



THE THEORY AND METHOD OF CONDITIONING
IN RELATION TO ENURESIS AND ITS TREATMENT.

A thesis submitted for the degree of
Doctor of Philosophy in the Faculty of Arts.
University of Adelaide

by

Sydney Harold Lovibond, B.A. (Melb.) M.A., A.U.A.(Sec. Sc.)

Department of Psychology.
University of Adelaide.

ACKNOWLEDGMENTS.

The author wishes to acknowledge his indebtedness to the numerous members of staff of the University of Adelaide with whom many helpful discussions were held.

He wishes to thank also the British Medical Association for assistance with the problem of medical safeguards and the provision of subjects; the Headmaster and members of staff of Hillcrest Primary School from which the control subjects were obtained; the mothers and children who participated in the experiments; and the technicians who gave invaluable assistance with problems of instrumentation.

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ABSTRACT.

The general aim of the investigation is to relate developments in the theory and method of conditioning to the therapy of enuresis.

The major problems studied are:

- I the appropriateness of conditioning methods of treating enuresis in the light of
 - (a) general theoretical considerations.
 - (b) the therapeutic effectiveness of the method by comparison with other methods of treatment.
 - (c) the general psychological effects of conditioning treatment.

- II the processes of normal continence development and the aetiology of enuresis in relation to conditioning methods of treatment.

- III the mechanism of conditioning treatment and its relation to instrumental design and procedure.

It is concluded that there are two major psychological theories of enuresis with differing implications for treatment.

Firstly there is the symptom theory of enuresis, according to which enuresis is merely a symptom of an underlying general emotional disturbance. The implications of this theory are (a) treatment should take the form of psychotherapy aimed at removal of the underlying conflict.

(b) direct conditioning methods are contraindicated because removal of symptoms alone will lead to symptom substitution or exacerbation of anxiety.

Secondly there is the habit deficiency theory of enuresis which views the disorder as a failure to develop the habit of continence sufficiently strongly, and which indicates that direct conditioning is the only form of treatment likely to be effective.

According to the habit deficiency theory any changes in the general adjustment of enuretics following successful conditioning therapy are likely to be beneficial rather than harmful, inasmuch as anxiety secondary to the enuresis is likely to be ameliorated.

Following a survey of the literature on psychotherapeutic and conditioning treatment of enuresis in relation to evidence

of spontaneous recovery, it is concluded that

- (a) there are so few adequately reported studies of psychotherapy which have been carried out with reasonably large groups of enuretics, that no firm conclusions regarding the effectiveness of this type of treatment can be drawn.
- (b) conditioning treatment is extremely effective in arresting enuresis.
- (c) the effectiveness of conditioning treatment is due to the specific stimulus conditions provided by the conditioning instrument and does not result from incidental "suggestion".
- (d) the rate of relapse following initial arrest of enuresis by conditioning methods is probably higher than usually reported.
- (e) conditioning treatment does not appear to give rise to symptom substitution or to exacerbate anxiety. On the contrary, there is suggestive evidence, mainly from parental observations, that beneficial personality changes often follow successful conditioning treatment, but more objective evidence is required.

The theories of normal continence development which provide the logical bases for the conditioning treatment methods of Mowrer and Crosby are examined. Although both authors appeal to the principles of conditioning to account for continence development, their accounts of the process are in important respects contradictory. Thus Mowrer believes that nocturnal potting procedures play an essential part in continence development, whereas Crosby believes that these procedures may often predispose to enuresis.

It is concluded that there is little soundly established knowledge of the process of continence development, and in particular the role of toilet training requires elucidation.

An examination of the mechanism of conditioning treatment is undertaken and it is concluded that

- (a) the treatment process follows the avoidance rather than the classical conditioning paradigm.
- (b) any sudden and relatively intense stimulus will serve adequately as the U C S for sphincter contraction and hence Crosby's electrical stimulus per se is unlikely to offer any therapeutic advantages.
- (c) in order to facilitate the development of a conditioned avoidance response of sphincter contraction the aversive stimulus should be "turned off" by the response of sphincter contraction.

A modified auditory apparatus (Twin Signal) developed in the light of these considerations is described. This apparatus makes use of a pad electrode and presents two auditory stimuli. The first of these is loud and of short duration. This is followed by an interval of silence of about one minute, after which a buzzer sounds continuously to warn the attendant.

The first field experiment compares the efficiency of the Mowrer, Crosby and Twin Signal instruments, using a sample selected as representative of the total population of 6-14 year old enuretics. The results indicate that the Twin Signal is the most effective and the Mowrer is the least effective in terms of initial arrest of wetting, but there is suggestive evidence that the rate of relapse is lower with the Mowrer instrument.

In order to obtain evidence on the general psychological effects of conditioning treatment, 25 enuretics are given a number of tests of adjustment before treatment and are re-tested 6 or 12 months later. A matched control group of non-enuretics is tested and re-tested after a similar time interval. The tests are selected to detect both general mal-adjustment and reactive mal-adjustment.

Although the enuretics and controls do not differ significantly on any of the initial tests, the general pattern

of test results is consistent with the hypothesis that the enuretics differ from the controls chiefly in being more reactively maladjusted. This hypothesis is further substantiated by the retest results. On retest the enuretics show markedly less reactive maladjustment, whereas the control children do not.

A survey of control of micturition in relation to parental practices, attitudes and expectations concerning toilet training is undertaken with 124 enuretics and 121 non-enuretic children. No evidence is found to suggest that toilet training history is of significance in the aetiology of enuresis. Consequently the attempts of Mowrer and Crosby to give conditioning treatment a rationale in terms of assisting the process of normal continence development, gain no support from the evidence.

In an attempt to overcome the problem of the very high relapse rate following initial arrest of enuresis by conditioning methods, a series of animal and field investigations is carried out.

Animal experiment I examines the effects of free shocks in maintaining avoidance responding in rats, and Field Experiment II studies the analogous use of false alarms in conditioning treatment. In common with the results of other investigations, free shocks are found significantly to retard extinction of avoidance responding in the rat.

The results of the field experiment suggest that whilst false alarms may reduce the number of early relapses, the method is of no practical significance since the ultimate relapse rate is not appreciably reduced.

A second experiment with rats is designed to test the effects of different aversive stimulus patterns on the acquisition and maintenance of avoidance responding. In particular, an attempt is made to combine the superior acquisition of the escape pattern of the Twin Signal with the apparently increased resistance to extinction of the non escape pattern of the Mowrer instrument. To this end, in one experimental group short duration intense stimulation is followed immediately by long duration less intense stimulation. In a concurrent field study this combined stimulus pattern is compared with the standard Mowrer pattern.

The results of both the animal and field experiments are negative in that whilst acquisition with the combined pattern is superior to that with the standard pattern, resistance to extinction is decidedly poorer with the combined pattern.

A final animal experiment is conducted to test the hypothesis that intermittent reinforcement during acquisition of a passive avoidance response will result in significantly increased resistance to extinction.

The results confirm the hypothesis and a final field investigation is undertaken to study the effects of intermittent reinforcement in conditioning treatment.

The Twin Signal in its original form is used. Acquisition is found not to be significantly impaired. Initial resistance to relapse appears to be markedly improved but the follow up period is insufficient to draw firm conclusions regarding the ultimate effect on the relapse rate.

Finally, the implications of the study as a whole are considered. It is suggested that the results strongly support the habit deficiency theory of enuresis and the use of direct conditioning methods of treating behavioural disturbances.

It is argued, however, that it does not necessarily follow that wrong habit theories offer an adequate account of all behaviour disorders or that treatment by the verbal methods of psychotherapy has no place.

Suggestions for further research are offered.

CHAPTER I.

INTRODUCTION AND HISTORICAL
BACKGROUND.

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Introduction.

In recent years numerous reports of the direct treatment of behavioural disturbances have appeared in the literature. The term direct means simply that the treatment is aimed specifically at the elimination of undesirable behaviours which are usually called symptoms.

In all of the cases reported, treatment has been based on the principles of conditioning, and almost invariably non-verbal methods have been employed.

Following the original work of Mowrer and Mowrer, (1938) other writers have continued to claim success with direct conditioning methods of treating enuresis (Crosby, 1950; Sieger, 1952; Baller and Schalock, 1956, Gillison and Skinner, 1958; Wickes, 1958)

Liversedge and Sylvester (1955) achieved excellent results in the treatment of writers cramp by administering a sensory counter stimulus of shock to the left hand when the tremor and spasm associated with the condition occurred.

Raymond (1956) has reported a case of fetishism which was successfully treated by aversion therapy similar to that used in the conditioning treatment of alcoholism.

Jones (1956) was able to overcome urgency and frequency of micturition in a female patient by means of a conditioning technique utilising false manometric readings.

Myer (1957) has given an account of the application of the principle of primary stimulus generalization to the treatment of two phobic patients.

Yates (1958) secured substantial reduction in the frequency of tics in a female patient following a practice regime based on the principles of reactive and conditioned inhibition.

The use of direct conditioning methods in the treatment of behavioural disorders is not a new development. Favourable reports of the use of these methods in the elimination of childrens' fears (Jones, 1924) had appeared in the 1920's.

Nevertheless, despite their apparent effectiveness, direct conditioning methods have met with little acceptance among clinical practitioners. Thus Eysenck (1957) reports that, at the time of

writing, conditioning methods of treating enuresis were not in use in a single clinic in Great Britain.

Not a few clinicians have deprecated the use of conditioning procedures on theoretical grounds (Michaels, 1939; Dibden and Holmes, 1955) whilst others have questioned the evidence relating to their therapeutic effectiveness (Davis, 1958).

In the investigation to be reported, an attempt is made to elucidate some of the general problems associated with the use of direct conditioning methods in the course of making a detailed study of the application of these methods to the treatment of a particular disturbance - enuresis.

In accordance with the view that an understanding of behaviour is facilitated by mutual interaction between theory and social practice, attention is directed both to the practical implications of theoretical developments in the field of conditioning, and to the possibility of feedback from treatment practice to the theory of conditioning.

Historical Background.

Nocturnal enuresis is usually defined as the involuntary discharge of urine during sleep after the age of three years in the absence of demonstrable organic pathology.

Although there is evidence that enuresis has been a problem since ancient times (Glicklich, 1951) it is only very recently that reliable evidence of the incidence of the disturbance in civilized communities has become available.

In 1951, information relating to the prevalence of bed-wetting was obtained from the parents of 1648 children presented for routine medical examination in a district of Birmingham (Bransby et al. 1955).

In another investigation, which formed part of a long term study of child health, the National Survey of Child Health and Development determined the incidence of enuresis among all legitimate single birth children born in the first week of March, 1946, in all parts of Britain. Questions relating to bed-wetting were asked for at four, six and seven years. Information at each of the three ages was obtained from 4294 of the original 5386 children. (Bransby et al. 1955).

A further survey was undertaken in York. Mothers of all children for whom there was a school medical card, and whose surnames began with "D", were asked to provide information on bed-wetting for all their children above the age of three years. The response was practically complete. (Bransby et al. 1955).

The weighted averages from these three studies have been smoothed and extrapolated to give the estimated age-incidence curve shown in Figure 1.

This curve shows that approximately one child in five is enuretic at the age of three years. With increasing age the incidence falls, at first rapidly and then more slowly, until at the age of 14 years the proportion of bedwetters is about 1 in 35.

Inasmuch as the limited evidence which is available from Canada (Bransby et al., 1955) and Norway (Halgren, 1958) tends to confirm the present estimates, it seems reasonable to accept the curve in Figure 1 as applicable to all highly developed countries in the Western world including Australia.

Possibly the most graphic way of illustrating the extent of the disorder is to estimate the total number of enuretics in the

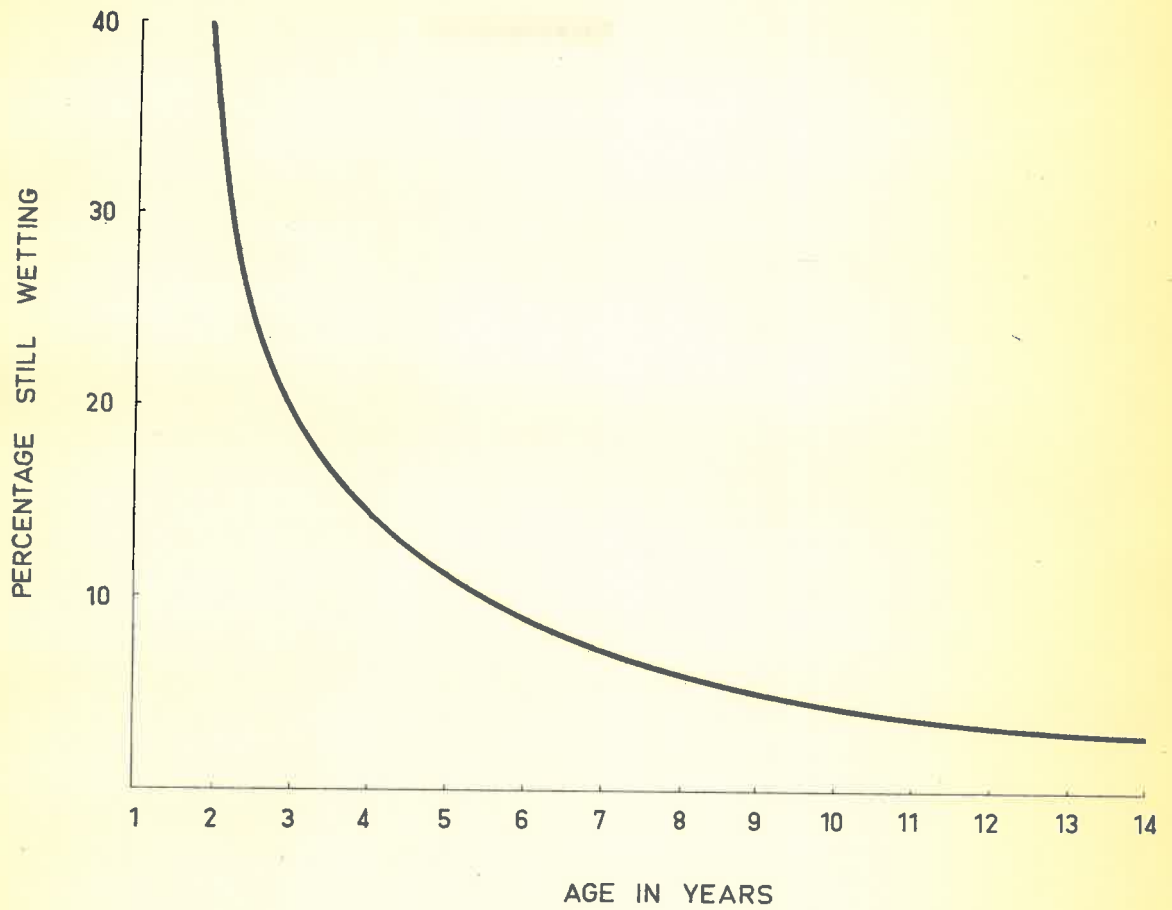


Fig 1. BEDWETTING INCIDENCE AT DIFFERENT AGES
ESTIMATED FROM DATA IN BRANSBY et al. (1955).

community at a given moment. Using the data in Figure 1 and Commonwealth Census returns, it has been estimated that the number of enuretics in Australia between the ages of five and 14 years is approximately 100,000. In view of the high incidence of the disturbance, the distress which it causes sufferers and their families, and its generally recognized resistance to treatment, it is understandable that an enormous range of therapeutic procedures has been used in efforts to combat it.

The prescriptions of the ancients included such measures as eating the bladders of pigs and sheep and drinking the urine of spayed swine. Similar measures were still being advocated by Thomas Phaer, the father of modern Pediatrics, in his *Boke of Children*, written in 1554. This book contains a section entitled "Of Fyseyng in the Bedde" in which Phaer advises enuretics to eat various entrails. He adds "The stones of an hedgehog powdered, is of the same vertue" (Glicklich, 1951).

The remedies adopted by present day parents, whilst not as lurid, are scarcely more soundly based. They include raising the head of the bed, raising the foot of the bed, sleeping on the back, not sleeping on the back, sleeping on cotton reels, restriction of fluids, waking at two hourly intervals to urinate, keeping

progress charts, scolding, beating and bribing. Present day medical treatment includes surgical, hormone and drug therapies. Finally there are the psychological procedures; hypnosis, psycho-therapy and the recently developed direct conditioning methods.

The first practical conditioning apparatus for the treatment of enuresis was devised by the American psychologists Mowrer and Mowrer⁺ (1938). A similar apparatus was reported independently by Morgan and Witmer (1939).

The Mowrer type apparatus makes use of a urine sensitive pad which is used in place of a rubber waterproof. When the child urinates, the urine strikes the pad and triggers a relay in circuit with an electric bell. The bell causes urination to cease, awakens the child, and, in the case of younger children, summons the attendant. The child is fully awakened and required to urinate. The apparatus is then reset and the child returns to bed. In the procedure advocated by Mowrer, treatment is continued until seven consecutive dry nights occur, followed by seven further dry nights with an increased fluid intake before retiring.

⁺In the remainder of the text Mowrer and Mowrer are referred to simply as Mowrer.

Mowrer's method differs only in refinement from that described by Pfaundler in 1904 (Pfaundler, 1904). Pfaundler's apparatus was originally devised as a signal to warn the attendant that the child had urinated, and its therapeutic capacity was discovered by accident.

In 1950 Crosby developed a new instrument for the treatment of enuresis by the application of conditioning principles (Crosby, 1950). Crosby's method differed from Mowrer's in two major respects:

- (a) an electrode attached to the genitals was used in place of the pad;
- (b) a mild electrical stimulus to the loin region was used in place of the bell.

Crosby claimed that his method differed in principle from Mowrer's, but it is interesting to note that he too was anticipated by a pediatrician.

In 1830 the pediatrician J. Nye, (Nye, 1830) outlined a proposed method for the treatment of enuresis as follows:
"Attach one pole of an electric battery to a moist sponge or a metallic plate fastened between the shoulders of the patient and the other to a dry sponge attached to the meatus urinarius."

"When this has been done and arranged so as not to annoy the patient, let him be put to bed and the circuit of the bed completed. The sound of the battery will soon lull the patient to sleep. While the sponge is dry, no electricity passes through the body of the patient, and his slumber is undisturbed, but the moment the patient begins to urinate, the sponge is moistened and becomes a conductor of electricity. The circuit is completed through the body of the patient and he or she is at once aroused, awakened and caught in the very act and thus caveat is entered by the will as well as by the electricity against further proceeding at least for this time. A repetition of a like experience a sufficient number of times ought, I am inclined to think, to cure the patient, but since this suggestion has occurred to me I have not had the opportunity of putting it to the test of practical experiment and submit it to the consideration of the profession for what it is worth*.

CHAPTER II.

THE MAJOR THEORIES OF ENURESIS AND THEIR
IMPLICATIONS FOR TREATMENT.

THE MAJOR THEORIES OF ENURESIS AND THEIR IMPLICATIONS
FOR TREATMENT.

The variety of methods of treating enuresis is matched by an equal variety of theories concerning the nature and causation of the condition.

Insofar as organic involvement is ruled out by definition, most theories of enuresis are psychological theories, in the sense that they attempt to account for the condition in terms of the child's reactions to his life circumstances.

These psychological theories fall into two major classes. Firstly there are the theories which regard enuresis as a symptom - of emotional disturbance. Secondly there are the theories which view enuresis as a habit deficiency - the acquisition of the faulty habit of bedwetting, or the failure to develop the desired habit pattern of control over urinary function.

Enuresis as a symptom of emotional disturbance.

The general view of enuresis as a symptom of emotional conflict has been stated forcibly by Michaels (1939). This author quotes Dorlands Medical Dictionary definition of a symptom -- "any evidence of a disease or a patient's condition indicative of some bodily or mental state". (p. 629)

He points out that "enuresis is always regarded in psycho-analysis as a symptom of a deeper underlying disorder", (p. 629) and criticizes " the monosymptomatic point of view which considers the bladder of the child to the neglect or avoidance of the total personality" (p. 631).

This latter view is considered characteristic of "the approach of the academic psychologist with his apparatus", which is posed against the approach of "the medical psychologist with his clinical experience". According to Michaels, the clinical point of view, the psycho-biological approach, attaches fundamental causal importance to the deep seated patterns of the child-parent relationship which are "moulded from birth due to the complex interplay of unconscious forces from both sides" (p. 633).

Many of the specific "symptom" theories of enuresis take the form of highly speculative interpretations based on psycho-analytic symbolism. For example, Robertiello (1956) considers that in a case analysed by him, enuresis "represented a cooling of the penis, the fire of which was condemned by the super-ego".

According to de Pichon (1951) enuresis represents an attempt to escape a masochistic situation and to expel outwards the destructive tendencies by way of considering urine to be a corrosive liquid and the penis a dangerous weapon.

Inhof (1957) suggests that usually enuresis expresses a demand for love, and it may be a form of weeping through the bladder.

Mowrer (1950) has attempted to sub-divide writers who view enuresis as a symptom in the psychiatric sense according to whether they conceive of enuresis as (a) a substitute form of gratification of repressed genital sexuality, (b) a direct manifestation of deep-seated anxieties and fears, or (c) a disguised form of hostility toward parents or parent substitutes which the victim does not dare to express openly.

