	-	-	1	2	-	-	2	-	-	-
FM	1	1	4	1	-	1	3	3	2	-	-	-	4	2	3	3	-	1	-
m	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
F	7	4	6	6	1	3	8	6	8	9	10	15	6	7	10	7	10	23	9
C'	-	1	-	-	8	1	-	-	-	-	-	-	1	-	-	-	-	1	-
FC	1	-	-	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	1
CF	2	2	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
C	-	2	-	2	1	2	1	-	-	3	-	-	-	-	-	-	-	3	-
Content																			
H	1	-	2	-	-	1	1	-	-	-	1	1	2	-	-	2	2	-	-
Hd	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	11	2
A	8	6	7	3	1	2	7	8	10	-	4	6	11	9	13	7	8	6	3
Ad	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	-	2
At	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	1
Obj	-	-	-	5	1	-	4	1	-	-	2	3	1	-	-	1	-	4	-
Pl	-	-	-	-	-	3	-	2	-	-	-	-	-	1	-	2	-	-	-
N	-	1	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	2	-
Geo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Archit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Clouds	-	-	1	-	-	1	-	-	-	9	-	-	1	-	-	-	-	-	-
Fire	-	-	-	-	-	1	1	-	-	3	-	-	-	-	-	-	-	-	-
Food	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Card Des.	-	2	-	2	9	1	-	-	-	-	-	2	-	-	-	-	-	3	-

APPENDIX IV

PARENTAL COMMENTS ON BEHAVIOR

I. Experimental Group

Subject A: He acts more alert. People are amazed at his alertness. His behavior is calmer. (Improved)[1]

Subject B: He doesn't have as many temper tantrums. (Improved)

Subject C: During the past month he's been good, although he seems a little stiff. (Improved)

Subject D: He has calmed down considerably and gained a lot of weight. He has calmed down tremendously. (Improved)

Subject E: The medicine did him harm. He was very fidgety. With these pills he was unable to sit in one place for any length of time. (Became worse)

Subject F: He hasn't gotten any better. He still runs around all the time. (No change)

Subject G: He hasn't been quite as wild. The pills seem to have helped him a little. (Improved)

Subject H: It was just as though he first noticed things. The teacher thinks he is really beginning to catch on. (Improved)

---

[1] Comment in parentheses is category under which behavioral report was classed.

Subject I: She seems to be more relaxed. (Improved)

II. Control Group

Subject J: He seems improved within certain limitations. There is a general reduction in hyperactivity. (Improved)

Subject K: It appears as though they (the pills) slowed him down. He cries less. (Improved)

Subject L: His behavior hasn't improved. He has as many temper tantrums as he ever had. (No change)

Subject M: He's no different. (No change)

Subject N: He's better. Much more better. He's calmer. He can say his ABCs. He's very quiet. (Improved)

Subject O: I can't say there's any change. (No change)

Subject P: Can't see any difference. He might be a trifle quieter, but I doubt it. (No change)

Subject Q: It slowed her down. She isn't fidgety. (Improved)

Subject R: She's as impossible as ever. She's unmanageable. (No change)

Subject S: He made some progress. He did seem quite good and his teacher felt he played with other children better, but he still has bad days. (Improved)

APPENDIX V

RESULTS WITH FIVE SUBJECTS ALTERNATED ON PROCHLORPERAZINE AND PLACEBO

Five subjects were given both prochlorperazine and placebo. Two of these subjects, H and I, were originally in the experimental group and hence received prochlorperazine first. The remaining three subjects, Q, R, and S were in the control group and thus received the placebo first. The test results for the WISC and the Rorschach for all five subjects under the two conditions are contained in Tables XXII, XXIII, and XXIV.

Table XXII presents the test results for each subject obtained with the WISC. Table XXIII contains the changes in sub-test scores and Scale IQs for each subject for the three successive tests and under prochlorperazine and placebo. Table XXIV contains the results of the Rorschach expressed in terms of mean percentages for the five subjects as a group. The results of the initial test with the Rorschach and the results following prochlorperazine and following placebo are presented, together with the changes in mean percentages between the initial test and the two experimental conditions.