However, these interpretations are by no means mutually exclusive, and all three possibilities would be recognized by most psychoanalytically oriented clinicians. Thus the conception of enuresis as a form of sexual gratification, which was first stated explicitly by Freud (1916), is consistent with the psychoanalytic emphasis on the role of elimination in the developing sexuality of the child. In these terms enuresis is a regressive phenomenon. However, regressive processes are set in motion as a consequence of intense anxiety following repression. Furthermore, anxiety has its source in tabooed impulses of a sexual or aggressive and hostile character.

From the foregoing it can be seen that the differences between the theoretical sub-types are in no sense critical.

They are simply differences in emphasis which usually have no specific implications for therapy. Consequently these theories can conveniently be considered as a unity.

Enuresis as a habit deficiency.

Possibly Mowrer (1938) is the best known exponent of the point of view that in the majority of cases enuresis may be regarded as a simple habit deficiency. According to Mowrer "there is a relatively large group of enuretic children in whom faulty habit training is the predominant, perhaps exclusive, causal factor" (p 456).

Mowrer is supported by Morgan and Witmer (1939), who believe that the ordinary continence training process serves to teach the child to respond to bladder stimulation by awakening. The child thus learns to substitute a toilet action for bedwetting and when this learning fails to take place, enuresis results.

Campbell (1934), after an exhaustive clinical study of 330 enuretics, put forward the view that despite the frequent presence of some degree of pathology of the urinary system, bedwetting is a habit condition in nine cases out of ten.

Smith (1948) regards bedwetting as an incorrect habit which results from inefficient toilet training and becomes

fixated as a consequence of the atmosphere of anxiety and frustration it engenders.

Crosby (1950) has argued strongly for his view that what he terms simple enuresis is a continuation into childhood of the automatic bladder reflexes of infancy.

In the case of the complicated type of enuresis, on the other hand, the child has acquired habits of urinating during sleep in response to specific environmental conditions. Both types of enuresis are ascribed to faulty training procedures.

From the foregoing it can be seen that theorists who accept the habit deficiency view of enuresis have usually turned to an analysis of environmental conditions of learning in attempting to elucidate the aetiology of the condition. In particular, the methods of toilet training employed by parents have received detailed attention.

However, it is entirely consistent with this type of theory to consider internal conditions which may be inimical to efficient learning. A possible internal condition of this character is the presence of what might be termed "nervous tension".

Most habit deficiency theorists have recognized explicitly that in a small minority of cases enuresis may represent a disruption of normal habit patterns as a consequence of severe psychological stress. (Crosby e.g. explicitly excludes from his category of essential enuresis all cases in which there is "significant psychological defect".) In other cases nervous tension may be present to a degree sufficient to prevent the learning of bladder control at a time when such control is normally achieved.

Nevertheless it is considered that in the great majority of cases enuresis exists as a relatively isolated habit pattern which is not significant of generalized psychological disturbance.

When enuresis results from breakdown of the previous habit of continence, the breakdown can usually be ascribed to failure to establish this habit sufficiently strongly rather than to unusual psychological stress. Thus it is considered that any general maladjustment in enuretics is usually a secondary reaction to the fact of being enuretic with all its social implications.

There is a further internal condition of possible aetiological significance which has not been discussed in the literature.* This might be referred to as the general level

* It has recently been referred to by Jones (1960).

of conditionability of the subject. In his extensive investigations of conditioning, Pavlov (1927) repeatedly found striking individual differences in conditionability among his experimental animals. Some animals formed conditioned reflexes very rapidly, and, once formed, these reflexes showed remarkable resistance to extinction. In other animals conditioned reflexes were established with difficulty, and, once formed, were readily extinguished. Pavlov ascribed these and other individual characteristics to differences in "nervous type" which was defined in terms of the strength, balance and lability of the nervous processes of excitation and inhibition.

Recent work by Eysenck (1957) and his associates and by Spence (1956) and others has confirmed the existence of marked differences in the capacity of human subjects to form conditioned eye blinks and conditioned galvanic skin reflexes. Eysenck has attributed these differences to different degrees of inhibition in the nervous system which he links in turn with differences on the extraversion-introversion personality dimension. (These differences in learning capacity do not necessarily carry over into more complex learning tasks).

It is possible that most enuretics owe their disability at least in part to low levels of conditionability.

A final internal condition, or set of conditions of importance, comprise those influences which act directly on the nervous system in such a way as to retard the development of new temporary linkages or conditioning. These include prolonged fatigue, inter-current infections and the like.

Implications for treatment.

The major theories of enuresis discussed have important implications for treatment.

According to the first type of theory, psychotherapy, aimed at improvement in the child's general adjustment, should be the method of choice in the treatment of enuresis. Wexberg (1940) has stated the position clearly. He says that it is necessary to think of enuresis as being a disturbance of the total personality. Because of this it is therefore important to direct treatment towards the individual primarily and towards the enuresis secondarily.

Any attempt to treat enuresis directly is considered highly undesirable as it can be expected to result in an exacerbation of the underlying conflict with the emergence of substitute symptoms or greatly increased anxiety.

Decurtins (1957) suggests that the substitute symptoms may sometimes be more harmful than the enuresis, and lists as examples severe neuroses, compulsive fire setting and premature ejaculation.

From the second theoretical viewpoint, general psychotherapy is looked upon as likely to yield little result as it does not afford the conditions necessary for the required specific learning to take place.

Specific treatment utilizing conditioning principles is considered the only method which can be relied upon to provide the required conditions for learning bladder control during sleep. In a minority of cases this treatment may need to be supplemented by drugs which increase conditionability and/or psychotherapy and environmental manipulation to reduce nervous tension. It would be predicted that no undesirable personality changes would follow reasonably intelligent application of conditioning treatment.

On the contrary, because any emotional disturbance in the enuretic child is likely to be secondary to the enuresis rather than primary, any personality changes following successful conditioning treatment would tend to be beneficial rather than harmful.

TABLE 1.

MAIN FEATURES OF HABIT DEFICIENCY AND SYMPTOM
THEORIES OF ENURESIS.

Habit Deficiency Theory.

Process of normal continence development.

Acquisition of simple learned response of sphincter inhibition by process of conditioning.

Nature of enuresis in majority of cases.

Failure to establish response of sphincter inhibition sufficiently strongly.

Aetiology of enuresis.

In majority of cases: Absence of environmental conditions ordinarily necessary for learning to occur, and/or low level of conditionability.

In minority of cases: Presence of condition ordinarily inimical to efficient learning or productive of breakdown of previously established linkages (e.g. "nervous tension").

Treatment of choice.

Conditioning by special apparatus, plus in minority of cases ancillary drug treatment or removal of conditions inimical to efficient learning.

View of psychotherapeutic treatment.

Useless in majority of cases.

Possibly useful in minority of cases to reduce nervous tension.

Symptom of emotional disturbance theory.

Process of normal continence development.

No specification of process.

Nature of enuresis in majority of cases.

Symptom of emotional disturbance of general character.

Aetiology of enuresis.

Psychological conflict or stress.

Treatment of choice.

Psychotherapy to remove underlying emotional disturbance.

View of conditioning treatment.

Symptomatic treatment, useless as only treatment - likely to be positively harmful in production of emotional crisis or substitute symptom formation.

The important features of the two major theories of enuresis and their contradictory implications for treatment are summarized in Table 1. The evidence bearing on the points of conflict between the two theories can conveniently be considered in relation to two specific questions:

- (a) is there acceptable evidence of the efficacy of either general psychotherapy or direct conditioning methods in the treatment of enuresis?
- (b) if direct conditioning methods are effective in bringing about a cessation of enuresis, is there evidence that undesirable personality changes accompany the use of these methods?

In examining the evidence relating to the first question, the problem of the base line against which to compare the incidence of recovery in treated cases must be given careful consideration. This problem has been discussed by Hebb (1949) and Eysenck (1952). As these writers have noted, it seems generally to have been assumed that the validity of psychoanalysis as a theory, and its efficacy as a method of treating neurotic disorders, have been amply demonstrated by clinical evidence.

Thus many papers have been written attesting that after a period of psychoanalytic treatment often lasting several years, a high proportion of severe neurotics show a remission of symptoms sufficient to constitute a cure. However these findings could in no way be regarded as conclusive as long as there was no available evidence concerning the rate of remission in a comparable group of untreated patients.

Clearly, the ideal procedure would be to use a suitably matched control group of untreated patients in any investigation of the efficacy of psychotherapeutic procedures. However, failing the availability of such control group data, an approximate base line for comparison can be derived from estimates of the spontaneous remission rates of neurotics in general.

According to Eysenck, (1957) published reports suggest that "spontaneous remission" and non-psychotherapeutic treatment produce improvements in neurotic disorders which follow an exponential curve, the formula for which is:

$$X = 100 (1 - 100^{-0.00435N})$$

where X stands for the amount of improvements achieved in per cent and N for the number of weeks elapsed. He observes that psychotherapy does not appear to improve on this rate. The approximate nature of such a base line for assessment of the effects of treatment of neurotic disorders is obvious.

The range of differences among neurotics in terms of type and severity of disturbance and resistance to treatment is known to be very wide. Furthermore, it is well recognized that there is a relationship between type of neurosis and response to treatment (e.g. hysterics are in general more susceptible to treatment than obsessive-compulsives) although differential diagnosis is often difficult.

Finally, generally acceptable criteria of cure have yet to be established in the case of neurotic disorders. Under these circumstances an estimated rate of recovery for untreated neurotics in general may or may not be a reasonable base line against which to evaluate the efficacy of treatment administered to any particular sample of neurotics.

The difficulties in the case of enuresis are much less formidable. Here the disturbance is clear cut and definite. Furthermore, criteria for the prediction of response to treatment have been found difficult to establish. Among the criteria suggested have been age of the child (Dibden and Holmes 1955), wet since birth V. relapse after becoming dry (Seigel 1952), intermittent V. consistent wetting (Geppert 1953), family history of bed wetting, sex of child (Martin and Kubly 1955).

However, many of the associations reported between such variables and measurements of treatment response have not been statistically significant. Others have been barely significant and in some cases the findings of various authors have been inconsistent or contradictory. Thus Dibden and Holmes found that children over nine years of age were more difficult to cure whereas Martin and Kubly found no relation between age and ease of cure.

Seigel found the most difficult cases to be those who had previously been dry over an interval of $1\frac{1}{2}$ to 5 years, but then became enuretic, whereas Geppert states that sporadic wetters are most resistant to treatment. (Treatment in all these cases was by direct conditioning methods.)

These results suggest that any one sample of enuretics is not likely to differ markedly from any other sample in terms of susceptibility to treatment.

Hence a sufficiently reliable estimate of the incidence of bedwetting in the general population at the various age levels should provide a reasonable base line of recovery resulting from no treatment, or the usual medical and folk methods of treatment against which to evaluate therapy given to any particular sample

of enuretics.

The estimated age incidence curve shown in Figure 1 provides such a base line. From this curve the recovery rates between various age levels in the absence of psychotherapy or conditioning treatment have been estimated. The results are shown in Table 2.

The percentage recovery rate over a 12 month period falls from 25 per cent between the ages of 3 and 4 years to 16 per cent between the ages of 11 and 12 years.

These rates are considerably less than those obtained from Eysenck's curve of spontaneous recovery from neurotic illness. (Eysenck's recovery rate over 12 months is approximately 40%.) This means that the task of demonstrating the efficacy of a particular form of treatment is much less difficult in the case of enuresis than in the case of neurotic disorders.

Table 2.

Approximate percentage "spontaneous recovery" rates
among enuretics between various age limits.

Age Limits in Years	Percentage Recovery Rate during 12 month period.
3 - 4	25
4 - 5	23
5 - 6	21
6 - 7	19
7 - 8	19
8 - 9	18
9 - 10	18
10 - 11	17
11 - 12	16

CHAPTER III.

THE RESULTS OF PSYCHOTHERAPEUTIC
AND CONDITIONING METHODS OF TREATMENT.

THE RESULTS OF PSYCHOTHERAPY.

As Behrle et al. (1956) have noted, there is a remarkable lack of information on the results of psychiatric treatment of enuresis. It is perhaps understandable that there should be a lack of published results of psychotherapeutic treatment of enuresis. Although the disorder is distressing to the sufferer and his family, it is not incapacitating, and probably few parents would be willing to give the time and money necessary for private psychotherapy. Furthermore, in the public and semi-public clinics the case load is usually so heavy that intensive and prolonged psychotherapy is reserved for the most incapacitating disturbances.

Although most writers who discuss methods of treatment state their approval of psychotherapy, (often asserting that it is the only possible method) most of them merely assert its effectiveness in general terms or cite in detail the successful treatment of a single case.

One exception is Hamill (1929) who gives details of his conception of the nature of enuresis, the form of psychotherapy which derives from this conception, and the results of treatment of a group of patients. According to Hamill, enuresis is a

conduct disorder which results from inadequate toilet training at the critical period of 2-3 years. The bedwetting can be stopped when the child so desires. It is of prime importance that the child should assume responsibility for its conduct during sleep and this depends in large measure on the entente established between the physician and the child.

In treatment, the first step is to establish a friendly relation with the child (a "bridge permitting the passage of ideas from adult to child".) Then the attempt is made to get the child to accept the idea that he can stop wetting if he wants to and to inculcate in him the desire to do so.

Hamill reports the responses of 55 children with whom it was possible to continue treatment. Of this number, 40, or 72%, stopped wetting the bed entirely. Some improvement was noted in a further 19 cases; two relapsed after becoming dry, and only nine were unimproved.

The age range of these patients was from just over 3 years to almost 13 years. The duration of treatment is not stated.

Slokvis (1954) reports on his use of group psychotherapy with four boys in Holland, aged 12-15 years. All had lost their parents when young. One admitted fractitious wetting. In the case of all four boys the response was remarkably rapid as "after

the first session, bedwetting which until then had been almost a nightly occurrence, was suddenly reduced to sporadic instances". (p. 266). After six months the boys were all completely dry and had remained so after a period of two years.

Kreigman and Wright (1947) achieved good results with the brief psychotherapy of enuretics in the American Army. Twenty-five cases with an average age of 19.6 years were given an average of 5.4 treatment interviews. Nineteen had been continuous bedwetters since birth. The other six were intermittent wetters. Treatment was aimed at helping the soldiers to obtain independence and maturity. As with Hamill (1929) the idea that the patient could stop wetting if he wanted to, was stressed. There were 16 overall cures, four improvements and five failures. The follow-up period varied from 15 days to 5 months.

Bostock and Shackleton (1952) used psychological treatment to remove the frustration which they consider plays a large part in the genesis of enuresis. All except one of the cases cited were relapsed enuretics. Improvement of an unstated degree was achieved in all patients in a series of 16 cases.

De Ataide (1946) describes the treatment of 113 enuretic boys aged 5-15 years. Seventy-four of these were treated by

psychotherapy, re-education and water reduction. Thirteen cures and six cases of progress were recorded. Thirteen others were cured spontaneously just by being admitted to the institution. A further twenty-three boys were treated by psychotherapy and ephedrine. Of these seven were cured and eight improved. Finally sixteen patients received psychotherapy plus testicular hormone. In this group there were five cures and four were improved. Thus the combined cure rate for the 100 boys who received treatment was 25% and the rate of improvement was 18%. Again the length of treatment is not stated.

Conclusions regarding the effectiveness of psychotherapy.

The studies cited include all those abstracted in Psychological Abstracts between 1929 and 1959 in which a group of four or more patients was treated by psychotherapy. By any standards the evidence relating to psychotherapy as a means of treating enuresis is scanty indeed. Such evidence as there is raises difficulties of interpretation owing to certain deficiencies in the reports.

Hamill, (1929) for example, fails to specify in any detail the age distribution of his patients and he does not report the length of treatment. As a consequence it is impossible to establish a definite spontaneous recovery base line against which to evaluate

his treatment results. However, it seems unlikely that his sample included a grossly disproportionate number of 3-5 year old children, and it would appear from his discussion that treatment did not cover more than a six month period at the most. Hence the spontaneous recovery base line can be estimated conservatively from Fig. 1 to have been less than 10%. As Hamill's reported recovery rate of 72% is greatly in excess of this figure, his results would seem to point to the conclusion that psychotherapy is an effective method of treating enuresis.

If this conclusion is correct, it might reasonably be expected that in the thirty years following the publication of Hamill's report, confirmatory evidence sufficient to remove the issue from the realms of controversy, would have been forthcoming. However, little confirmation appears to be available.

Slokvis' (1954) evidence is of little value. Not only did one of his patients admit fractitious wetting, but the sudden reduction of wetting in the remaining three boys after the first treatment session suggests strongly that fractitious wetting occurred in these boys also. In any case a sample of four is insufficient to reject the null hypothesis of no effect even under the most favourable conditions.

Kreigman and Wright (1947) offer more substantial evidence. Their rate of cure with 25 adults (64%) appears clearly significant as the 5-6 interviews were presumably not spread over a period of more than three months. It is probably not co-incidental that the form of psychotherapy used by Kreigman and Wright closely resembled that of Hamill.

Bostock and Shackleton's report is another which is difficult to evaluate owing to inadequate presentation of data. Thus no criterion is offered of the "improvement" which was stated to have occurred in a series of 16 cases, nor is the basis for selecting the sample given. It is perhaps significant that after the publication of this report the authors turned with initial enthusiasm to a trial of conditioning methods of treatment. (Bostock 1954.)

The results of de Ataide (1946) are clearly at variance with those already discussed. He claimed only a 25% cure rate among 113 boys treated by him, and a spontaneous recovery rate of 12% immediately on admission to the institution was noted. Again the length of treatment and precise age composition of the sample are not given. However, unless it is argued that the adjuvant therapies (fluid restriction, ephedrine, re-education, and testicular hormone) prevented the successful use of psycho-

therapy, there is little suggestion that de Ataide's unspecified method of psychotherapy was effective.

The question which the foregoing review of the literature raises most forcibly is this: How many studies of the psychotherapeutic treatment of enuresis which yielded negative results have remained unpublished?

In view of the widespread acceptance of psychotherapeutic treatment of enuresis among psychiatrists and clinical psychologists it would seem almost inconceivable that so few systematic studies of this form of therapy have been carried out. However, it must be admitted that the absolute necessity of carrying out controlled investigations before any conclusions concerning the effectiveness of psychotherapy can be drawn, is not universally accepted among clinicians. Thus as recently as 1958 we find Davis (1958) in an address from the Chair to the Medical Section, British Psychological Society, stating in relation to the treatment of hysteria -

"It is generally assumed that psychotherapy based broadly on the suppositions enunciated by Breuer and Freud is effective in a wide range of cases. This assumption hardly comes into doubt, for there are now so many well-attested cases in which clinical improvement has taken place, or a hysterical symptom has disappeared, in close relation to the recall of traumatic

experiences. Such cases are commonplace and the assumption has been little, if at all, weakened by Eysenck's (1952) much discussed failure to demonstrate statistically in large pooled samples that "psychotherapy facilitates recovery from neurotic disorder". (p. 76)

It is here clearly implied that the accumulation of clinical cases in which disappearance of symptoms occurs during treatment constitutes sufficient evidence of the effectiveness of psychotherapy, and that such evidence is not to be expected if "large pooled samples" are studied. But the failure of large pooled samples to provide evidence could occur only if therapeutic failures and/or non-therapeutic cures also occur, and clearly both of these outcomes must be taken into account in assessing the effectiveness of any therapeutic procedure, psychological or otherwise.

It is true that there are circumstances under which a statistical analysis of results is unnecessary. Clearly, if the investigator is able to obtain such control over his subject matter that he can cause certain phenomena to appear, disappear, and vary in degree at will, statistical analysis is rendered superfluous.

In the therapeutic field this will ordinarily occur only in the case of fully reversible procedures producing temporary effects, i.e. procedures such as drug administration which enable the subject to return completely to his former state after a specifiable period. The situation with respect to psychotherapy is obviously otherwise. Not only are the procedures irreversible but response to treatment is ordinarily highly variable. Under these circumstances statistical comparison of group results is the only method which will enable valid conclusions to be drawn.*

In summary, it must be concluded that there are so few adequately reported studies of psychotherapy carried out with reasonably large groups of enuretics, that no firm conclusions regarding the effectiveness of this type of treatment can be drawn.

* It is to be noted that in neither of the studies which reported significant results from psychotherapy was the therapy of the type which aimed at correcting "underlying emotional conflicts". In both cases the therapy was highly directive and stressed the need for the patient to assume control over his wetting by "voluntary" effort.

Results of Treatment by Direct Conditioning Methods.

Mowrer Instrument.

The results of a number of studies of professionally supervised treatment with the Mowrer instrument have been reported and in addition several reports of commercial use of the technique are available.

In his original study Mowrer (1938) reports that all 30 children treated by his method reached the criterion of fourteen consecutive dry nights within two months of the commencement of treatment. Relapses are reported as having "sometimes occurred", usually in children who had to return to an unfavourable home environment after treatment in a children's centre. No mention is made of any further treatment in these cases.

Davidson and Douglass (1950) record treatment of a group of 20 chronic enuretics composed of 18 orphanage children and two adults with an age range of 5 - 30 years and a mean age of 11.4 years. Thirteen of the 20 reached a criterion of three weeks clear and had remained dry subsequently. The remaining five children showed substantial improvement, which was sustained in all but one case.

Sieger (1952) reports a high degree of success in the treatment of 106 cases with an age range of 2½ to 29 years.

After a follow-up period varying from 2 to 36 months, 89 cases had remained dry after a single treatment, five were dry after relapse and re-treatment, four had relapsed after initial arrest of wetting but had not been re-treated. In the remaining eight cases treatment was either unsuccessful or only partially successful. The period of treatment varied from one to 60 days with a mean of 14.5 days and a median of 14 days.

Geppert (1953) records treatment of 42 enuretics, 35 of whom had been wet since birth. A wide variety of corrective measures had previously been used without success. In 38 of the 42 patients enuresis was arrested in one to 15 weeks. Five of the 38 later relapsed, four of them responding promptly to further treatment.

Baller and Schalock (1956) used the pad and bell method in the treatment of 59 persons ranging in age from five to 26 years with a median age of 9.5 years. A complete follow-up enquiry was conducted 24-35 months (median 30 months) after cessation of treatment. Initial arrest of bed-wetting was achieved in 54 (92%) cases. Twenty-nine or 54% of the total group had remained dry over the period since treatment. Twenty-five or 48% of the initial arrests relapsed. Nine persons

were re-treated and had remained dry for 18 months at the time of the follow-up.

Behrle et al. (1956) treated 20 children who showed a wide range of emotional difficulties. After 18 to 39 months thirteen were found to have remained completely dry or had had no more than one wet bed per month following initial treatment. Six children responded initially with periods of dryness ranging from a few weeks to a few months before relapsing. Three of these were re-treated, two successfully and one unsuccessfully. Only one child failed to show any initial response to the treatment.

Wickes (1958) gives an account of the treatment of 100 intractable enuretics of whom 81 were boys. Seventy-four were aged 7 to 13, twelve were aged 14 to 17 and the remaining fourteen were under seven years. Fifty of the children responded rapidly and became completely dry, fifteen became almost completely dry, nine improved markedly but slowly and twenty-six failed to benefit from the treatment. From Wickes' account it appears that treatment was prematurely discontinued in at least three cases which he classified as failures. Nine of these in whom enuresis was arrested later relapsed but eight of these responded rapidly and completely to re-treatment.

Gillison and Skinner (1958) record the results of treatment of 100 enuretics aged $3\frac{1}{2}$ years to 21 years (64 males and 36 females). Of the 100 patients, 74 were reported as wetting the bed consistently every night. The remaining 26 were wet less frequently. All but eight had wet the bed since birth. Ninety of the 100 patients ceased wetting within 1-30 weeks. Fifty-three became dry in five weeks or under and 26 responded within 10 weeks. Of the patients classed as failures three had improved to the extent of having five or six dry nights per week. Eleven patients relapsed but became dry after a further course of treatment. Two others relapsed three or four times but responded to re-treatment on each occasion.

The authors note that "As there is no systematic follow-up scheme there may well be rather more relapses than here recorded, particularly of the mild or partial variety but, since all are invited to return if relapses ensue, and informal contact is often made between clinic workers and ex-patients, it is not thought that severe or complete relapses are much in excess of the figure given". (p. 1270)

Biering and Jespersen (1959) treated 21 children aged 5-17 years selected on the basis of absence of organic or grave emotional disturbances. At the time of follow-up, six months after treatment, 15 children were dry every night or were wetting

no more than once or twice per month, and six were unchanged or only slightly better. Three relapses occurred after more than six months.

Freyman (1959) was able to complete treatment with 14 cases. Of this number only one failed to respond initially. Three of the 13 successful cases subsequently relapsed during a period of more than 12 months.

The first report of the results of commercial use of the Mowrer technique were published by Martin and Kubly (1955). These authors analysed the responses to questionnaires sent to all persons who had purchased a conditioning apparatus for unsupervised use in the home over a period of 18 months. One hundred and eighteen of the 220 questionnaires were returned. Fifty-six per cent of the children, whose ages ranged from 3.5 to 18.5 years, could be classed as cured (three occurrences or less since the end of treatment). Of the remainder 12 per cent showed temporary improvement and 14 per cent were complete failures.

Jones (1960) received a personal report from Lowe (1959) on the commercial treatment of 769 cases ranging in age from five years to more than sixteen years. Jones has published the results in a table (Jones 1960, p.400) setting out the percentage of cases cured, markedly improved and failed. Unfortunately the

presentation of Lowe's results contains an error in that the total percentages add to more than 100. However, it seems likely that the entries in the markedly improved category should all be zero. If this is the case, 88 per cent of the two younger samples were cured and 12 per cent were failures, and 85 per cent of the sample aged 16+ years were cured and 15 per cent were failures.

In a personal communication to the author, Coote (1960) has reported on the results of the personally supervised service he offers in the homes of clients. In a series of 100 cases 90 per cent initial arrests were recorded. Parents were encouraged to report relapses as re-treatment at reduced rates was available. Ten per cent of the initial arrests were reported as having relapsed over a period of 12 months.

Crosby Dri-Nite.

Three investigations of the Crosby Dri-Nite instrument have been reported. Crosby's (1950) original study was made on fifty-eight enuretics with an age range of 3 years 8 months to 38 years and a mean age of 10 years. Complete initial success was achieved in 52 of the 58 cases. A small unspecified number of cases relapsed but responded to further treatment. There appears to have been only one outright failure, some improvement being effected in the remaining 5 cases.

In a follow-up of 26 cases treated by the Dri-Nite method, Dibden and Holmes (1955) found that 11 had remained dry since the initial arrest of enuresis, 12 had shown improvement and later relapsed and three cases were unimproved. The age range of these children was 6-15 years with a median age of eight years.

In an early report on the use of the Crosby instrument, Bostock (1954) gives details of the treatment of 12 intractable enuretics aged 7-15 years. Eight were relieved and four were unchanged, but treatment of one of the four failures had to be discontinued after two nights.

The median time of treatment was eight weeks, but this included two weeks after completion of treatment during which the instrument was left with the patient for reassurance. The follow-up period varied up to 20 months.

The results of the non-commercial studies of conditioning treatment outlined above are summarized in Table 3. Also shown are the results of the major psychotherapeutic investigations mentioned previously. Because of lack of detail in authors' reports some cells are unfilled and the values in others are queried.

TABLE 3. RESULTS OF TREATMENT BY MOWRER INSTRUMENT, CROSBY.

DRI-NITE AND PSYCHOTHERAPY.					
Investigator	No. of cases	Percent initial arrests	Percent initial failures	Percent relapses after arrest	Follow-up period in months.
MOWRER.					
Mowrer	30	100	0	7	7
Davidson and Douglass	20	75	25	13	5-9
Seiger	108	93	7	97	2-36
Geppert	42	90	10	13	7
Baller and Schalock	55	98	2	48	24-40
Behrle et al.	19	100	0	32	18-39
Wickes	100	65	35	14	7
Gillison and Skinner	100	90	10	14	4-12
Freyman	14	93	7	23	12-7
CROSBY DRI-NITE					
Crosby	58	90	10	87	6-30
Bostock	11	82	18	11	7-20
Dibden and Holmes	26	88	12	52	9-54
Biering and Jespersen*	21	717	297	207	6-7
Conditioning medians		90	10	147	7.5-33
PSYCHOTHERAPY					
Hamill	55	72	28	3	7
de Ataide	100	25	75	7	7
Kreigman and Wright	25	64	36	7	7.
Psychotherapy medians		64	36	7	7

* Biering and Jespersen used both Crosby and Mowrer instruments.

Conclusions regarding the effectiveness of conditioning treatment.

Although many of the studies reviewed are deficient in the reporting of significant detail, the available evidence strongly supports the conclusion that direct conditioning methods are highly effective in arresting bedwetting.

As shown in the summary of research reports presented in Table 3 the median rate of initial arrest of enuresis is 90 per cent. The base line of spontaneous recovery against which this rate of arrest must be compared can be estimated from Figure 1. In the great majority of cases the subjects were over six years of age and conditioning treatment was completed within eight weeks. Figure 1 shows that beyond six years of age the maximum rate of spontaneous recovery during a two-month period is about three per cent.

In these circumstances the effectiveness of the general procedure employed in conditioning treatment of enuresis would appear to be beyond question. However, the specific features of the treatment procedure which produce the therapeutic effect are not decided by this evidence.

In this connection it has been argued by some writers that the therapeutic factors must be sought in the entire setting of the treatment (which involves psychologist - parent - child - machine relationships) and not in the specific stimulus conditions produced by the apparatus itself.

Among the factors postulated are:

- (a) suggestion effects deriving from the combination of a prestige figure and an awe inspiring machine with the implication of magical therapeutic powers.
- (b) a pleasant change in the environment leading to a reduction in the usual tensions to which the child has been exposed.
(Michaels 1939)
- (c) the fascination of a new method of treatment. (Michaels 1939)
- (d) a new transference relationship between the psychologist and the child. (Michaels 1939)
- (e) the enthusiasm of the therapist. (Dibden and Holmes)

The implausibility of this type of explanation of the effectiveness of conditioning procedures is easily demonstrated.

- (1) the discrepancy between the 90 per cent arrest rate obtained by conditioning treatment, and that achieved by other methods, including prolonged explicit psychotherapy, is too great to be attributable to incidental psychotherapeutic effects.
- (2) the great majority of enuretics treated by conditioning methods have previously undergone, without benefit, a wide range of treatments including those involving relationships with sympathetic therapists of high prestige, such as general medical practitioners.

- (3) if a very weak stimulus only is used (e.g. buzzer without shock in the case of the Crosby apparatus) no therapeutic effect appears to be obtained. (Crosby 1950)
- (4) the response to treatment involving a progressive increase in the amount of urine retained before wetting, and a progressive decrease in the size of the wet spot, and requiring a total of 10-40 reinforcements in most cases, parallels the course of conditioning observed in a wide variety of situations.

In view of these considerations it may be concluded that the specific stimulus conditions provided by the conditioning instrument are responsible for the effectiveness of this type of treatment in bringing about an initial arrest of bedwetting.

However, the evidence concerning the rate of relapse after initial arrest is not as clear cut. In many of the reported studies the follow-up is far from adequate or covers a relatively short period.

It is apparent from Table 3 that the longer the follow-up period the higher the relapse rate tends to be. (The Spearman rank order correlation coefficient between reported relapse rate and minimum period of follow-up is $\pm .7$)

It thus appears likely that some of the least optimistic figures reported (30-40 per cent) are closer to the true value than is the median value of 14.

Several investigators have reported that relapsers, treated a second time, usually respond well to treatment and remain dry, but there has been no systematic study of the relapse problem.

CHAPTER IV.

THE GENERAL PSYCHOLOGICAL EFFECTS

OF DIRECT CONDITIONING TREATMENT.

THE GENERAL PSYCHOLOGICAL EFFECTS OF DIRECT CONDITIONING TREATMENT.

In view of the widespread belief among psychiatrists and psychiatrically oriented physicians that unfavourable personality changes are likely to result from the use of direct conditioning treatment, most investigators have been alert to the possibility of such effects. In the great majority of cases reliance has been placed on general observation of the child's behaviour, often carried out by the parent or guardian.

In the report of his early use of the direct conditioning method, Mowrer states that "personality changes, when any have occurred as a result of the application of the present method of treating enuresis, have uniformly been in a favourable direction. In no case has there been any evidence of "symptom substitution". (1950 - p. 410) No details are given of the methods of observation used, the persons making the observations, the types of personality changes observed or the frequency of such changes.

Morgan and Witmer (1939) also report favourable behavioural changes. They say "One interesting tendency noted among children given this training was the general improvement in their personality and behaviour". (p. 64) In the case of these authors the only details given refer to the nature of the changes noted.

"One subject became neater in her dress and appearance. Another was more eager to enter social activities and games. Another became much more responsible in his attitude. Another was reported to have become more self-reliant and eager to do things for himself". (p. 64)

Geppert (1953) notes in passing that 85 per cent of his 42 patients showed noticeable improvement in emotional stability and personality adjustment (p. 382). No instance of deleterious behavioural change was observed.

Baller and Schalock (1956) made a detailed personal enquiry about the effects of treatment on the emotional and social adjustment of their patients. Before and after treatment reports were secured from 25 parents who were asked to describe the play of the child, his peer adjustments, and his interpersonal relationships with adults. The same questions were asked before treatment and one to six months after the conclusion of treatment.

Twenty-four of the twenty-five cases were reported as showing positive behavioural changes. The main change was the apparent increase in self confidence and "pleasant disposition". Play orientation changed from younger children to the peer group. "Nervous tendencies, described as shyness, restlessness and lack

of concentration, and generalized anxiety were considered by the adult observers to have been greatly reduced". (p. 236)
Impressions formed by supervisors tended to confirm the parental judgements.

No apparent behaviour pathology or symptom substitution was observed following treatment, nor was there any evidence of other undesirable behavioural changes attributable to treatment.

Wickes (1958) comments on the 65 patients in his series who were cured by direct conditioning treatment as follows. "The marked improvement in the mental outlook of these cases was most gratifying. Several parents reported that their children were happier and more confident now that their enuresis had been eliminated. It is clear that a great deal of the associated anxiety was secondary to the enuresis and disappeared with it". (p. 163)

Gillison and Skinner (1958) report that "No adverse psychological effects, or substitute symptoms, have been observed either during or subsequent to treatment. Indeed, parents have spontaneously remarked how much brighter and happier the child has been since he became dry". (p. 1270)

The study of Behrle et al. (1956) was undertaken to evaluate the psychological as well as the therapeutic effects of the Mowrer

instrument. Their twenty children were given a battery of ability and personality tests, including the Rorschach and T A T, prior to beginning treatment.

In addition a history of the child's behaviour was obtained in an interview with the mother. At monthly intervals for six months after the completion of treatment the mothers were questioned about the behaviour of their children. Six months after treatment the psychological tests were re-administered. "Prior to treatment the 20 children showed a wide range of emotional difficulties as reflected by the psychological tests". Two appeared to be unusually free from emotional disturbance, 11 showed evidence of 'moderate' emotional difficulties and seven were seriously disturbed with definite neurotic patterns present.

The post-treatment questioning of mothers "revealed that approximately one-third of the mothers of children who had benefited from treatment in respect to their enuresis felt their children had gained in self-confidence, and were in general better emotionally adjusted than prior to treatment. None of the mothers whose children were considered to have failed to benefit from therapy could detect any appreciable change in their children, either for better or for worse". (p. 852-3)

Seventeen of the original twenty children were available for post-treatment testing. The test results indicated that of this number, seven had improved in emotional stability. The bedwetting of three of these seven had not been improved by treatment. Eight children showed no significant change on re-testing. All but one of these eight no longer wet the bed.

Two children showed an increase in emotional difficulties at the time of the second test. The authors acknowledge that in these cases the poorer adjustment may have resulted from treatment, but, in reviewing the circumstances, they offer their opinion that "it appeared more probable that a steadily deteriorating home environment was the causative factor". (p. 853)

Dibden and Holmes (1955) directed specific attention to possible personality changes in their follow-up study of 26 children treated by the Crosby instrument. The mothers of seven of the eleven cases cured reported that their children had become more confident and happy. No comments were made on two children and the remaining two were reported as showing adverse effects. Of the 12 children who relapsed after becoming dry, four were reported as happier and more confident when dry. No report was secured on five children and three were described as showing an adverse personality change after use of the instrument.

No information was available in the case of the three children who were unimproved.

The authors note that in two of the five cases in which undesirable behavioural effects were observed "other factors contributed and may have been wholly responsible" (p. 253) No child in the series developed a new symptom.

The authors conclude "The general impression is --- that the use of the apparatus has not been shown to be detrimental to the child". (p. 253)

Bostock (1954) also reports favourable changes in general adjustment following successful treatment with the Crosby instrument. He says "The improvement in the child's psychological condition after 'relief' of the enuresis has been a pleasing feature of many cases in this series. It varies from the child's being less troublesome to the statement of one parent who said that after the cure the child had suddenly 'grown up' and was no longer whining and petulant". (p. 142)

Biering and Jespersen (1959) investigated the influence of direct conditioning treatment on 21 enuretics aged 5-17 years. One of their aims was to determine whether any harmful

or favourable psychological effect of the treatment could be demonstrated. The psychological examination, carried out before treatment and six months after completion of treatment included administration of the Rorschach Test and Children's T A T, and interviews with both parents and children.

The general psychological condition was unchanged in eight cases, in nine cases it was better, and in four cases it was worse than before treatment. What the authors describe as adjustment to the environment was unchanged in 11 cases, better in eight cases and worse in two cases. No case of pathological emotional disturbance was observed.

Conclusions.

The findings of the studies reviewed may be summarized as follows:

- (a) No case of symptom substitution following direct conditioning treatment has yet been reported.
- (b) Almost all writers report that in a substantial minority of their cases at least an improvement in general adjustment appeared to follow successful treatment.
- (c) In a very small minority of cases a deterioration in general adjustment appears to have followed treatment, successful or otherwise.

These findings, on balance, constitute evidence against the theory of enuresis as a symptom of emotional disturbance, and favour the view that in the majority of cases enuresis is no more than a habit deficiency. In particular, the failure of investigators oriented to the symptom theory of enuresis to find any evidence of symptom substitution brings this theory into serious question.

Findings (b) and (c) also are more favourable to the habit deficiency theory than the symptom theory. Not only is the proportion of patients who have manifested improved post-treatment adjustment much larger than the proportion whose adjustment has worsened, but in the case of the latter group, possible causative factors other than treatment have frequently been obvious. However, the available evidence cannot be regarded as conclusive. In not a single case have the personality changes of the enuretic group been compared with those of a control group. The necessity for using the control group method in an investigation of the effects of any influence on general adjustment has been stressed in the discussion of the results of psychotherapy (Chapter III).

It is to be expected that the percentage of an untreated control group who show either positive or negative changes in

general adjustment over a period of say six months, will depend primarily on the extent of maladjustment in the group. Thus in a group of markedly maladjusted children a preponderance of positive changes would be expected. On the other hand, in a group of initially very well adjusted individuals, the proportion of negative changes might well exceed the proportion of positive changes.

Insofar as the great majority of enuretics whose behaviour has been observed were selected through the medium of clinics or institutions, it seems likely that they represent a group considerably more maladjusted than the general population of children or the general population of enuretics for that matter. Hence, in the absence of treatment, more positive than negative behavioural changes would be expected over a six months period, as was observed in the case of the treated enuretics reported on by Behrle (1956) and Bisring and Jespersen (1959).

From the foregoing analysis it would appear that ideally an investigation of possible deleterious effects, following conditioning treatment, should make use of an experimental group of enuretics with a restricted range of adjustment close to the population average. This would ensure that any possible undesirable effects would not be offset by positive changes occurring "spontaneously" or as the result of unknown influences.

The personality changes of this group should then be compared with those of an untreated control group of enuretics matched with the experimental group in terms of adjustment scores. The practical difficulties involved in obtaining such a control group of enuretics are likely to be considerable, and a non-enuretic control group comparable in basic adjustment with the enuretics should not be significantly inferior.

If the habit deficiency theory of enuresis is correct the required conditions could be met by random sampling from the two populations, enuretics and non-enuretics. The two samples thus obtained should not differ in basic adjustment although they might well differ in situational or reactive maladjustment.

In all of the studies of personality changes reviewed, except those of Behrle et al. (1956) and Biering and Jespersen (1959), reliance has been placed almost completely upon observations made of the child's behaviour by parents or guardians. Whilst the value of this sort of evidence is not to be denied, it seems highly desirable that it be supplemented by the results of objective psychological tests.

CHAPTER V.

THEORIES OF NORMAL CONTINENCE DEVELOPMENT
AND THE AETIOLOGY OF ENURESIS IN RELATION
TO CONDITIONING TREATMENT.

THEORIES OF NORMAL CONTINENCE DEVELOPMENT AND THE AETIOLOGY
OF ENURESIS IN RELATION TO CONDITIONING TREATMENT.

Both Mowrer (1938) and Crosby (1950) claim that their conditioning methods of treating enuresis reinforce conditioning processes which normally result in the development of continence in the young child. However, their conceptions of the conditioning processes involved differ considerably.

Mowrer's theory of continence development and the aetiology
of enuresis.

Mowrer recognizes that, in the absence of specific continence training, human infants would "sooner or later acquire sphincter control during sleep as well as at other times", since "no healthy member of any other mammalian species once past the age of infantile helplessness ordinarily soils itself during sleep". (1950, p. 393 footnote)

Nevertheless he believes that the development of continence is ordinarily facilitated by the training procedures practised in highly developed societies. The failure to produce continence, as in the case of bedwetting existing since birth, is attributed partly to haphazard use of inefficient procedures, and partly to the absence of the motivational conditions necessary for

learning. The absence of the required motivational conditions is a consequence of emotional conflict. The training procedure referred to by Mowrer is the practice of awakening the child once or more after a number of hours of sleep and putting it on the "pot" to urinate.

Mowrer gives a theoretical analysis of this nocturnal toilet training procedure, which he apparently believes is well-nigh universal in Western society, as follows:

"Insofar as the most common method of training in bladder control during sleep may be said to rest upon any definite psychological theory, it would appear to be this; that if the child is repeatedly awakened at a time when the bladder is partially filled, but not so distended as to produce reflex emptying, the attendant bladder stimulation will eventually become specifically associated with the response of awakening before the point has been reached at which voiding tends to occur automatically". (1950, p. 402)

The rationale of Mowrer's treatment method.