As to the WISC, the data obtained do not indicate improvement for either of the medications. The mean increase in Verbal sub-test scores following prochlorperazine is +.43; the mean increase in Performance Scale sub-test scores following prochlorperazine is +1.32. The respective changes following placebo are +.47 and +1.32. The changes in scale IQs following prochlorperazine are as follows: Verbal Scale +2.6, Performance Scale +8.2, Full Scale +6.2. The

TABLE XXII

WISC Sub-test Weighted Scores and Scale IQs for Three Tests for Five Subjects

	Test 1 Subjects					Test 2 Subjects					Test 3 Subjects				
WISC	H	I	Q	R	S	H	I	Q	R	S	H	I	Q	R	S
Inform.	14	3	3	1	9	16	4	3	1	9	11	4	5	2	9
Comp.	14	2	9	0	6	13	2	4	0	9	11	2	6	0	9
Arith.	6	1	2	1	6	8	0	4	1	7	8	1	1	0	6
Simil.	9	4	2	0	9	12	2	4	0	5	14	4	4	0	4
Vocab.	9	4	2	0	5	10	5	3	0	6	11	3	4	0	3
Dig. Sp.	10	4	1	2	5	10	4	6	2	9	11	4	7	4	7
Pict. Arr.	11	1	6	10	8	14	3	5	10	8	14	5	5	11	8
Pict. Comp.	12	0	6	4	13	13	1	6	5	14	14	3	6	5	14
Bl. Des.	12	1	5	10	10	12	1	7	13	9	13	1	10	16	11
Obj. Assemb.	10	2	6	13	6	13	2	5	14	9	12	3	6	15	7
Coding	9	0	1	10	4	10	0	4	10	5	11	0	6	9	5
Verb. Sc. IQ	103	56	57	45	79	110	55	62	45	85	106	53	66	45	77
Perf. Sc. IQ	106	44	64	96	87	117	44	65	103	93	120	47	76	108	93
Full Sc. IQ	104	46	56	64	83	115	46	60	67	88	114	46	68	72	83

TABLE XXIII

Means and Mean Changes for WISC Subtest Weighted Scores and Scale IQs for Five Subjects

	Test 1	Test 2		Test 3		After Compazine		After Placebo	
WISC	Mean	Mean	Change	Mean	Change	Mean	Change	Mean	Change
Inform	6.0	6.6	+ .6	6.2	+ .2	7.2	+1.2	5.6	- .4
Comp.	6.2	5.8	- .4	5.8	- .4	6.0	- .2	5.2	-1.0
Arith.	3.2	4.0	+ .8	3.2	0	3.0	- .2	4.2	+1.0
Simil.	4.8	4.6	- .2	5.2	+ .4	4.4	- .4	5.4	+ .6
Vocab.	4.0	4.8	+ .8	4.2	+ .2	4.4	+ .4	4.6	+ .6
Dig. Sp.	4.4	6.2	+1.8	6.6	+2.2	6.4	+2.0	6.4	+2.0
Pict. Arr.	7.2	8.0	+ .8	8.6	+1.4	8.2	+1.0	9.1	+1.9
Pict. Comp.	7.0	7.8	+ .8	8.4	+1.4	7.8	+ .8	8.4	+1.4
Bl. Des.	7.6	8.4	+ .8	10.2	+2.6	10.0	+2.4	8.6	+1.0
Obj. Assemb.	7.4	8.6	+1.2	8.6	+1.2	8.6	+1.2	8.6	+1.2
Coding	4.8	5.8	+1.0	6.2	+1.4	6.0	+1.2	6.0	+1.2
Verb. Sc. IQ	68.0	71.4	+3.4	69.4	+1.4	70.6	+2.6	70.2	+2.2
Perf. Sc. IQ	79.4	84.4	+5.0	88.8	+9.4	87.6	+8.2	85.6	+6.2
Full Sc. IQ	70.6	75.2	+4.6	76.6	+6.0	76.8	+6.2	75.0	+4.4

comparable changes following placebo are: Verbal Scale +2.2, Performance Scale +6.2, Full Scale +4.4. There is a slight superiority in favor of prochlorperazine in the results of Scale IQs. It should be noted that the largest single increment in IQ occurred in the results obtained on the Performance Scale the third time the test was administered to the five subjects. The change in this sub-test was +9.4. Of the children in this group, two were on placebo and three were on prochlorperazine.