In accordance with his view of the processes of normal continence development, Mowrer views his treatment method as a refinement of conventional potting procedures. He writes, "On the assumption that this interpretation (of continence training) is correct, there now arises this important question: would it

not be advantageous from the point of view of most efficient habit formation if the awakening could always occur at a time when bladder distention is maximal and only at such a time, instead of at more or less arbitrarily determined intervals during the night when bladder filling may be at any of the various stages? If some arrangement could be provided so that the sleeping child would be awakened just after the onset of urination, and only at this time, the resulting association of bladder distention and the response of awakening and inhibiting further urination should provide precisely the form of training which would seem to be most appropriate". (1950 p.402)

Mowrer's instrument and procedure were designed to provide the required training conditions.

Crosby's theory of continence development and the aetiology of enuresis.

In common with Mowrer, Crosby (1950) believes that conditioning processes underly the development of nocturnal continence. However, unlike Mowrer he considers that in the absence of constraining factors the required conditioning normally takes place automatically as a result of necessary circumstances of the organism's existence. Consequently, special training procedures such as nocturnal "potting" are

unnecessary. Indeed, Crosby believes these procedures are often positively harmful in that they impede the operation of the normal processes of continence development.

Crosby describes the hypothetical process whereby nocturnal continence is normally developed as follows:

"I consider that the wet urinous state which I term 'somatic discomfort', acts as an inhibitory stimulus, and that this, at the onset of micturition, causes an unconditioned response tending to inhibit continuation of urination by inhibiting the detrusor and contracting the sphincter. Reinforcement of this inhibition from repeated soiling would be expected to produce a gradual increase in the tone of inhibition of the bladder, so that the volume of urine necessary to initiate urination would increase also. As the bladder fills, the inhibitory tone diminishes in prepotency over the increasing stimuli which travel over the afferent arm of the bladder reflex arc. At the same time, increasing bladder distention causes an increasing general bombardment of the brain, which tends to impinge on and disperse sleep... If the inhibitory tone is sufficiently prepotent, the discomfort of a filled bladder will disperse sleep before the bladder afferents initiate micturition as a reflex act". (1950, p. 536)

Thus the two conditions necessary for continence are achieved. "Firstly there must be inhibition of detrusor activity and micturition,

so that micturition does not occur too easily as a response to bladder volume. This inhibition together with the increasing anatomical capacity of the bladder as the child grows older, may allow the child to be continent all night without urinating if the volume in the bladder does not reach the threshold value which is necessary to initiate micturition. More than this is necessary for continence, so that secondly, this inhibition must remain prepotent over visceral afferent stimuli tending to initiate micturition until the discomfort of a filling bladder will disperse sleep, thus allowing the person to urinate voluntarily". (1950, p.535)

In support of the hypothesis that the somatic discomfort stimulus acts as an unconditioned inhibitor of the micturition response, Crosby cites (a) the observation that pinching of the tail sometimes interrupts micturition in a monkey after spinal transection, and that "micturition is imminent when (spinal) defaecation sets in is postponed";

(b) the fact that strong sensory stimuli will inhibit micturition in dogs which have had a dorsal transection of the cord;

(c) the discomfort evinced by an infant in the wet urinous state.

Crosby postulates three different processes which may prevent or retard the development of normal continence.

(a) "Conditioned responses to micturate can be acquired. These may interfere with or extinguish the somatic discomfort inhibition

of detrusor activity". (1950, p. 536)

(b) "Adaptation to many types of discomfort, including that of being soiled, can be rapidly attained during sleep as well as when awake". "The inhibition developed by somatic discomfort is liable to diminution and extinction as a result of adaptation to discomfort as well as by acquirement of conditional responses". (1950, p. 536)

(c) "In (the treatment of) enuresis the rate at which inhibition becomes prepotent seems to depend on the duration of the responses which initiate micturition, the length of adaptation to the wet state and the presence of nervous tension. Nervous tension in experimental animals always retards the development of conditioned responses, more especially inhibitory ones --- Pavlov --- found that neurosis extinguished conditioned responses and precluded the establishment of new responses" (1950, p. 451)

Crosby claims that this conception of the mechanism of enuresis is based upon his observations of the "urinary pattern" in his patients, i.e. the circumstances under which micturition during sleep occurred. He states that according to these observations enuretics fall into two main classes:

(a) those who urinate during sleep in response to such external stimuli as a door opening or the light being switched on, or who urinate at regular time intervals during the night (complicated type) and (b) those who urinate in response to a given degree

of bladder tension, (simple type).

The simple type is comparatively rare. It arises from adaptation of the somatic discomfort stimulus consequent upon repeated soiling, and responds to restriction of fluid for some hours before retiring. This usually allows the child to sleep through the night without wetting and facilitates "the establishment or restoration of a prepotent inhibitory tone".

The complicated type of essential enuresis will not respond to simple fluid restriction because the child micturates "compulsively" regardless of the degree of bladder tension. This type of enuresis, Crosby believes, is produced by nocturnal potting procedures. The practice of raising the child to urinate after several hours of sleep results in the development of a conditioned micturition response to the environmental stimuli associated with this procedure (noise of opening door, lighting up of room, etc.). If the mother raises the child at a particular time each night or at set intervals during the night, the child is likely to develop a conditioned time reflex (incorrectly referred to by Crosby as a "delayed conditioned response"), and thus to micturate at these periods in the absence of potting.

No evidence of these predicted relationships between the urinary pattern and toilet training history is presented.

Crosby acknowledges the role of organic pathology in producing enuresis in a small minority of cases but these are excluded by definition from the cases of "essential enuresis" with which he is concerned. He concedes that in a further small minority of cases, nervous tension is important in preventing the development of the inhibitory tone necessary for continence. He notes Pavlov's experience that "nervous tension always, in experimental animals retards the development of conditioned responses, more especially inhibitory ones". (1950, p. 539)

This leaves the great majority of cases of enuresis to be accounted for in terms of inappropriate night toilet training procedures, i.e. potting. He states "It (regular potting) is especially dangerous if the child is not properly woken", but gives no rationale for this view. Presumably he is here basing himself upon the oft-quoted belief that potting the child whilst it is in a state of partial sleep is likely to train it to urinate in its sleep.

The rationale of Crosby's treatment method.

In contrast to his detailed discussion of the aetiology of enuresis, Crosby's discussion of the principles underlying his method of treatment is extremely brief. He says, "The method of treatment used in this series aims at extinguishing any

conditioned responses which initiate micturition and at reinforcing the natural method of building up the "inhibitory" tone, which is considered necessary for continence. (1950, p. 538). No detailed description is given of the mechanism whereby extinction of conditioned micturition responses occurs during treatment, nor is the mechanism of building up inhibitory tone discussed. However, the electrical stimulus to the loin region clearly is designed as an analogue of the "somatic discomfort stimulus".

Diurnal toilet training procedures in relation to enuresis.

Numerous writers have claimed that the method of diurnal toilet training is an important factor in the aetiology of enuresis. Some of the earlier workers believed that insufficient training pre-disposed to enuresis, but more recently harsh or coercive training methods have come to be regarded as aetiologically significant. (Huschka, 1943; Bostock and Shackleton, 1952; Dibden and Holmes, 1955.)

Huschka (1943) in supporting this viewpoint, used the term coercive to denote methods which were over-active or otherwise destructive psychologically. The use of physical punishment and/or scolding, shaming, arousing disgust etc., qualified as coercive training, but in the absence of these components, beginning training before the age of 10 months was considered coercive.

Bostock and Shackleton (1952) concluded that "rigid" toilet training, including both early training and physical or psychological pressure, tended to produce enuresis in combination with frustration due to parental rejection. However, in a later publication (1956), these writers implicated only early training after studying a number of enuretics whose training had not been otherwise coercive.

The mechanism whereby diurnal toilet training procedures might be supposed to interfere with the development of nocturnal continence has not been discussed in detail. Nevertheless it seems clear that the writers who attach aetiological significance to coercive procedures, believe that these methods operate to produce emotional disturbance which makes use of enuresis as a form of expression.

In this connection Huschka (1943, p. 259) draws attention to the frequency with which clinicians "find the enuretic child unconsciously using urine as a destructive agent directed towards those whom he wishes to punish".

From the point of view of the habit deficiency theory of enuresis, coercive diurnal training procedures would be considered likely to predispose to enuresis only if they gave rise chronically

to a high degree of nervous tension which could interfere with the elaboration of the necessary "temporary linkages". (Pavlov, 1927). The probability of this situation arising in any significant numbers is not great. In any case the studies reporting a relationship between coercive training and enuresis have lacked adequate control data from normal children and hence cannot be regarded as offering conclusive evidence in favour of the hypothesis.

Conclusions.

The theories of continence elaborated by Mowrer and Crosby to provide a logical basis for conditioning treatment of enuresis are in important respects contradictory, despite the fact that both authors appeal to the principles of conditioning.

Thus, whereas for Mowrer nocturnal potting procedures play an essential part in continence development, Crosby believes that these procedures may often predispose to enuresis. At the present time there appears to be so little soundly established knowledge of the processes of continence development, and the role of toilet training, that neither theory is supported or contradicted by relevant evidence.

Whilst the use of conditioning methods of treating enuresis

may be justified on purely empirical grounds, the case for conditioning therapy would undoubtedly be strengthened if it could be demonstrated that conditioning plays an essential role in the normal development of continence. In particular it would appear to be of primary importance to elucidate the role of toilet training, both nocturnal and diurnal.

Among the many research questions which suggest themselves, the following should be readily amenable to investigation.

- (1) Do human infants in highly developed societies become continent in the absence of specific toilet training procedures?
- (2) If continence can be developed "naturally", do toilet training procedures accelerate the process?
- (3) Do some enuretics micturate at set intervals during the night, and if so, are these intervals related to the potting routine employed by the parents?
- (4) Is enuresis more likely to develop if the child is not fully awakened before night potting?
- (5) Is the age at which diurnal toilet training commences related to the occurrence of enuresis?

CHAPTER VI.

THE MECHANISM OF CONDITIONING TREATMENT AND ITS RELATION
TO INSTRUMENTAL DESIGN AND PROCEDURE.

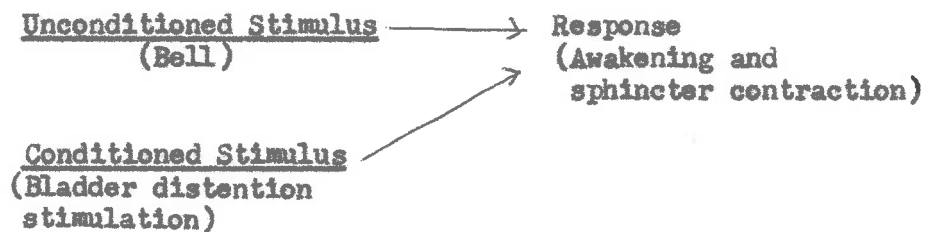
THE MECHANISM OF CONDITIONING TREATMENT AND ITS RELATION
TO INSTRUMENTAL DESIGN AND PROCEDURE.

Since Crosby's paper, other writers who have discussed the mechanism of conditioning treatment (Martin and Kubly 1955, Eysenck, 1957, Jones, 1960) have accepted the essentials of Mowrer's analysis.

As a consequence instrumental design and technique, other than those of Crosby, remain essentially as Mowrer described them. It would appear that a re-examination of the mechanism of conditioning treatment in the light of advances in the experimental investigation of conditioning and learning is long overdue.

Although their conceptions of the conditioning treatment process differ, both Mowrer and Crosby make use of the classical conditioning model.

For Mowrer, (1938) the process of conditioning treatment may be represented schematically thus:



In accordance with the classical conditioning paradigm, repeated conjunction of the adequate or unconditioned stimulus (ringing of the bell) and the previously indifferent stimulus (bladder distention stimulation), results in the bladder stimulus acquiring the capacity to elicit the response (awakening and sphincter contraction). Stimulation from bladder distention thus becomes a conditioned stimulus for the conditioned response of awakening and sphincter contraction.

Crosby (1950), does not describe in detail the conditioning process by means of which he believes his instrument produces its effect, but he makes reference to Pavlov's experiments, and he clearly has the classical model in mind.

As Place (1954) has pointed out, the conditioning treatment situation differs from the usual classical conditioning situation in one important respect. In the classical conditioning situation, if the conditioned response is elicited a number of times without being accompanied by the unconditioned stimulus, the tendency for the conditioned stimulus to elicit the response gradually diminishes (the phenomenon of experimental extinction).

Applying this principle to the situation in hand, we should expect that if the bladder tension stimulus elicits the inhibition of urination on a number of occasions without the occurrence of the bell, its tendency to elicit that response will be

weakened Following the analogy of classical conditioning, therefore, we should expect that the conditioned response in this case would become extinguished as soon as it began to develop. (p. 31-32)

Place goes on to suggest that the process of conditioning treatment follows the instrumental avoidance rather than the classical Pavlovian pattern. In instrumental avoidance conditioning, the unconditioned stimulus (electric shock or other aversive stimulus) is not applied if the response occurs with a sufficiently short latency.

In this case the non-appearance of the unconditioned stimulus does not result in the rapid occurrence of experimental extinction. On the contrary, avoidance of the unconditioned stimulus appears to reinforce the conditioned response so that under favourable conditions this response may be extremely difficult to extinguish.

In these terms the bell of the Mowrer apparatus and the electrical stimulus used by Crosby are aversive stimuli which provide the basis for the development of a conditioned avoidance response of awakening and sphincter contraction. The permanent continence following successful use of these instruments is thus accounted for.

Place continued to think of bladder distention stimulation as the conditioned stimulus and did not suggest any implications of his analysis for treatment practice.

On closer examination the response to treatment appears to have the characteristics of Konorski's conditioned reflex Type II, Variety III,* rather than those of the more usual conditioned avoidance response. (Konorski, 1948) The paradigm experiment for the Type II, Variety III conditioned reflex is as follows:

Passive flexion of a dog's foreleg is followed by electric shock to the limb. After a number of conjunctions of flexion and shock, the dog strenuously resists any attempt to flex the limb and executes the antagonistic response of extension. In this case the conditioned stimulus is provided by the pattern of kinaesthetic stimuli accompanying the movement of flexion, and extension is the response which avoids the noxious stimulus.

Analysing the conditioning treatment of enuresis in these terms we have the following:

The contraction of the detrusor and relaxation of the sphincter when micturition occurs are followed by the noxious stimulus, electric shock or loud noise. After a number of such conjunctions, the stimuli arising from detrusor contraction,

* Termed by Mowrer (1960) a "passive avoidance response".

sphincter relaxation and the passage of urine become the conditioned stimuli for the antagonistic response of sphincter contraction and detrusor relaxation which avoids the aversive stimulus. In other words, the conditioned stimulus is not bladder distention stimulation but the pattern of stimuli arising from the act of micturition. (This pattern of stimulation closely precedes the aversive stimulus and, being relatively sudden, is likely to be more readily discriminable than the relatively diffuse slowly developing stimulation arising from bladder distention.)

When conditioning reaches the stage where the first indication of this stimulation gives rise to the antagonistic response of sphincter contraction and detrusor relaxation, the child does not wet the bed and the aversive stimulus is avoided.

If this analysis is correct, it has a number of implications for practice. As the essential function of the unconditioned or aversive stimulus is to bring about a sudden relaxation of the detrusor and contraction of the sphincter, the response of awakening should not be critical and could even be entirely irrelevant.

Most writers, following Mowrer, have stressed the role of the awakening response in the treatment process. For example,

Martin and Kubly (1955) write as follows:- "In terms of conditioning theory, bladder tension is the conditioned stimulus, the bell is the unconditioned stimulus, and waking up is the response that is to be associated with bladder tension. As time goes by it is also hoped that the somewhat more temporally removed response of sphincter control will become associated with bladder tension, thus allowing the child to sleep through the night dry".

Mowrer himself emphasised the part played by the awakening response in treatment, although he was aware that inhibition of micturition could take place without the child awakening. Thus he writes (1950, p. 409) that "usually the ringing of the bell will inhibit further urination even though it does not waken the child". In describing the use of his apparatus in a separate publication (Mowrer, 1938a) he states further that "the ringing of the bell almost invariably inhibits further urination, and if at first it does not also waken the child it soon acquires the capacity to do so, providing the attending adult makes a practice of arousing the child while the bell is still ringing". (p. 164)

Mowrer (1950) also quotes Remy-Roux (1910) as making similar observations. It seems likely that any sudden and relatively intense stimulus will similarly inhibit micturition,

and as in terms of the present theory this is the essential function of the aversive stimulus, any such stimulus could be used effectively in the conditioning treatment of enuresis.

It follows that the resemblance of Crosby's electrical stimulus to the "somatic discomfort stimulus" gives it no therapeutic advantages, and as an electrical stimulus has obvious disadvantages, an auditory stimulus may well be preferable from a practical point of view.

Place (1954) has suggested that the shorter interval between the onset of micturition and the occurrence of the aversive stimulus, which is achieved by the use of Crosby's genital electrode, might make this arrangement more therapeutically effective.

Wolfe (1930, 1932) and Spooner and Kellogg (1947) working with finger withdrawal, and Reynolds (1945) and Kimble (1947) studying eye blink conditioning in human subjects, all found a CS onset - UCS onset interval of 400-500 milliseconds to give optimal conditioning of skeletal responses. In all cases the effectiveness of conditioning decreased with both shorter and longer intervals.

White and Schlosberg (1952) and Moeller (1953) obtained

surprisingly similar results with the conditioned galvanic skin response.

Of more relevance for the present problem, however, are the findings of Kamin (1954) and Brush, Brush and Solomon (1955). Kamin studied the effects of CS-UCS interval on traumatic avoidance learning in dogs, using a trace conditioning procedure. The CS duration was 2 seconds throughout and CS-UCS intervals of 5, 10, 20 and 40 seconds were used.

The general finding was that the trace procedure was less efficient in terms of both acquisition and extinction than the delayed procedure previously used, and this difference increased as CS-UCS interval increased.

Brush et al. carried out a similar experiment but used a delayed conditioning procedure and CS-UCS intervals of 1.5, 5, 10, 20, 40 and 80 seconds. They found no significant differences between these intervals in either acquisition or extinction measures. There is further evidence that in avoidance conditioning the CS-UCS interval is not as critical as in classical conditioning if the delayed procedure is used. This is provided by the fact that following Mowrer and Lamoreaux (1942) the use of a five second CS-UCS interval has become the usual practice in Mowrer box conditioning.

In terms of the present theoretical analysis, the process of conditioning treatment parallels delayed conditioning procedures in that the CS (stimulation from the act of micturition) continues to operate until the aversive stimulus occurs.

In the case of the Crosby genital electrode, the CS-UCS interval is probably of the order of 500 milliseconds whilst with a pad type electrode it may be as much as 2-3 seconds. This difference is probably insignificant in relation to the acquisition of the conditioned avoidance response of sphincter contraction.

However, the difference may be important in relation to the extinction of the avoidance response, or relapse following successful treatment. With the genital electrode the CS-UCS interval is likely to vary little from trial to trial. On the other hand this interval in all probability varies considerably when the pad electrode is used, depending on the postural attitude of the child when urination occurs, whether or not a full stream of urine is emitted etc.

There is now considerable evidence to show that varied delay in reinforcement results in greater resistance to extinction than does invariant delay in a number of conditioning and learning situations.

(Crum, Brown and Ritterman, 1951; Peterson, 1956; Logan, Beier and Kincaid, 1956; McNamara and Wickes, 1956).

The results of these experiments suggest that the genital electrode may be disadvantageous in relation to resistance to extinction or relapse.

In addition, the genital electrode has the practical disadvantage that it is cumbersome to use and is likely to be found distasteful by many parents and children.

In the standard avoidance learning situation the subject first learns to escape the noxious stimulus by making the appropriate response. (It is usually considered that this escape learning is reinforced by the reduction of painful stimulation which occurs when the response to be learned "turns off" the aversive stimulus.) Later the subject learns to perform the response in advance of the onset of the UCS and thus avoids the noxious stimulation.

In the case of both the Mowrer and Crosby instruments the noxious stimulus (bell or shock) continues to act until the attendant or the child switches it off manually. Thus the response to be learned (sphincter contraction) does not "turn off" the UCS. The effectiveness of these instruments in practice

suggests that it must be possible to develop an avoidance reaction in the absence of previous escape learning.

Mowrer (1950, p.280) reports a relevant experiment with rats in a shuttlebox. For one group the response of running to the opposite end of the box terminated the CS, but the UCS (electric shock) continued to act for a fixed period of ten seconds. These animals learned to avoid the UCS but the learning was slower than in the case of the standard escape procedure. As Mowrer puts it "Avoidance learning is most efficient when the response to be learned is a solution both to the shock and the fear aroused by the conditioned stimulus which is premonitory of shock". In a similar experiment Church and Solomon (1956) found that fewer animals learn to avoid when there is a delay in shock termination following a response during shock.

A number of studies have shown the facilitating effect on avoidance learning of response termination of the conditioned stimulus. According to the present analysis, response termination of the CS occurs with both the Crosby and the Mowrer instruments and is the essential basis of their therapeutic effectiveness. That is, the response to the aversive stimulus terminates the conditioned stimulus arising from sphincter relaxation and

urination. The stimulus of bladder distention, previously thought to be the CS, is not terminated by sphincter contraction. Hence if it were in fact the CS, the Mowrer and Crosby instruments would be expected to be very inefficient because sphincter contraction provides escape from neither the UCS nor the CS.

In the light of the foregoing considerations a conditioning instrument which provides for termination of the aversive stimulus by sphincter contraction should be more effective than existing instruments. To meet this requirement a modified auditory apparatus was developed.

Description of modified auditory apparatus. *

The apparatus makes use of a pad electrode^{**} and presents two auditory stimuli. The first of these is delivered by a 240V industrial warning signal, similar to a modern car hooter,

* For convenience, this apparatus is hereinafter referred to as the Twin Signal (see Appendix 1, p.209 for a description of the circuit and technical discussion.)

** The pads used were a special type designed and manufactured by P. Coote, Victoria.

with stepped attenuation to provide four output levels. This stimulus lasts for 800 m.s., and is followed by an interval of silence of one minute. After this period an ordinary buzzer operates continuously until it is switched off manually. Auditory stimuli were chosen because of (a) the relative simplicity and ease of control and (b) the absence of any attachment to the child.

The duration of the first loud stimulus, the hooter, was chosen to exceed slightly the latency plus the duration of the response of sphincter contraction. Thus this response would appear to provide escape from the aversive stimulus and should thus be more readily conditioned to the preceding stimulation arising from sphincter relaxation.

CHAPTER VII.

FIELD EXPERIMENT I.

FIELD EXPERIMENT I.

Experimental comparison of Twin Signal, Crosby and Mowrer
Instruments.

As the first of a series of experiments relating to conditioning methods of treating enuresis, an investigation of the comparative effectiveness of the Twin Signal, Crosby and Mowrer instruments was carried out.

METHOD.

Subjects.

The subjects were 36 enuretic children, 20 males and 16 females. Twelve subjects were drawn from each of three age groups, 6 - $7\frac{5}{12}$ years, $7\frac{1}{2}$ - $10\frac{5}{12}$ years, and $10\frac{1}{2}$ - 14 years.

These age bands were chosen to give approximately equivalent areas under the age/incidence curve shown in Figure 1. Hence the sample was representative of the population of enuretics, below the age of 14 years in terms of age distribution.

Most of the subjects were obtained by actively canvassing the mothers of children reported as enuretic in the student

administered questionnaire (See Chapter IX). The remainder were obtained by means of a circular letter to parents in a large State Primary School, or were referred by parents of previously treated children or by medical practitioners.

The only criteria for selection were:

- (a) freedom from organic involvement as determined by medical examination.
- (b) a bed wetting frequency of at least three times per week.
- (c) willingness of both parent and child to co-operate to the required degree.

Procedure.

Subjects of the same sex and age band were obtained in threes and were allocated at random to the treatment groups.

A history and standardized ratings of behaviour and problem tendencies were obtained from the parents and each child was given a number of personality tests. (See Chapter VIII before commencing treatment in the home.)

The parents and children were instructed in the use of the particular apparatus and as far as possible the child was encouraged to assume responsibility for the treatment.

Crosby's genital electrode was discarded and pad type electrodes were used with all three instruments. This step was taken because pilot runs had indicated that the rate of loss of subjects was likely to be high if the genital electrode was used, and because the main interest of the experiment centred around different types of stimulus.

The treatment was carried out in standard fashion including Mowrer's emphasis on awakening the child thoroughly with the bell still ringing.

In the case of the Twin Signal, parents were instructed to wait until the buzzer commenced before disturbing the child if he were not fully awakened by the hooter stimulus. (See Appendix 3 for detailed instructions supplied to parents). Close supervision over treatment was exercised by telephone conversations and home visits. Parents were required to record details of treatment on a standard form.

These included bed time, signal setting where applicable, time of self awakening in night, time woken by instrument, amount of urine passed in ounces, diameter of wet spot in inches, time of awakening in morning, and whether child was fully awakened, disturbed but not fully awakened or apparently undisturbed by the stimulus.

Weekly reports were phoned in by parents, when a duplicate of the record was filled out. Fluid intake was initially unrestricted but was increased if the child did not wet five times in the first week.

Treatment continued to a criterion of approximately 14 consecutive dry nights, including seven with increased fluid intake if child was sleeping right through the night after the seventh successive dry night. If the child was still self awakening on most of the first seven dry nights the fluid intake was not increased. A subject was considered a failure if the criterion had not been reached after 50 reinforcements or stimuli.

It was predicted that the Crosby instrument would be more effective than the Mowrer apparatus because of the greater aversiveness of the electrical stimulus, and that the Twin Signal would be more effective than either of the other two because of its provision for escape learning coupled with a strong stimulus.

Results.

Preliminary tests indicated that age was not significantly related to outcome of treatment. Consequently all age sub-groups

were combined for purposes of further analysis.

The results of the experimental comparison of the three instruments are presented in Table 4 which shows the number of reinforcements before arrest of wetting, i.e. the number of times the child received a stimulus on wetting, the time since treatment, and the period before breakdown occurred in the case of relapses. There is only one failure of initial arrest in the case of both the Crosby and Mowrer and none in the case of the Twin Signal. The median number of reinforcements for the Twin Signal is 14.5; for the Crosby the median is 20 and for the Mowrer it is 30.5.

In order to test the hypothesis that these samples were drawn from populations ordered in the predicted sequence, Twin Signal, Crosby, Mowrer, the Jonckheere non-parametric test of trend (Jonckheere 1954) was used. This test yielded an S value of 2.75 with an associated probability of less than .003.

Thus we may with some confidence accept the hypothesis of order in the parent populations and conclude that of the three instruments the Twin Signal is the most effective and the Mowrer is the least effective in bringing about an initial arrest of bed wetting.

TABLE 4.

Results of experimental comparison of Twin Signal,
Crosby and Mowrer Instruments.

Subject No.	Age Group.	Sex	No. of Stimuli Relapsed		Months since
			to arrest	after ? months treatment	
<u>TWIN SIGNAL</u>					
1	7½-10	M	6		44
2	10-14	M	7		37
3	6-7½	M	10	12	38
4	6-7½	F	11		45
5	10-14	F	12		31
6	7½-10	M	14	9	
7	7½-10	F	15		35
8	6-7½	M	17	5	
9	10-14	F	18		32
10	7½-10	M	25	2	
11	6-7½	F	28	3	
12	10-14	M	44		31
Median 14.5					
<u>CROSBY DRI-NITE</u>					
1	7½-10	M	8	3	
2	10-14	M	9		31
3	7½-10	F	10		33
4	7½-10	M	18	10	42
5	10-14	F	18		32
6	6-7½	M	19	4	
7	7½-10	M	21		31
8	6-7½	F	24	1	
9	6-7½	M	24		37
10	10-14	M	28	2	
11	10-14	F	46		31
12	6-7½	F	50		
Median 20.0					
<u>MOWRER</u>					
1	10-14	F	11		32
2	10-14	F	14		31
3	7½-10	F	16		34
4	7½-10	M	21	11	
5	6-7½	M	24	8	
6	10-14	M	30	2	
7	6-7½	F	31		43
8	7½-10	M	36		34
9	7½-10	M	37		46
10	6-7½	F	38	1	
11	10-14	M	46		31
12	6-7½	M	50		
Median 30.5					

The relapse rates are high for all three instruments with a slight and insignificant difference in favour of the Mowrer.

The results relating to the rate of conditioning appear to be consistent with the proposed analysis of the treatment process. In particular the clear cut difference between the Mowrer and Twin Signal instruments supports this analysis. However, it is possible that this difference is not due to the presence or absence of escape training, but simply reflects the difference in the intensity of the training stimuli. Several experiments have shown that there is an optimum intensity of the noxious stimulus for at least some types of avoidance learning, with both lower and higher intensities resulting in decreased rates of learning. It may be that the hooter is closer to the optimum intensity than is the bell.

On the other hand it is possible that the advantage of the Twin Signal is a function of both escape training and increased stimulus intensity and that the intermediate position of the Dri-Nite results from the greater intensity of the shock stimulus compared with the bell.

The failure to find greater resistance to extinction with the Twin Signal instrument appears at

first sight to contradict the analysis. If the Twin Signal provides more efficient conditions for learning, this should be reflected not only in the rate of conditioning, but in resistance to extinction also. This was in fact the expectation when the instrument was designed. However, recent work on avoidance conditioning in animals indicates that efficiency in acquisition is not necessarily related to resistance to extinction.

Brush (1957) and Kimble (1955) working with dogs and rats respectively, have investigated the effects of a wide range of intensities of shock on the acquisition and extinction of avoidance responses. In both cases shock intensity was found to be significantly related to acquisition with weak shocks resulting in slower learning and fewer animals reaching the criterion. However, in neither case was shock intensity significantly related to resistance to extinction. The tentative conclusion which might be reached from these experiments appears to be that conditions which are sufficient to support avoidance learning in the first place will be sufficient to maintain it subsequently.

This conclusion poses a problem for theories of avoidance learning based on secondary drive reduction. If the maintenance of avoidance responding depends on the secondary drive reduction which follows response termination of the conditioned stimulus,

it follows that this drive reduction, and hence resistance to extinction, should be greater when the CS has been paired with strong rather than weak shock during training. The need for further investigation in this area is clear.

Critical evidence in favour of the hypothesis that the awakening response is inessential in the treatment process was obtained from one Twin Signal subject who slept on apparently undisturbed by the hooter on each occasion, but who nevertheless ceased wetting after 17 reinforcements.

Many other subjects failed to awaken on several occasions but in each case the sphincter inhibition induced by the hooter remained prepotent over the emptying reflex during the interval of silence before the buzzer came on.

There is further suggestive evidence for the hypothesis that stimulation from the act of urination itself becomes the conditioned avoidance stimulus. This is provided by the very marked reduction in the size of the wet spot on the pad which usually takes place in the course of treatment before the subject becomes dry. Typically the wet spot is 6 - 12 inches in diameter initially, but in many cases the diameter is reduced to one or two inches before wetting is arrested. (Figure 2)

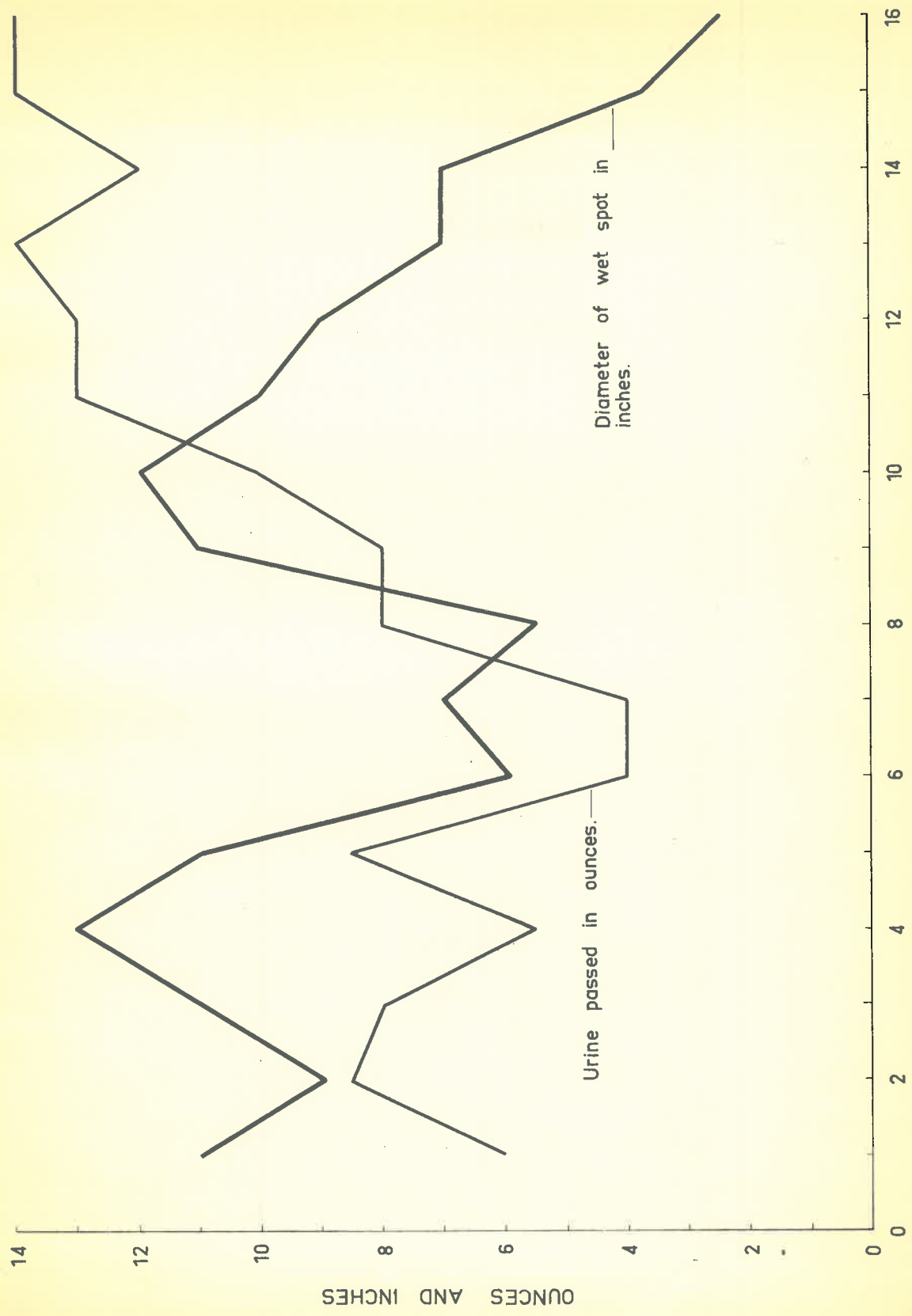


Fig. 2 DATA FROM FIRST SUBJECT TREATED BY TWIN SIGNAL INSTRUMENT.

This has usually been interpreted as indicating increased speed of response to the stimulus. However, tests involving voluntary urination on the pad, by a boy of eight years, have shown that a wet spot of 12 inches represents about the minimum amount of urine which is passed when a full stream is interrupted by the stimulus. Therefore spots as small as one or two inches (usually occurring with a fuller bladder than at commencement of treatment), suggest that the sphincter must be closing almost as soon as it opens in the late stages of treatment.

From the point of view of practice, the overall results suggest that the disadvantages of the Crosby apparatus, in relation to auditory methods are not offset by greater therapeutic effectiveness. These disadvantages of the Crosby instrument are as follows:

- (1) Fear of the apparatus on the part of the child. In the present experiment the treatment of two Dri-Nite subjects had to be discontinued because of excessive fear reactions. This did not occur at all in the case of the auditory instruments. Some parents also have an irrational attitude towards electric shock which reduces their willingness to co-operate. Some of these mothers seem quite unable to discriminate between being hooked up to a dry cell and being hooked up to the 240V mains.

(2) There is the possibility of the child sustaining burns if the shock electrodes are not properly attached. Three subjects of the present experiment sustained corrosive burns in the region of the shock electrodes. This problem was subsequently overcome by the careful use of electrode jelly.

It is unlikely that the genital electrodes would have proven significantly more effective than the pad electrode and in any case the use of this electrode makes very heavy demands on parental co-operation as well as being distasteful to many parents and enuretics. Almost invariably parents prefer the pad electrode.

The Twin Signal instrument appears to offer worthwhile advantages over the Mowrer apparatus. It is clearly more rapid in action and there is the possibility that it may eliminate wetting in a higher proportion of cases although the present evidence is not conclusive on this point. Also, contrary perhaps to initial expectation, there appears to be less likelihood of fear reactions to this instrument. There were some initial fear reactions to the Mowrer instrument but none to the Twin Signal. This is apparently because the stimulus has ceased by the time the child awakens if he awakens fully at all.

CHAPTER VIII.

THE INVESTIGATION OF THE GENERAL PSYCHOLOGICAL

EFFECTS OF CONDITIONING TREATMENT.

THE INVESTIGATION OF THE GENERAL PSYCHOLOGICAL
EFFECTS OF CONDITIONING TREATMENT.

Recent reviews of personality testing (Vernon, 1953, Eysenck, 1959) have underlined the difficulty of obtaining reliable and valid assessments of the degree of maladjustment in adults under the most favourable conditions. The difficulties in the case of children are even more pronounced.

As a guide to the selection of the most suitable tests for the present purposes, a number of criteria were established.

- (1) As far as possible the tests (or very similar ones) must have been shown by previous work to have a reasonable degree of reliability and empirical validity.
- (2) The tests must permit objective scoring by a person without special training.
- (3) Tentative norms at least should be available for all tests if possible.
- (4) The battery should include both direct and indirect (concealed purpose) techniques and if possible more than one observer (e.g. child himself and parent or teacher).
- (5) The tests should provide a measure of the degree of general neuroticism or emotional disturbance present in the child.

as well as the degree of reactive or situationally determined anxiety or maladjustment.

The first four of these criteria are straightforward but the fifth requires some comment. This criterion was included on the following grounds. As previously noted, according to the symptom theory of enuresis, the enuretic population can be expected to manifest a much greater degree of general neuroticism or emotional disturbance than the non-enuretic population. According to the specific habit deficiency theory any such difference should be small.

Hence, one test of the deductions made from the two theories requires a measure of general emotional disturbance or neurotic tendency. In addition, the specific deficiency theory of enuresis predicts that enuretics will be differentiated from non-enuretics in reactive maladjustment which is a secondary effect of enuresis. This is likely to take the form of a general lack of self-confidence or feeling of inferiority and is likely to be ameliorated by clearing up of the enuresis. Hence in order to test this prediction a test which taps the reactive aspects of maladjustment is required. Application of these five criteria resulted in the selection of five tests, two self report tests, three parent report scales and one projective test.

Description of Tests.

Social Under-valuation Test.

The first self-report technique selected was the Social Under-valuation Test, (S U V), one of a battery used by Sanders (1948) to measure social maladjustment in children. Sanders found this test to be a strong selector of children with largely conscious mental insecurity based on feelings of social under-valuation. It was less successful in separating children with apparently deep-seated nervous disabilities.

The test consists of 20 statements evaluative of self and social relations made by specifically named children of the same sex as the testee. The items are administered individually (see Appendix for full instructions) and the child's response is scored in terms of the extent to which he declares himself to be like the child in question. Points are allotted as follows:-

- Exactly like child - 3 points.
- A bit like child - 2 points.
- Not like child at all - 0 points.

The total points from all the items represent the child's

score of the test. The items are as follows:

- (1) Some members of my family aren't fair to me.
- (2) No-one ever praises me.
- (3) People often think I'm queer.
- (4) The others are always trying to make fun of me.
- (5) Teachers try to make out I can't read as well as other boys.
- (6) I don't think the other boys like me.
- (7) Everyone tries to make out that I'm not clever.
- (8) No-one ever gives me presents.
- (9) I'm often a failure.
- (10) The others tell lies about me.
- (11) I've hardly any friends at all.
- (12) My teachers are always complaining about my arithmetic.
- (13) I'm always being scolded or punished by someone.
- (14) I'm never allowed to do anything I want to do when I'm at home.
- (15) I never seem to be allowed to keep anything of my own.
- (16) Teachers reckon I can't spell.
- (17) I'm always being blamed for other people's faults.
- (18) The others are always calling me names.
- (19) I'm not allowed to play when I want to.
- (20) Teachers always hurry me too much with my schoolwork.

The S U V test was selected as a measure of the "lack of self confidence" which on the habit deficiency theory of

enuresis would be expected to be the main personality characteristic differentiating enuretic and non-enuretic children. Sanders (1948) reports a corrected split half reliability coefficient of .89 for the S U V. This value was obtained from a group of 50 boys attending Child Guidance Clinics. The scores of these boys together with those of 100 boys from London schools are available.

Neurotic Inventory.

The second self report test was made up of twenty items derived from the Minnesota Multiphasic Personality Inventory and the Maudsley Medical Questionnaire. These items, which were judged to be suitable for children of 8 - 12 years, were presented in the same form as the S U V test items. Most of the items, which are reproduced below, relate to anxiety and psychosomatic symptoms. This test was included as a measure of the more clearly neurotic tendencies likely to be missed by the S U V test, although there is obviously some degree of overlapping with the S U V. With adult subjects, tests of this type have been shown to have split half reliabilities of the order of .90, and reasonable empirical validities in differentiating abnormal persons from normals. (Stouffer, 1950, Vernon, 1953, Eysenck, 1959.)

Since the present study was initiated Castenada, McCandless and Palermo (1956) have published a Childrens' Form of the Manifest Anxiety Scale, (MAS). These authors obtained test-retest reliability coefficients ranging from .7 to .94 when the children's scale was given to fourth, fifth and sixth grade children with a period of one week between test and retest.