The results obtained with the Rorschach indicate a marked increase in mean D% following prochlorperazine. Also, it is following prochlorperazine that an m score appears while in the initial test and following placebo, this score is absent. As to P, R, and sum C, there is apparently no difference between the initial test and the results obtained following prochlorperazine and placebo. The initial raw score mean value for P was 1.4; following prochlorperazine the obtained mean was 1.6; following placebo the obtained mean was 1.0. The respective mean values for R were, 10.4, 11.8, and 11.6; the mean values for sum C were, 0.5, 1.0, and 1.0.

As to the Raven Progressive Matrices, the initial raw score mean for the five subjects was 13.4; the mean following prochlorperazine was 14.2; the mean following placebo was 16.6. While there is apparently a greater increase in mean raw score following placebo than following prochlorperazine in this test, these differences can be accepted as no more than a chance result for the reasons pointed out in Chapters IV and V.

Parental comments on behavior indicated that when the five subjects were on prochlorperazine, improvement was reported by each parent, while only two of the five parents reported improvement following placebo. Two of the parents

TABLE XXIV

Rorschach Results in Terms of Mean Percentage and Mean Percentage Change for Three Tests for Five Subjects

Rorschach Categories	Test 1	After Compazine	% Change	After Placebo	% Change
Location					
W	64.8	56.8	- 8.0	71.0	+ 6.2
D	20.8	40.6	+19.8	20.4	- .4
d	4.6	2.6	- 2.0	1.4	- 3.2
Dd	8.6	---	- 8.6	6.4	- 2.2
S	1.6	---	- 1.6	.8	- .8
Determ.					
M	6.4	---	- 6.4	2.0	- 4.4
FM	6.0	12.4	+ 6.4	14.6	+ 8.6
m	---	2.0	+ 2.0	---	---
F	81.8	75.0	- 6.8	78.4	- 3.4
C'	---	1.6	+ 1.6	.6	+ .6
FC	4.0	4.4	+ .4	2.0	- 2.0
CF	---	1.6	+ 1.6	---	---
C	1.8	3.0	+ 1.2	2.4	+ .6
Content					
H	6.0	4.0	- 2.0	6.0	0.0
Hd	2.0	1.6	- .4	11.8	+ 9.8
A	58.4	64.8	+ 6.4	58.2	- .2
Ad	7.6	6.6	- 1.0	4.0	- 3.6
At	6.2	6.6	+ .4	2.6	- 3.6
Obj	11.4	3.4	- 8.0	5.0	- 6.4
N	2.2	1.6	- .6	1.4	- .8
Pl	2.0	3.6	+ 1.6	2.0	0.0
Geo	2.0	2.2	+ .2	4.0	+ 2.0
Archit.	---	---	---	.6	+ .6
Card Des.	---	4.0	+ 4.0	2.4	+ 2.4
Wood	2.2	---	- 2.2	2.0	- .2
Food	---	1.6	+ 1.6	---	---

whose children had first received placebo and who had reported no change in behavior, reported improvement following prochlorperazine. One parent whose child had originally received placebo and who had reported improvement commented on a marked reversal in behavior following placebo.

It is difficult to draw any more than tentative conclusions from the results obtained with these five children. The gist of the data contained in this appendix suggests a possibly more beneficial result from prochlorperazine than from placebo. There is a slight improvement following the drug in the Scale results of the WISC, and there is apparently a more noticeable improvement in behavior. The increase in D% following prochlorperazine on the Rorschach is also of some interest since this change is in the direction of the norms reported for D% by Phillips and Smith.[2]

Nonetheless, the general constancy in WISC sub-test results and in the Rorschach tend to off-set these apparently positive findings. One may conclude that, in all likelihood, there is probably no difference in results on psychologic tests following prochlorperazine and following placebo. There may, however, be a difference in overt behavior.