The items of the Neurotic Inventory are as follows:

- (1) Almost every day something happens to frighten me.
- (2) I get a lot of headaches.
- (3) In school I find it very hard to talk in front of the class.
- (4) At times I have very much wanted to leave home.
- (5) I'm not likely to speak to people until they speak to me.
- (6) I often feel sick in the stomach.
- (7) I worry quite a bit about things which may happen.
- (8) I often do things which I'm sorry about afterwards.
- (9) Most of the time I feel down in the dumps.
- (10) I hardly ever enjoy my meals because most times I'm not hungry.
- (11) I dream nearly every night.
- (12) I often find myself worrying about something.
- (13) I often get a stomach ache.
- (14) I wish I could be as happy as other boys.
- (15) I've often been punished for nothing.

- (16) I often have some sort of ache or pain.
- (17) I seem to be frightened of more things than my friends are.
- (18) I wish I wasn't so shy.
- (19) Most mornings I'm still tired when I wake up.
- (20) I'm unhappy most of the time.

Behaviour Rating Scale.

A Behaviour Rating Scale was modified from the Haggerty-Olson-Wickman Behaviour Rating Schedules (Olson, 1930) for use with parents rather than teachers. Olson required teachers to rate a group of children on a series of graphic scales for 35 characteristics.

The children had previously been assessed for degree of maladjustment, and by determining the numbers of well and poorly adjusted children who were given each particular rating, a maladjustment index was derived for that rating. The total indices calculated from all his ratings then represented a child's maladjustment score, larger scores indicating greater maladjustment.

Olson (1930) has reported detailed studies of the reliability and validity of the Behaviour Rating Scale. Repeated ratings of elementary school children by the same teacher yielded average correlations of .86. Split half reliability coefficients

in three studies averaged about .9. The reliability between raters was found to be best represented by the value .60 for a group of junior high school children.

Scores on the scale correlated .62 (.73 corrected for attenuation) with a record of the behaviour problems of children in seven different schools. Clinical validation of the scale revealed that cases referred to a Child Guidance Clinic were differentiated significantly from the general school population. In the present application this scale had the very important advantage that parents were not asked to rate degrees of psychological disturbance as such. Rather they were required to rate the child on a number of widely recognized general personality characteristics which were relatively free from connotations of social approval or disapproval.

However, in order to increase the acceptability of the scale, 15 items were omitted, including such questions as "Is he rude or courteous?", "Is his personality attractive?". (The complete scale instructions are contained in Appendix 5)

Extraversion Scale.

The second rating scale was an extraversion scale. This scale was included because of the relationship postulated by

Eysenck between extraversion and conditionability.

According to Eysenck (1957) the personality dimension which is most closely related to conditionability is extraversion. This dimension is in turn related to the speed with which inhibition and excitation are generated in the nervous system, the strength of these processes, and the speed with which inhibition dissipates. The extravert generates strong inhibitory potentials quickly and dissipates them slowly. Excitatory potentials are generated slowly and weakly, and hence the extravert conditions poorly. If enuresis results essentially from a failure to develop inhibitory control of the bladder by a process of conditioning, it seems reasonable to believe that this failure may result, at least in part, from a poor level of conditionability among enuretics. Hence a group of enuretics would be expected to be more extraverted than a comparable group of non-enuretics.

As there is no children's form of Eysenck's E scale, it was necessary to construct such a scale. For this purpose the 20 items of the Behaviour Rating Scale were examined for similarity to the items of the E scale. Ten of the items were selected and scored for extraversion on a five point scale of 0 - 4, giving a possible score range of 0 - 40.

The items selected were as follows;

- (1) Is his attention sustained?

- (2) What is his output of physical energy?
 - (3) Is he quiet or talkative?
 - (4) What are his social habits?
 - (5) Is he shy or bold in social relationships?
 - (6) Is he easily discouraged or persistent?
 - (7) Is he generally depressed or cheerful?
 - (8) How does he react to frustrations or to unpleasant situations?
 - (9) Is he emotionally calm or excitable?
 - (10) Does he act impulsively or cautiously?
- (For details of the rating system see Appendix 6)

Behaviour Problem Record.

As a second measure of general adjustment based on parent's observations, a Behaviour Problem Record was used. This consisted of a list of 15 behaviour problems frequently mentioned in the literature as being associated with enuresis. The parent was asked to indicate on a four point scale the extent to which any of the behaviours listed had been a problem with her child over the last year or two. The four points of the scale were scored 0 (no occurrence) to 3 (frequent occurrence). The total score on the test was simply the arithmetical sum of the scores on all the items giving a range of possible scores from 0 - 45.

The behaviour problems were as follows:-

- (1) Marked over-activity.
- (2) Temper outbursts.
- (3) Speech difficulties.
- (4) Imaginative lying.
- (5) Stealing.
- (6) Night terrors.
- (7) Nail biting.
- (8) Eating difficulties.
- (9) Aches and pains.
- (10) Stomach upsets.
- (11) Anxieties and Fears.
- (12) Restlessness and Fidgetting.
- (13) Irritability.
- (14) Destructiveness.
- (15) Tics or nervous twitches.

Movie Story Test.

The final measure of general adjustment used was a projective story telling test called the Movie Story Test, (Lovibond, 1952). This technique requires the subject to imagine and tell the story of "home movies" involving specified social relationships. For example, if material is required on mother-child

relationships, the child is told that the characters in the movie are a Boy/Girl and his/her Mother/Father, etc. (see Appendix 8 for full instructions.) The "home movie" setting is designed to provide an acceptable context for fantasy production.

It is assumed that in the circumstances of the test the child will be under strong pressure to interact symbolically with his/her own life situation in order to structure the immediate situation, and that in this process of symbolic role playing any conflict in the area of social relations in question is likely to direct the course of fantasy. Hence the stories may be interpreted almost literally as representing the subject's inner reflection of his own social relationships.

In the present use of the test the two themes - boy/girl/mother and boy/girl/father - were used. Scoring was in terms of eleven previously derived empirical categories. (See Appendix 9.) These categories express degrees of positive or negative feeling towards the parent concerned ranging from 1, high degree of positive feeling, to 11, high degree of negative feeling. A child's overall score is the sum of the categories given to each of his stories, with a score range of 2 - 22.

Lovibond (1952) has presented some evidence of the



reliability of this test, but evidence of its validity is lacking. Inasmuch as there has been an almost total failure to demonstrate adequate reliability and validity for projective tests generally, the inclusion of this test requires justification. It was included on two grounds:-

- (a) Despite the evidence, most clinicians appear to believe that projective tests reveal significant aspects of personality adjustment which are not touched by other types of test. Consequently an important group of psychologists is likely to be unconvinced by the results of any testing programme which makes no use of projective techniques.
- (b) The M S T, unlike most projective tests is not necessarily tied to psychodynamic theory, but can be given a rationale in terms of general behaviour theory.

The test battery was given initially to a group of 30 enuretic children and a group of 30 non-enuretics. The enuretics were those treated in the experimental investigations of conditioning methods whose ages ranged from 8 - 12 years. Initial arrest of the enuresis occurred in all cases.

As reported earlier, the first members of this group were obtained by incidental sampling among the acquaintances of Psychology I students. Additions to the sample were later

obtained primarily among acquaintances of the first group of parents. A further six cases were referred by friends of the investigator and general medical practitioners.

The non-enuretic group was obtained from the rolls of a large primary school attended by children with a wide range of socio-economic backgrounds.

The first child appearing on the rolls who matched a particular enuretic in terms of age, sex, school class and socio-economic background was selected. The children so selected were tested individually in the school and the ratings were obtained from the mothers during home visits. Only one mother refused to co-operate and her child was replaced in the group. Twentyfive matched pairs of enuretics and non-enuretics were available for re-testing.

Twelve of the enuretic group were re-tested approximately 3 months after the completion of treatment and the remaining thirteen were re-tested 12 - 18 months after treatment. Eight had relapsed and had undergone successful re-treatment by the time of re-testing. The non-enuretics were re-tested after comparable time intervals. Only the tests which made use of the child as observer were administered on the second occasion. These were the Social Undervaluation Test, the Neuretic Inventory and

the Movie Story Test.

Results of Personality Testing.

Adequacy of Scales as measuring instruments.

Inasmuch as there existed no external criterion against which to check the validity of the scales used, tests of the adequacy of the scales as measuring instruments were necessarily based on criteria of internal consistency.

Product moment split half reliability co-efficients were computed for all of the scales except the M S T, for which it was inappropriate. A tetrachoric retest co-efficient was computed for the M S T.

The co-efficients are shown separately for the enuretic and non-enuretic groups in Table 5.

TABLE 5. RELIABILITY CO-EFFICIENTS OF INITIAL TESTS.

<u>Test.</u>	<u>Split Half.</u>		<u>Test - Retest.</u>	
	<u>Enuretic.</u>	<u>Non-Enuretic.</u>	<u>Enuretic</u>	<u>Non-Enuretic.</u>
S U V	.88	.90	-	-
N I	.76	.90	-	-
B P R	.36	.30	-	-
B R S	.80	.78	-	-
M S T	-	-	.41(rtet)	.46(rtet)
E	.12	.67	-	-

The split half reliability co-efficients of the three 20 item tests (S U V, NI and B R S) range from .76 to .90 for the two groups. These reliabilities can be regarded as reasonably satisfactory for childrens' tests.

The co-efficients of .88 and .90 for the S U V are almost identical with that obtained originally by Sanders (1948).

The N I scale is equally reliable for the non-enuretic group, but the co-efficient is lower for the enuretics.

The B R S, as might be expected, is less reliable than the original 35 item form.

The co-efficients for the B P R are very much lower than those obtained by Olson (1930). The number of items (15) is the same as in the original scale, although the content of some items has been changed. It is possible that the mothers of the present study were not as objective in their reporting as were Olson's school teachers.

The test - retest reliability co-efficient of the remaining test of adjustment, the M S T, is very low. Whilst the changed retest scores may, to some degree, result from changes in the children's family situations, they are probably due primarily to the unreliability which seems to be characteristic of projective

tests in general (Eysenck 1957).

The E scale reliability co-efficient obtained from the non-enuretic group (.67) is not unduly low for a 10 item test, but the same scale is almost completely unreliable for the enuretic group. Inasmuch as no other reliability co-efficient differs appreciably between enuretics and non-enuretics, this finding suggests a personality difference between the two groups.

An examination of the item content suggested the hypothesis that four of the ten items were reflecting situational or reactive maladjustment in the enuretic group. These were the three odd number items, quiet/talkative, shy/bold in social relations, depressed/cheerful; and the even number item dealing with social habits. A colleague, asked independently to select the "reactive" items, chose the same four.

It was hypothesized that the enuretic group were the more extraverted, but were answering the above four items in the introverted direction because of reactive maladjustment. Hence the enuretics were expected to be more introverted than the non-enuretics on the four reactive items, but more extraverted on the remaining six items.

The mean scores of both groups on all items were computed

to test this prediction. The results are shown in Table 6.

TABLE 6. TOTAL SCORES OF ENURETIC AND NON-ENURETIC GROUPS ON E SCALE ITEMS.

Item No.	<u>Reactive Items</u>				<u>Non-reactive Items.</u>					
	3	4	5	7	1	2	6	8	9	10
Enuretic Scores	47	49	43	7	52	22	51	62	18	53
Non-enuretic "	54	63	62	18	39	44	37	57	20	56
Difference	7	14	19	11	13	22	14	5	2	3
Prediction *	+	+	+	+	+	-	+	+	-	-
	Total + differences = 83.				Total - differences = 27.					

All four reactive items show considerable differences in the predicted direction. Three of the non-reactive item scores conform to prediction and three do not. In only one case of failure of prediction (item 5) is the difference large. A Mann Whitney test on the ranks of the differences yielded a P value of .04 for a one tailed test.

The data thus supports the hypothesis that the reactive

* Correct predictions are indicated by a plus sign, incorrect predictions by a minus sign.

maladjustment of the enuretics is responsible for the lack of reliability of the E scale with these subjects.

As a further check on the hypothesis that the enuretic group differed from the non-enuretic group only in terms of situational maladjustment, product moment inter-correlations between initial test scores were computed. On the reactive maladjustment hypothesis, similar patterns of inter-correlations were expected in the two groups with the possible exception of lower correlations between S U V and other measures for the enuretic group.

The inter-correlations are shown in Table 7.

TABLE 7. INTER-CORRELATIONS BETWEEN INITIAL TEST SCORES OF

<u>NON-ENURETICS AND ENURETICS.</u>				
<u>Non-enuretics.</u>				
	<u>N I</u>	<u>B P R</u>	<u>B R S</u>	<u>E</u>
S U V	.76	.20	.04	.10
N I		.22	.01	.36
B P R			.40	.47
B R S				.72
<u>Enuretics.</u>				
	<u>N I</u>	<u>B P R</u>	<u>B R S</u>	<u>E</u>
S U V	.65	.18	.12	-
N I		.02	.12	-
B P R			.53	-
B R S				-

The E scale is included for the non-enuretic group only as this scale was not sufficiently reliable for the enuretic group to make inter-correlations worth computing.

It is clear from Table 7 that the inter-correlations are virtually the same for both groups on all measures, adding further weight to the reactive-maladjustment hypothesis.

The two self-report tests correlate rather highly with each other and scarcely at all with the rating measures. The two scales based on ratings by the parents also inter-correlate positively. When the co-efficient is corrected for the attenuation resulting from the low reliability of the B P R, the value obtained is .72. This value is almost identical with the .73 reported by Olson (1930).

The E scale correlates insignificantly with S U V. The correlation with N I is higher but is also insignificant. However, E has a positive correlation with B R S which is only slightly lower than the reliability co-efficient of the latter scale.

Inasmuch as extraversion has been shown by Eysenck (1957) to be independent of adjustment/maladjustment, this finding suggests that either the present E scale is a poor measure of

the E dimension, or the B R S is a poor measure of maladjustment.

In order to explore possible reasons for the lack of independence of E and B R S, mean B R S maladjustment ratings for each of the four categories of E were computed over the 10 items. The results are presented in Table 8.

TABLE 8. MEAN B R S MALADJUSTMENT RATINGS OF E CATEGORIES.

E Category	0	1	2	3	4
Mean Rating	2.7	1.7	1.7	2.4	4.9

It can be seen from Table 8 that extraverted responses are associated with higher ratings than are introverted responses. This suggests that the B R S is primarily a measure of maladjusted patterns of an extraverted kind.

Hence, since the responses of enuretics to some items tend in an introverted direction as a result of reactive maladjustment, it would be expected that the B R S would tend to under-estimate the maladjustment present in these subjects.

Comparison of Initial Test Scores.

The means and standard deviations of the scores of the enuretic and non-enuretic groups on the initial tests are shown in Table 9 with the associated t test probabilities.

TABLE 9. INITIAL TEST SCORES OF ENURETICS AND NON-ENURETICS.

	Enuretics		Non-Enuretics.		P. (t test)
	Mean	S.D.	Mean	S.D.	
S U V	16.8	9.5	13.8	10.8	>.3
N I	20.3	8.3	19.4	12.2	>.7
B P R	7.1	3.6	7.4	4.1	>.7
B R S	41.0	9.8	45.1	10.2	>.1
M S T	10.4	4.1	10.6	3.1	>.5
E	16.3	2.9	18.2	6.4	>.2

Although the scores of the two groups do not differ significantly on any single initial test, the whole pattern of initial test scores is consistent with the hypothesis that the enuretics differ from the non-enuretics only in the degree of reactive maladjustment present.

The scores of the enuretics are higher on the S U V and lower on the B R S and the E scale. The S U V was chosen as a measure of reactive maladjustment, and it has been demonstrated that reactive maladjustment would tend to depress the scores of the enuretics on the B R S and the E scale.

The score differences between the two groups on the remaining tests, N I, B P R and M S T are negligible.

Comparison of retest scores.

The reactive maladjustment hypothesis receives its most striking confirmation from the retest scores shown in Table 10.

TABLE 10. RETEST SCORES OF ENURETICS AND NON-ENURETICS AND CHANGES FROM INITIAL TEST SCORES.

Test.	<u>Enuretics</u>		<u>Non-enuretics.</u>		Diff. of diff. P (t test)
	Retest Mean	Mean Change	Retest Mean	Mean Change	
S U V	9.3	-7.5	13.6	-0.2	< .001
N I	16.1	-4.2	19.4	0	< .01
M S T	8.5	-1.9	8.8	-1.8	< .5

As there were no significant differences between the scores of children retested after three months and those retested after 12-18 months, the retest scores of the total enuretic and non-enuretic groups were used for purposes of analysis. The t test was used to test the significance of (a) changes in mean test scores on re-test, and (b) the difference of the differences between the test and re-test mean scores of the two groups.

The mean re-test scores of the non-enuretics are virtually identical with the initial mean scores of this group on both the S U V and the N I. On the third test, the M S T, the scores of the non-enuretics show a decrease on retest which approaches significance. (P = .06).

In the case of the enuretics there is a significant reduction in retest scores on all three tests. The S U V scores show the most marked change, but the N I scores are also reduced substantially.

Tests of the significance of the disparity of the differences between the initial and retest scores of the two groups yield very low probabilities in the case of the two self report tests, S U V and N I. In the case of the M S T the probability is high.

It seems likely that the reduction of the enuretics' re-test scores on both self report tests to a point well below the level of the control group is a reflection of a general euphoria, which often seems to follow successful treatment and which is reported by mothers as a marked increase in self confidence.

Conclusions.

Considered as a whole, the test data constitute formidable evidence in favour of the specific habit deficiency theory of enuresis and against the symptom theory. Contrary to the symptom theory, the enuretics are not significantly more maladjusted on any of a variety of reasonably

adequate tests.

On the other hand, the initial score patterns, initial score inter-correlations and retest scores strongly suggest that the enuretics differ from the non-enuretics only in terms of reactive maladjustment as predicted by the specific habit deficiency theory of enuresis.

CHAPTER IX.

THE ENURESIS SURVEY.

THE ENURESIS SURVEY.

Among the research questions raised in the foregoing chapters, there are many which can be answered only by survey data obtained from relatively large numbers of subjects. This applies particularly to problems concerning the relationship between various aspects of toilet training and enuresis.

The survey method offers the further possibility of obtaining information concerning the attitudes of parents towards conditioning treatment in general, and types of instrument in particular.

Accordingly, a survey type enquiry was undertaken with mothers of both enuretic and non-enuretic children.

The Survey Sample.

As the total universe of enuretics in a given regional population is not available, the various methods of probability sampling are inapplicable. Under these circumstances the ideal method of obtaining comparable groups of enuretics and non-enuretics would be to study an entire population large enough to ensure that a minimum number of enuretics would be obtained. Comparisons of enuretics and non enuretics within the total group could then be made.

As there were insufficient resources available to use this method in the present instance, it was decided to use a type of incidental sampling which, as far as could be judged, offered a minimum likelihood of introducing bias of consequence.

Each student in the Psychology I class in the University of Adelaide, over a period of two years, was required to administer personally to at least one respondent an appropriate survey questionnaire as part of the practical course of study.

Students were asked to select as respondents mothers of either enuretic or non-enuretic children known to them with preference being given to mothers in the unskilled and skilled socio-economic groups and mothers of enuretics. In the case of non-enuretics the required information was to be obtained only with respect to children who had had their sixth birthday but not their ninth. In the case of enuretics the permissible age range was 5 and above.

It was assumed that this procedure would be likely to result in a sample of enuretics more representative of the total population of enuretics than samples obtained from such institutions as guidance clinics.

From a knowledge of the limited children's clinic facilities

in Adelaide, and the estimate of the incidence of enuresis contained in Figure I, it can be concluded that the great majority of enuretics is never taken to a clinic. It is thus a reasonable inference that most of the relatively small number of enuretics seen in clinics are taken there because of other behaviour problems in addition to enuresis.

It seems not unlikely that the common finding of more behaviour problems among enuretics sampled from clinics, than among non-enuretic non-clinical samples, can be accounted for, at least in part, by this biasing factor in the selection of samples.

Characteristics of the sample.

Reasonably complete records were obtained from the mothers of 125 enuretics (74 males and 51 females) and 123 non-enuretics (63 males and 60 females). The greater disparity between the sexes in the enuretic group was considered to be unimportant for most of the comparisons to be made. To ensure comparability of age, only the records of enuretics between the ages of six and eight years were included.

The socio-economic class distribution of the two samples, determined by the criterion of father's occupation, was as shown

in Table 11. (Seven cases were unclassifiable)

TABLE 11. SOCIO-ECONOMIC CLASS DISTRIBUTION OF ENURETIC AND
NON-ENURETIC SAMPLES.

<u>Socio-economic Class.</u>	<u>Group.</u>	
	<u>Enuretic.</u>	<u>Non-enuretic.</u>
Employer	4	10
White Collar Admin/Professional	36	36
White Collar Clerical/Sales	21	16
Self Employed and Small Employer	16	11
Skilled	22	34
Semi - skilled	5	5
Unskilled	16	9
<u>Totals</u>	<u>120</u>	<u>121</u>

It is clear from Table 11 that the two samples are reasonably comparable in socio-economic background, a factor which has been shown to be related to toilet training methods used and the incidence of enuresis. (Blomfield and Douglas, 1956)

The questionnaire.

The questionnaire and general instructions for administration are contained in Appendix 10. The students were given lectures on the survey method and the questionnaire was discussed in detail in

class. Problems of reliability and validity were raised, and students were informed that check interviews would be carried out by the lecturer. The use of inexperienced interviewers necessitated an emphasis on direct types of question, with a minimum use of open-ended questions.

The areas covered by the questions included history of continence development or enuresis, toilet training history, mothers' expectations concerning continence development, opinions on the causes of bedwetting and attitudes towards the use of conditioning methods.

Results of Enuresis Survey.

The most important questions which the survey sought to answer concerned the relationship between toilet training and enuresis. The first of these questions was: "Do human infants in highly developed societies become continent at night in the absence of specific nocturnal toilet training".

The relevant data are contained in Table 12 which shows the ages at which the enuretics (not dry by age three) and non-enuretics (dry by age three) began nocturnal toilet training in the form of potting.

TABLE 12. FREQUENCIES OF BEGINNING NIGHT POTTING AT VARIOUS AGES IN ENURETIC AND CONTROL GROUPS.

<u>Age potting started in months.</u>	<u>Enuretic.</u>	<u>Control.</u>
0 - 6	8	12
7 - 12	12	8
13 - 18	11	18
19 - 24	18	11
25 - 30	5	3
Age not given	10	23
Potting not used	60 (48%)	46 (38%)
	124	121

Table 12 shows that 46 of the 121 non-enuretics, or 38%, did not use night potting at any time. The only comparable data which have been reported are those of Cust (1958) who studied a sample of 20 enuretics drawn at random from all enuretics known in a school population of a division of West Riding, England.

Cust found that 80% of his non-enuretic controls had received no night potting. This evidence permits the conclusion that night potting is not essential for the development of

nocturnal continence in highly developed societies.

Table 12 contains no evidence that nocturnal potting procedures are of significance in producing either continence or enuresis. More enuretics received no training but the difference does not reach significance $\chi^2 = 2.73$.10 > P > .05.

Cust (1958) also failed to find any difference between his enuretic and control groups in night training history. No direct evidence of the pressure used by parents in relation to night training was obtained, but an indirect assessment was made from an analysis of the parents' expectations concerning night training. It was assumed that parents who expected their children to be dry at an early age would be more likely to exert psychological pressure on the child to meet the parental norms.

A combination of high expectations and early commencement of night training was termed "strict" training, whilst lax training was defined in terms of late commencement of training and low expectations.

The results of the comparison between enuretics and non-enuretics is presented in Table 13.

TABLE 13. RELATIONSHIP BETWEEN STRICTNESS OF NOCTURNAL POTTING AND ENURESIS.

	Enuretic.	Control.
Strict night training (night potting before 12 months. Expect dry before 24 months)	7	10
Lax night training (night potting after 12 months. Expect dry after 24 months)	38	23

$$\chi^2 = 2.43 \quad .20 > P > .10$$

On these criteria, strict night training is not of significance in the aetiology of enuresis. The trend towards somewhat laxer training among enuretics is similar to that found by Douglas and Blomfield (1958) and Dimson (1959). The final feature of night training procedures which was examined was the extent to which the child awoke at the time of potting. This information was obtained only from the 1957 sample, comprising 54 enuretics and 70 non-enuretics. The results are presented in Table 14.

TABLE 14. RELATIONSHIP BETWEEN DEGREE OF WAKEFULNESS DURING POTTING AND ENURESIS.

<u>State at potting.</u>	<u>Enuretic.</u>	<u>Group.</u>	
		<u>Non-enuretic.</u>	
Almost fully awake or not potted	29	47	76
Only half awake	7	9	16
Scarcely awake at all	18	14	32
	<u>54</u>	<u>70</u>	<u>124</u>

$$\chi^2 = 2.32 \quad .20 > P > .10$$

As the relationship approached significance in the predicted direction (lack of wakefulness associated with enuresis) a further sample of 42 cases was examined. The new sample comprised 27 enuretics and 15 non-enuretics selected at random from the 1956 group whose parents could be contacted by telephone. The amended results for the total group are shown in Table 15.

TABLE 15. RELATIONSHIP BETWEEN DEGREE OF WAKEFULNESS DURING POTTING AND ENURESIS (1957 and 1956 GROUPS)

<u>State at potting.</u>	<u>Group.</u>		
	<u>Enuretic.</u>	<u>Non-enuretic.</u>	
Almost fully awake or not potted	47	56	103
Only half awake	12	11	23
Scarcely awake at all	22	18	40
	81	85	166

$$X^2 = 1.16 \quad .10 > P > .50$$

The additional cases have increased the tenability of the null hypothesis, and hence it must be concluded that the present data offer no support for the belief that wakefulness during potting is of importance in the aetiology of enuresis.

Diurnal Toilet Training.

The enuretic and non-enuretic groups did not differ in the frequency with which day potting procedures were used. Approx-

imately 85% of the parents in each group used day pottling methods of toilet training. As shown in Table 16, both bowel and bladder control during the day were achieved significantly earlier by the non-enuretic group.

TABLE 16. DIFFERENCE BETWEEN ENURETIC AND NON-ENURETIC GROUPS IN ACQUISITION OF DIURNAL BLADDER AND BOWEL CONTROL.

	<u>Bladder Training.</u>		<u>Bowel Training.</u>	
	<u>Enuretic</u>	<u>Non-enuretic.</u>	<u>Enuretic</u>	<u>Non-enuretic.</u>
Trained before 2 years	51	83	64	85
Trained after 2 years	65	40	57	37
	$\chi^2 = 8.85 \quad P < .01$		$\chi^2 = 7.21 \quad P < .01$	

Enuretics and non-enuretics were also differentiated with respect to the frequency of subsequent diurnal enuresis after having become dry during the day. Results are shown in Table 17.

TABLE 17. FREQUENCY OF SUBSEQUENT WETTING DIFFICULTIES FOLLOWING DIURNAL BLADDER TRAINING IN ENURETIC AND CONTROL GROUPS.

<u>Subsequent Wetting Difficulties.</u>	<u>Enuretic.</u>	<u>Non-enuretic.</u>	
Yes	42	13	55
No	80	110	190
	122	123	245
	$\chi^2 = 20.02 \quad P < .001$		

These findings simply confirm the well established fact that difficulties in establishing diurnal bladder and bowel control are more frequent among nocturnal enuretics than among non-enuretics.

Strictness of diurnal toilet training and nocturnal enuresis.

In order to assess the significance of strict or coercive diurnal toilet training in relation to nocturnal enuresis, the age at which training commenced was examined initially. The results are given in Table 18.

TABLE 18. AGE OF COMMENCEMENT OF DIURNAL TOILET TRAINING IN ENURETIC AND NON-ENURETIC GROUPS.

	<u>Training Periods.</u>			Total.
	<u>Early.</u> (< 3 months)	<u>Medium.</u> (3-9 months)	<u>Late.</u> (> 9 months)	
Enuretic	36 (35%)	48 (46%)	19 (19%)	103
Non-enuretic	42 (41%)	41 (41%)	18 (18%)	101
	$\chi^2 = 1.04 \quad .70 > P > .50$			

Although the trend towards somewhat later training in the enuretic group is not significant it parallels the findings of Blomfield and Douglas (1956) and Dimson (1959). These results offer no support for the hypothesis that early training is an aetiological factor in enuresis, but it might be argued that early

training cannot be equated with strict or coercive training which should be conceived of in terms of psychological pressure. As a measure of the probable psychological pressure employed, the ages at which the mothers expected a child should be day trained were examined. The expectations of the mothers of enuretics were slightly but insignificantly higher than those of non-enuretics.

Finally the two criteria of age at which training began and expectations concerning training were combined to define two groups of children; those whose day training was strict and those whose day training was lax. A comparison between enuretics and non-enuretics in these terms is contained in Table 19.

TABLE 19. RELATIONSHIP BETWEEN STRICTNESS OF DAY TRAINING AND ENURESIS.

	<u>Enuretic.</u>	<u>Non-enuretic.</u>	
Strict day training (Day potting by 3 months Expect dry by 18 months)	26	28	54
Lax day training (Day potting by 4 months Expect dry after 18 months)	32	25	57
	58	53	111

$$x^2 = .71 \quad .50 > P > .30$$

The slight trend towards less strict training among the

enuretics does not approach significance. Dimson (1959) also found a slight but insignificant tendency for enuretics to receive somewhat less strict training defined in terms of rigid performance at given intervals, usually with punishment.

However, it is clear that there is no evidence, either from the present study or that of Dimson, to support the hypothesis that strictness or leniency of diurnal toilet training is of importance in the aetiology of nocturnal enuresis.

Subsidiary Survey Findings.

Socio-economic class.

Socio-economic class was not found to be related to a single feature of the toilet training methods used by the parents, the outcome of these procedures, or the attitudes and expectations of the parents with respect to them.

This finding is at variance with the results of British and American surveys, and it is probably to be accounted for in terms of the smaller differences in class patterns of behaviour in this country. (Oeser and Hammond, 1955).

Bladder and Bowel control expectations.

The median age at which parents of both enuretics and non-enuretics expected children to be bladder and bowel trained

during the day was two years.

Wetting frequency (enuretics).

Of the 65 enuretics from whom the information was obtained, nine wet 1-2 times per week, twenty-nine wet 3-5 times per week and twenty-seven wet 5-7 times per week. Sixty-six per cent had wet the bed since birth. Of those enuretics who had initially become dry, subsequent breakdown had occurred up to five years later. The circumstances most frequently mentioned as being associated with relapse into wetting was illness in the child.

Measures used to overcome bedwetting.

The measures adopted by parents to overcome bedwetting are listed in Table 20. As each mother was asked to list all methods used, the frequencies exceed the total number in the sample.

TABLE 20. MEASURES USED BY PARENTS TO OVERCOME BEDWETTING.

<u>Measure.</u>	<u>Frequency of report.</u>
Raising at night to pot	49
Medicines or tablets	45
Fluid restriction	37
Material rewards	23
Punishment or scolding	16
Unsuccessful use of conditioning instrument	15
Successful use of conditioning instrument	10
Stars, etc. for dry nights	9
Hypnosis	4
Other methods	9

Ninety per cent of the mothers had consulted a general practitioner on the problem of wetting. Approximately half of

them had been told that the child would in all probability "grow out of it".

Expectations regarding nocturnal continence.

More than 50% of the mothers of both enuretic and non-enuretic children expected a child to be dry at night by 2½ years of age. A further twenty-five per cent listed 3 years as the expected age. There was a slight and insignificant tendency for mothers of enuretics to expect continence to occur later than did the mothers of non-enuretics.

Age by which corrective measures should be undertaken.

Most mothers believed corrective measures should be undertaken by 3 to 5 years if a child continued to wet the bed consistently. Mothers of enuretics did not differ from mothers of non-enuretics in this respect. Mothers' opinions of the main causes of bedwetting are shown in Table 21.

TABLE 21. MAIN CAUSES OF BEDWETTING GIVEN BY MOTHERS.

<u>Cause.</u>	<u>Frequency of mention.</u>	
	<u>Enuretics.</u>	<u>Non-enuretics.</u>
Nerves or emotional disturbance	59	68
Bladder, kidney or muscle weakness	19	23
Heavy sleep	17	4
Laziness	5	8
Don't know	17	10

The most striking finding revealed in Table 21 is the high frequency with which "nervousness" or emotional disturbance is mentioned as a major cause of enuresis. This probably reflects the widespread dissemination of the views of "dynamic psychiatry" by the popular press. The vague conception of some inherent weakness of the urinary system is understandable.

There is little difference between the two groups of mothers other than a tendency for mothers of enuretics to implicate heavy sleep more frequently. It seems likely that this difference of opinion results from the fact that the enuretic child is often aroused from a deep sleep for purposes of potting, whereas the non-enuretic child is usually aroused when the depth of sleep is not great.

Attitudes towards use of conditioning methods.

The attitudes of mothers towards the use of conditioning methods in the treatment of enuresis are recorded in Table 22 which shows the percentage choosing each response category.

(Table 22 over-leaf)

TABLE 22. ATTITUDES OF MOTHERS TO CONDITIONING METHODS EXPRESSED AS PERCENTAGE CHOICE OF EACH RESPONSE CATEGORY.

<u>Response category</u>	<u>Electrical Method.</u>		<u>Bell Method.</u>	
	<u>Enuretic.</u>	<u>Non-enuretic.</u>	<u>Enuretic.</u>	<u>Non-enuretic.</u>
Quite happy about use	47	33	56	41
Use but not happy	27	39	25	30
Use with great reluctance	15	20	8	21
Not use under any circumstances	11	8	11	8
	n=124	n=121	n=122	n=115

Table 22 reveals that there is a considerable degree of resistance to conditioning methods on the part of mothers generally. This probably results in part from the widespread acceptance of the "symptom of emotional disturbance" view of enuresis noted in the opinions of mothers relating to the main causes of bedwetting. A few mothers did in fact state their objections to conditioning methods in precisely these terms, and many expressed vague feelings that the treatment would disturb a child who was already "nervous". Understandably the method is somewhat more acceptable to mothers at present facing the problem of a bedwetter in the family.

Table 22 also shows a tendency for the bell method to be more acceptable to the mothers of both enuretic and non-enuretic

children. When explicitly asked to choose between the two methods, 65% of the mothers chose the bell method. The most frequently stated reason for preferring the bell method was dislike of the genital electrode associated with the electrical stimulus instrument. (When asked to state an electrode preference, 80% of the mothers selected the pad electrode in preference to the genital electrode). The chief reasons for the minority preference of the electrical stimulus method were that the bell would disturb the house, and that the electrical method would be likely to be more effective.

Conclusions.

The results of the Enuresis Survey offer no support for the view that the toilet training experiences of children are of aetiological significance in the production of enuresis.

Not only has no relationship been found between strictness or lenience of either diurnal or nocturnal toilet training and enuresis/continence, but substantial and approximately equal numbers of enuretics and non-enuretics have been reported as receiving no training at all.

These results are at variance with Mowrer's theory of the positive role of nocturnal potting in continence development.

They are likewise at variance with Crosby's theory of the negative role of night potting in the case of secondary or conditioned enuresis.

It remains possible that an "automatic" process of conditioning such as that hypothesized by Crosby (1950) is responsible for continence development, although such an hypothesis is not compelling.

However, until evidence of some such process can be found, conditioning treatment will remain without an established logical basis in terms of reinforcement of the normal process of continence development.

CHAPTER X.

ANIMAL EXPERIMENT I AND FIELD EXPERIMENT II.

ANIMAL EXPERIMENT I.

The maintenance of avoidance responding
by the administration of free shocks.

The high relapse rate following initial arrest of enuresis by conditioning methods observed in Field Experiment I suggested that research interest needed to be focussed on the problem of maintaining the original conditioning.

Inasmuch as more than 50 per cent of the relapses occur within the first three months after treatment, it would appear to be particularly important to maintain conditioning over this period.

Presumably if the child is able to remain dry over the first few months, the development of normal cortical control over urinary function becomes increasingly likely.

Avoidance learning experiments with animals indicate possible ways in which the strength of the conditioned inhibition of micturition may be maintained. For example, Sidman et al. (1957) have shown that high levels of avoidance bar pressing are maintained in monkeys by the administration of "free shocks" i.e. shocks delivered independently of the conditioned stimulus, and of any particular response on the part of the animal.

Pavlov (1927) had observed a similar phenomenon in his studies of classical conditioning. Independent presentation of the unconditioned stimulus alone was found to increase the resistance to extinction of conditioned salivary reflexes.

However, no investigation of the efficacy of free shocks in increasing the resistance to extinction of an avoidance response which normally extinguishes rapidly, has been reported.

As it seemed desirable to perform such an experiment before testing the free shock method in the conditioning treatment of enuresis, the avoidance response of shuttlebox running in rats was chosen for the purpose. This response is ordinarily very poorly maintained after withdrawal of the shock stimulus.

METHOD.

Subjects. The Ss were 10 experimentally naive male albino rats approximately 90 days old.

Apparatus. The apparatus consisted of a shuttlebox similar to that employed by Mowrer and Lamoreaux (1943). Each half of the grille could be electrified separately by means of a constant current electronic stimulator (Lovibond and Turner, 1956) with a resistance of 500000 ohms in circuit. Current flow was set

at 0.3 ma. The C S was a 1000 cps tone of approximately 80 db above a reference level of .0002 dynes/cm² measured from the centre of the grille.

PROCEDURE.

Acquisition. Ss were trained to avoid the electric shock by running to the opposite end of the shuttlebox when the C S was presented. Training was carried out in accordance with the standard procedure of Mowrer and Lamoreaux (1943) in which an escape or avoidance response terminates the C S.

In the absence of an avoidance response the C S was presented for five seconds followed by electrification of the half of the grille on which the animal was sitting. The shock remained on until the rat escaped to the unchanged half of the grille.

The C S was turned on manually by a telegraph key. The shock was presented automatically, and depression of a second telegraph key turned off both C S and U C S. The presentations of the stimuli were recorded on an inkwriting oscillograph.

The animals were given ten trials per day with an inter-trial interval of 1½ minutes until a criterion of nine avoidance responses out of a block of ten trials was reached.

Extinction. Following acquisition the Ss were sorted into

matched pairs on the basis of the number of trials required to reach the acquisition criterion. Members of pairs were then allocated by a random procedure to one of two groups, Free Shock and Standard Extinction, and given extinction trials. The extinction trials of the Standard Extinction group consisted simply of unreinforced presentations of the C S. For the Free Shock group, ten "free shocks" were interspersed at irregular intervals in each daily block of 20 trials. Each free shock consisted of a one second shock of 0.3 ma., administered by charging the whole of the shuttlebox grille.

In both groups the inter-trial interval was 30 seconds. Extinction trials were discontinued when no more than two avoidance responses were made in each of two consecutive blocks of 20 trials, or when 100 trials had been given.

Immediately after the conclusion of the extinction trials each control group animal was given a block of 20 trials with 10 interspersed free shocks, in a manner identical with the experimental group extinction procedure. Twenty-four hours later a second block of 20 trials with 10 interspersed free shocks was given.

The results are presented in Table 23 which shows the individual responses of the 10 subjects during the extinction trials.

TABLE 23. NUMBER OF RESPONSES OF FREE SHOCK AND STANDARD EXTINCTION
SUBJECTS IN BLOCKS OF 20 EXTINCTION TRIALS.

STANDARD EXTINCTION GROUP.

<u>Subject.</u>	<u>Extinction Trial.</u>					
	1-20	21-40	41-60	61-80	81-100	101-120
1	6	5	2	1	6 (F.S)	2 (F.S)
2	0	0	1 (F.S)	0 (F.S)		
3	0	1	12 (F.S)	10 (F.S)		
4	0	0	14 (F.S)	2 (F.S)		
5	1	0	0 (F.S)	0 (F.S)		

(F.S) = Free Shock Trials.

FREE SHOCK EXTINCTION GROUP.

<u>Subject.</u>	<u>Extinction Trial.</u>				
	1-20	21-40	41-60	61-80	81-100
1	18	8	6	0	0
2	19	13	7	10	12
3	1	6	0	6	0
4	10	14	15	16	11
5	6	9	3	13	7

The differences between the two groups are striking. Four of the five subjects in the Standard Extinction group have reached the criterion of extinction at the end of the second block of extinction trials. Only one of the five Free Shock extinction ~~groups~~ ~~has~~ has reached the criterion of extinction by the 100th trial.

The difference between the two groups in the number of trials to extinction is significant beyond the one per cent level (exact test). This difference clearly demonstrates the efficacy of free shocks in maintaining the avoidance responding of the Free Shock group. However, the performance of individual animals recorded in Table 23 is noteworthy. Whilst free shocks actually increase the level of avoidance responding in two subjects, (S4 and S5) over the 100 extinction trials, the rate of responding of one animal, (S1), steadily diminishes till it reaches zero after 60 trials, despite the free shocks.

As S4 and S5 were the first of the Free Shock group to reach the acquisition criterion, and S1 was the last, this result suggests that the free shock method of maintaining avoidance is likely to be most effective with the least inhibitory animals. This is, of course, a not unexpected finding.

The introduction of free shocks after extinction in the Standard Extinction group had the effect of substantially reviving

the avoidance response in three of the five animals, but this effect diminished markedly during the second block of 20 free shock trials.

Conclusions.

The results of the experiment suggest the possibility of preventing relapses following conditioning treatment of enuresis by the administration of free shocks in the latter stages of training. This would be equivalent to deliberately presenting false alarms (triggering of the aversive stimulus in the absence of wetting) which sometimes occur during treatment and which are usually regarded as being deleterious to treatment.

After completion of treatment free shocks might be administered by setting an alarm clock to go off once or twice per night. The sounding of an alarm clock at frequent intervals during the night has often been used as a method of treatment.

The present analysis suggests that as an initial treatment method it is likely to be successful only in the case of sporadic wetters in whom the avoidance response is already partially established. However, it is possible that an alarm clock does not furnish a stimulus sufficiently intense and sudden to function adequately as a "free shock".

FIELD EXPERIMENT II.

The efficacy of false alarms in preventing relapses.

In order to test the effectiveness of false alarms in preventing relapses following initial arrest of bedwetting by conditioning methods, a second field experiment was carried out.

METHOD.

Subjects. The Ss of this experiment were 20 children between the ages of eight and twelve years obtained in a manner similar to that of the first experiment. Twelve were males and eight were females.