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[2]Phillips and Smith, op. cit.

APPENDIX VI

PLACEBO REACTION

An effort was made to determine whether placebo reactors could be identified, however arbitrarily, in the present study's control group. Since the Performance Scale of the WISC contained both the sub-tests resulting in significant findings, it was decided to investigate differences in the control group in their results on this Scale. Accordingly, the changes between initial and post-experimental Performance Scale sub-test results for each child in the control group were summed and a mean change of +4.6 was obtained. Of the ten subjects in the control group, four obtained mean Performance Scale sub-test changes in excess of +4.6. These four were tentatively identified as "placebo reactors" on the basis of the change they expressed in the Performance Scale.

It was then decided to evaluate the Rorschach protocols of these four subjects, comparing them with the remaining six subjects in the control group on the basis of the differences reported by Trouton (1957) between reactors and non-reactors on the Rorschach. It was recognized that this method was hazardous at best because of the wide differences between the subjects of the present study and the adult subjects reported in Trouton's article. Nonetheless, the use of the Rorschach was common to both, and the comparison was therefore attempted. The post-experimental results for the present study were utilized since it was after placebo treatment that the Rorschach data mentioned

by Trouton was obtained. The categories selected for comparison were total R, anatomy content, sum C, sum C:M ratio, and F%. These were chosen because of the description given by Trouton of the reported differences in placebo reactors as compared with non-reactors. The content category, anatomy, was included because of the reference to "insides" responses by Trouton. This response was not obtained with any subject in the present study. Ordinarily, however, this type of response would be scored as an anatomy response. The obtained means for these categories for the four subjects designated as reactors are as follows: total R, 16.25; anatomy content, 1.5; sum C, 1.25; sum C:M ratio, 1.25:0.67; F%, 70.00%. The remaining six subjects, the presumed "non-reactors," the obtained mean values are: total R, 11.33; anatomy content, .17; sum C, .98; sum C:M ratio, 0.98;0.17; F%, 87.33%.

As indicated previously, any effort to draw too many inferences from the data in the preceding paragraph is hazardous for the reasons mentioned and also because of the small number of subjects in the present study's control group. Nonetheless, the similarities in results obtained by the four "reactors" and those reported by Trouton are interesting. The only area in which the similarity breaks down is in the sum C:M ratio, but despite the greater ratio in favor of sum C over M in the "non-reactors," the mean sum C for the "reactors" is higher. Of even further interest is the fact that the only reversal in results between the "reactors" and "non-reactors" in terms of change between pre- and post-experimental tests is in the anatomy category; the mean for the "reactors" prior to placebo was 0.0, while the "non-reactors" obtained a mean of 0.5. Another aspect of the pre-experimental Rorschach is the close similarity in F% for the "reactors" and "non-reactors," the former

obtaining a mean of 72.25%, the latter a mean of 73.67%. Following placebo, the "reactors" decreased in F% to a mean of 70.00 while the "non-reactors" increased to a mean of 87.83.

It is possible, although admittedly highly tentative, that the results obtained in the present study are affected to some degree by a positive placebo reaction in the control group. The effect of such a reaction may have been to mask certain changes obtained by the experimental group as a result of the administration of prochlorperazine. A similar reaction may have occurred in the experimental group, accounting for positive changes in that group to some degree. Further investigation into this possibility, however, seemed pointless since there seemed no very good was to distinguish a placebo reaction in a group that had received a pharmacologically active drug.

APPROVAL SHEET

The dissertation submitted by John Michael McCauley has been read and approved by five members of the Department of Psychology.

The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the dissertation is now given final approval with reference to content, form, and mechanical accuracy.

The dissertation is therefore accepted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy.

Date

Frank J. Kobler

Signature of Adviser