Apparatus. The Twin Signal and standard Mowrer instruments previously described were each used with 10 subjects. There were two reasons for using the Mowrer instrument:

- (a) it was desired to test the efficacy of false alarms with both the bell and the more intense hooter stimulus.
 - (b) it was considered advisable to cross-validate the finding of the first experiment that the Twin Signal was considerably more effective in bringing about an initial arrest of wetting.
- The need for a further comparison with another sample was emphasized by the publication of a paper by Gillison and Skinner (1958) and unpublished results obtained by Coote (1960). These investigators of the Mowrer instrument made available for the first time comparative data on the number of reinforcements

necessary to achieve an initial arrest of wetting.

The median number of reinforcements reported by Gillison and Skinner for 100 cases was 15.3. The figure reported by Coote for 70 cases was 16.4. These figures are to be compared with the median value of 30.5 for the Mowrer instrument and 14.5 for the Twin Signal obtained in the experiment reported earlier. It would appear from this evidence that the difference in initial effectiveness between the two instruments is not as large as the results of Field Experiment I suggests.

PROCEDURE.

Ss were obtained in pairs of the same sex and age and the same wetting frequency, and were allocated by a random procedure to one of the two treatment groups, Twin Signal and Mowrer. Each of the treatment groups was divided into two sub-groups, Standard and False Alarm.

Procedure with the Standard sub-group was identical with that used in Field Experiment I. In the case of the False Alarm sub-group the parent was instructed to trigger the auditory stimulus between 10 p.m. and 11 p.m. on each of twelve nights following the first two consecutive dry nights.

If the criterion of 14 successive dry nights had not been

attained at the conclusion of this period, random alternation of false alarm and standard conditions was used during the remainder of the treatment period. In all other respects the treatment was as previously described.

RESULTS.

The results of the experiment are presented in Table 24 which shows the median number of stimuli to arrest, the proportion of arrests and the proportion of relapses in the two post-treatment periods for the two instruments and two treatment conditions.

TABLE 24. COMPARISON OF FALSE ALARM AND STANDARD TREATMENT

PROCEDURES.

<u>Instrument.</u>	<u>Treatment.</u>	<u>Median No. of stimuli to arrest.</u>	<u>Per cent initial arrest.</u>	<u>Per cent relapses 0-3 mths.</u>	<u>Per cent relapses 3-24mths.</u>	<u>Total relapses per cent.</u>
Mowrer	False Alarm	13	100	20	20	40
n=10	Standard	21	100	40	20	60
TwinSignal	False Alarm	18	100	20	40	60
n=10	Standard	10	100	40	20	60
Both Instruments	False Alarm	15	100	20	30	50
n=20	Standard	12	100	40	20	60

In this experiment there were no initial failures, all 20 subjects reaching the acquisition criterion of 14 days clear with

less than 50 reinforcements.

The median number of stimuli to initial arrest, 15 for the false alarm subjects and 12 for the standard procedure subjects, is well below the overall values for Experiment I (Mowrer 30.5, Crosby 20.0, Twin Signal 14.5).

These results suggest that as a group the subjects of Experiment II were initially more responsive than those of Experiment I. On the other hand the overall relapse rate is higher in the present experiment, despite the use of a measure designed to reduce the relapse rate.

In line with prediction, the proportion of relapses in the first three months is less for the combined false alarm group (20 per cent) than for the combined standard procedure group (40 per cent), but the difference does not approach significance. If the observed difference remained unchanged over a sufficiently large number of cases to give statistical significance, it would be of theoretical interest only, as the final relapse rate with false alarms (50 per cent) is almost as high as with the standard procedure.

This result indicates that the postulated tendency for normal development to take control, if relapse is averted during

the first three months, has not been demonstrated.

The difference between the false alarm relapse rates of the two instruments in favour of the Howrer, although not significant, is consistent with the slightly greater resistance to relapse observed with this instrument in the first field experiment.

CHAPTER XI.

ANIMAL EXPERIMENT II AND FIELD EXPERIMENT III.

ANIMAL EXPERIMENT II.


The effect of different aversive stimulus patterns on the acquisition and maintenance of avoidance responding.

Field experiments I and II have demonstrated that initial arrest of wetting is achieved more rapidly with the Twin Signal than with the Mowrer instrument. On the other hand the results of these experiments suggest that resistance to extinction is greater in the case of the Mowrer apparatus. The two instruments differ in three major respects:-

- (a) provision/lack of provision for escape learning, or duration of the aversive stimulus.
- (b) intensity of the aversive stimulus.
- (c) type of auditory stimulus.

On the theoretical grounds developed in Chapter VI, only the first two of these variables are likely to be of importance. The effects of these two factors, stimulus duration and stimulus intensity, are confounded in the field experiments and it would appear impracticable to separate them in experiments of this kind. Nevertheless, from both the theoretical and practical viewpoints it would be of advantage to determine the relative contributions of these two factors. For example, if it is the provision of escape training rather than its more intense stimulus which produces the superior acquisition of the Twin Signal, it might

be possible to combine the virtues of both instruments by the provision of a stimulus pattern which may be diagrammed thus -



The high peak represents a strong stimulus of short duration followed by a weaker stimulus of long duration. In this case the cessation of the strong stimulus would provide some degree of escape and thus facilitate acquisition, and the continuing weak stimulus would increase resistance to extinction, possibly by way of some consolidation of trace process.

It is possible however, that escape training is of advantage in acquisition only if the response to be learned is not an unconditioned reaction to the shock stimulus. For example, in the Mowrer Miller shuttlebox the avoidance response, running to one end of the box is not an automatic response to shock through the feet at the other end. Hence the provision of escape from shock when the animal runs to the opposite end will serve to attach the running response to shock (escape learning) and this response will be transferred to the C S which has been rendered aversive by pairing with the shock (avoidance learning).

On the other hand, in passive avoidance learning (Mowrer 1960) and Konorski's Type II, Variety III conditioning situation, the response to be learned, withdrawal, is an automatic unconditioned reaction to the shock. Under these circumstances it may be conjectured that escape from shock is irrelevant to the learning

of the avoidance response and the key variable is the total aversiveness of the shock. The aversiveness of the shock is in turn a function of both its intensity and its duration.

If, as previously argued, the conditioning treatment of enuresis conforms in essentials to passive avoidance learning, the superior acquisition of the Twin Signal would thus result from the greater intensity of the auditory stimulus used and not its provision for escape learning.

In order to obtain evidence relating to the above questions, a second experiment with animals was carried out. A passive avoidance response in rats was selected as being analogous to the enuresis treatment situation. Konorski's Type II, Variety III reflex in dogs would have been more closely analogous but facilities for this type of experiment were lacking.

METHOD.

Subjects. The subjects were 32 experimentally naive, male hooded Norwegian rats aged $1\frac{1}{2}$ to 3 months.

Apparatus. The apparatus used was the modified Mowrer-Miller shuttlebox and associated mechanism described in Experiment I with the addition of a drinking attachment. The latter consisted of a water bottle of the type used in the home cages

attached to the outside of one end of the box, with its glass drinking tube protruding through a hole into the interior of the box. Water from this bottle was continuously available throughout the experiment.

PROCEDURE.

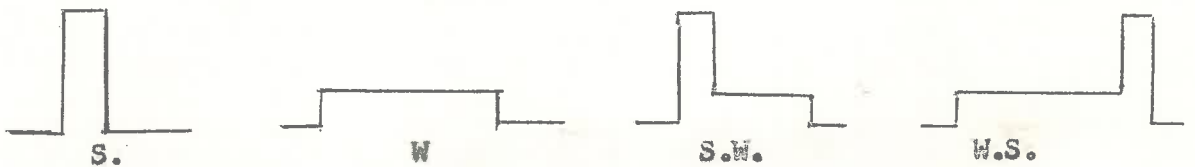
General. The animals were placed on a 22-24 hour water deprivation schedule with a half hour drinking period per 24 hours. Food was continuously available in the home cages. The experiment was divided into three phases, Habituation, Avoidance and Extinction, all of which were carried out after 20-24 hours water deprivation.

Habituation Trials. These trials served to accustom the animals to handling and to the shuttlebox, and to train them to run to the water bottle end of the box and drink. The animals were placed individually in the box at the end opposite to the water. The latency for each trial was measured from the moment the animal was placed in the box until it started drinking. The animal was permitted to drink for 30 seconds. If an animal had not started to drink at the end of 3 minutes the trial was terminated and the rat returned to its cage. Each rat was given five trials per 24 hours with a minimum inter-trial interval of 3 minutes, until all had completed 40 trials.

Avoidance Trials. Following habituation the 32 animals were divided randomly into four groups each of which was given avoidance training with a different form of shock as follows:

- (1) Group S, strong shock (.5 ma.) for 0.5 seconds.
- (2) Group W, weak shock (.2 ma.) for 5 seconds.
- (3) Group S.W., strong shock (.5 ma.) for 0.5 seconds followed by weak shock (.2 ma.) for 4.5 seconds.
- (4) Group W.S., weak shock (.2 ma.) for 4.5 seconds followed by strong shock (.5 ma.) for 0.5 seconds.

Diagrammatically the shocks followed the patterns -



Trials proceeded as in habituation but now the appropriate shock pattern was administered on each trial immediately the animal began to drink. The shock was turned on manually but was turned off automatically.

In addition to latency times the general behaviour of the animal before and after shock was recorded. Blocks of 5 trials per 24 hours were given until a criterion of four successive trials with latencies of 3 minutes had been recorded.

Extinction Trials. Extinction trials, in which the shock was turned off, were commenced on the day following acquisition of the avoidance criterion.

Blocks of 5 trials per day with a minimum inter-trial interval of 3 minutes were given until an extinction criterion of 3 successive trials with latencies less than 10 seconds was reached at any time after the first five trials. If an animal began to drink it was allowed to continue drinking for 15 seconds but if the latency exceeded three minutes the animal was removed to the home cage.

RESULTS.

Habituation. After initial exploration the animals quickly learned to run to the water and drink with a very short latency. The average latency of every animal was less than two seconds over the last five trials.

Avoidance. After the first shock, the latencies of all groups increased irregularly. The reaction to the shock was more or less sudden withdrawal from the bottle except in the case of two animals in Group W. These Ss continued to drink through the first few applications of the weak shock. The ranges and means of the trials required by the various groups to reach the avoidance criterion are shown in Table 25.

TABLE 25. MEAN NUMBER AND RANGE OF TRIALS REQUIRED TO REACH
THE AVOIDANCE CRITERION IN THE FOUR GROUPS.

<u>Group.</u>	<u>Mean.</u>	<u>Range.</u>
S.	10.3	5-19
W.	16.4	9-26
S.W.	8.1	6-10
W.S.	9.0	6-11

Whilst no two groups differ significantly in acquisition scores, the W group differs significantly from the combined S., S.W. and W.S. groups. (Mann - Whitney U test, $P < .01$) This evidence suggests that the critical variable in acquisition is the maximum strength of the shock rather than its pattern or duration.

The results of the experiment demonstrate conclusively that a passive avoidance response may be acquired in the absence of any prior escape training. Furthermore, need reduction does not appear to be an important determinant of the speed of acquisition. Rather the findings indicate that the critical variable in acquisition is maximum strength of the shock.

Extinction. The median latencies of the four groups for the first four extinction trials are shown in Figure 3.

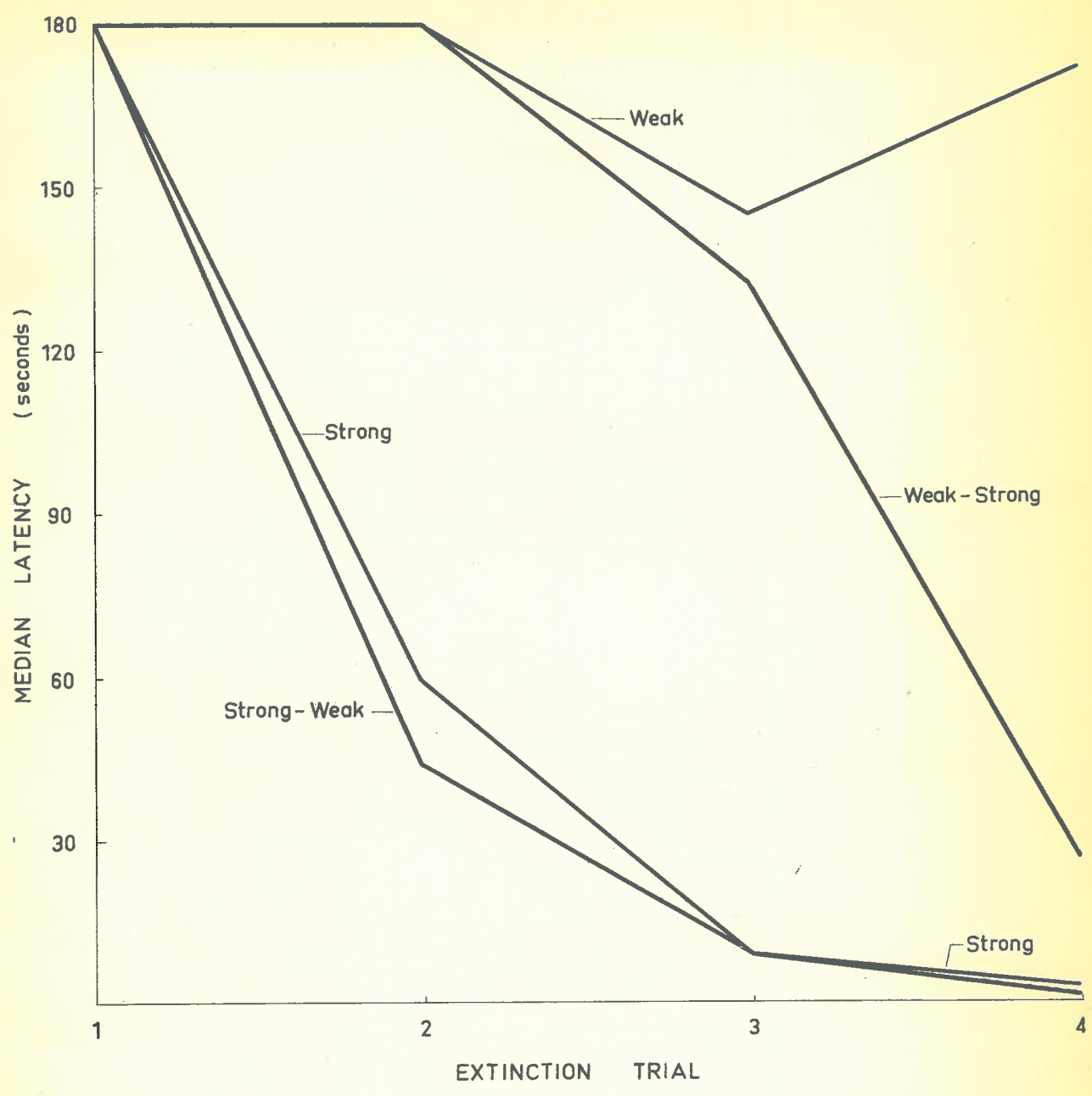


Fig 3. EXTINCTION TRIAL LATENCIES

Two other measures of resistance to extinction were computed, the median number of the extinction trial on which the animal first drank, and the median number of trials to extinction. These measures are presented in Table 26.

TABLE 26. MEDIAN EXTINCTION TRIAL ON WHICH ANIMAL FIRST DRANK AND MEDIAN NUMBER OF TRIALS TO EXTINCTION.

	<u>Group.</u>			
	<u>S.</u>	<u>W.</u>	<u>S.W.</u>	<u>W.S.</u>
Median Trial First drank	2	4	2	3.5
Median Trial to extinction	7	9	5	9

It is clear that on each of these criteria the two groups which received weak initial shocks of relatively long duration are more resistant to extinction. None of the differences between pairs of groups is significant on any of the criteria. However, when the combined W. and W.S. groups are compared with the combined S. and S.W. groups there is a significant difference on two of the criteria; median latencies on trials 2 - 4 (Mann-Whitney U test, $P < .05$) and median number of trials to extinction. (Mann-Whitney U test, $P < .05$)

It is to be noted that the experiment was relatively

insensitive in that extinction tended to be very rapid over all groups. It seems probable therefore that the differences observed would be accentuated under circumstances favouring greater resistance to extinction.

FIELD EXPERIMENT III.

The effect of omission of the time interval between stimuli
with the Twin Signal instrument.

In order to obtain data from conditioning treatment which would be comparable with data obtained from Animal Experiment II, Field Experiment III was carried out concurrently with the animal study.

As it was impracticable to examine the effects of all four stimulus patterns used in the animal experiment, it was decided to use the combination of intense short duration stimulus followed immediately by less intense long duration stimulation (pattern SW in Animal Experiment II) with the standard Mowrer as a control.

The SW stimulus combination was achieved simply by eliminating the delay period between the two stimuli in the Twin Signal apparatus and substituting a bell for the buzzer.

METHOD.

Subjects. The subjects were 24 enuretics, aged 7 - 14 years obtained by incidental referral. Twelve were males and twelve were females. Criteria for selection were as previously described.

PROCEDURE.

All subjects were treated in the standard fashion of the previous experiments.

RESULTS.

The results are set out in Table 27 which gives the median number of stimuli to arrest and the proportion of relapses which occurred by three months and 24 months with the two instruments, Mowrer and modified Twin Signal.

TABLE 27. ACQUISITION AND RELAPSE DATA OBTAINED WITH MOWRER AND MODIFIED TWIN SIGNAL INSTRUMENTS.

<u>Instrument</u>	<u>Median no. of stimuli to arrest</u>	<u>Per cent initial arrest</u>	<u>Per cent relapse 0-3 mths</u>	<u>Per cent relapse 3-24 mths</u>	<u>Total per cent relapse</u>
Mowrer N = 12	13.5 (N = 10)	83	20	20	40
Modified Twin Signal N = 12	13.0	100	25	17	42

In this experiment there were two failures to reach the criterion with the Mowrer instrument and none with the Twin Signal. The median number of stimuli to arrest does not differ between the two instruments and is comparable with the results achieved in Experiment II. The Twin Signal relapse rate is slightly higher than that of the Mowrer instrument although the difference is not statistically significant.

These results are again comparable with the corresponding animal data with less marked differences appearing in the same direction, i.e. acquisition is slightly superior with the strong - weak pattern of aversive stimuli and resistance to extinction is slightly better with the weak - long duration pattern.

A certain stability in results has emerged over the three field experiments. An intense short duration stimulus gives somewhat better acquisition and somewhat poorer resistance to extinction, whether or not it is followed immediately by less intense stimulation of long duration, and whether or not it is accompanied by free shocks.

CHAPTER XII.

ANIMAL EXPERIMENT III AND FIELD EXPERIMENT IV.

ANIMAL EXPERIMENT III.

Partial reinforcement and resistance to extinction of passive avoidance responses.

Reinforcement is usually defined as the condition or process which strengthens learning. In most animal learning experiments reinforcement consists in the application of an aversive stimulus or the presentation of a positive reward such as food or drink.

In 1939, Humphreys (1939) demonstrated that random alternation of reinforcement resulted in greater resistance to extinction of conditioned eyelid reactions than did reinforcement on every trial. Later investigators have found that the Humphreys or intermittent reinforcement effect (IRE) holds in a variety of other learning situations.

These include classical conditioning of heart rate changes. (Notterman, Schoenfeld and Bersh, 1952); human verbal learning. (Grant, Hake and Hornseth, 1951); instrumental pecking in pigeons, (Jenkins, McFann and Clayton, 1950); bar pressing in rats, (Jenkins and Rigby, 1950); escape learning in rats, (Jones, 1953); and runway performance in rats, (Freides, 1957).

The two major hypotheses which have been put forward to account for the Humphreys effect have been termed by Mowrer and Jones (1945) "the response unit hypothesis and the discrimination hypothesis".

According to the first hypothesis, in intermittent reinforcement experiments the response unit must be redefined in terms of the whole pattern of behaviour which produces reward during acquisition. For example the "response" leading to reward might be two presses of a lever or two runs to the end of a runway.

The discrimination hypothesis on the other hand accounts for the Humphreys effect in terms of the lack of a clear cut difference between acquisition and extinction trials. Thus the subject "having experienced runs of non-reinforced trials during acquisition, cannot easily determine when "true" extinction has begun, whereas with continuous reinforcement this change is abrupt and clear cut". (Mowrer, 1960). The evidence, which has been reviewed by Mowrer, (1960) tends to favour the discrimination hypothesis.

During avoidance training the subject typically begins to manifest acquisition by occasional avoidance responses interspersed by failures to avoid. Thus during the period

between the first avoidance response and the last failure to avoid, the subject usually experiences intermittent reinforcement. The increased resistance to extinction of avoidance learning compared with escape learning has sometimes been attributed to this intermittent reinforcement which occurs during acquisition.

It is possibly because of the assumption that avoidance learning involves intermittent reinforcement by the nature of things (e.g. Jones, 1953), that the extensive literature on intermittent reinforcement contains no reference to investigations of the effect of this reinforcement procedure in standard avoidance situations.

There would appear to be a critical difference between the "intermittent" reinforcement in the standard avoidance learning situation and that in the usual experiment on the Humphreys effect.

For example, in Animal Experiment II, already described, during acquisition the animal experiences an unreinforced trial only if it does not perform the reinforced response (drinking). When, however, the shock has been turned off for the extinction trials, on the first non-avoidance trial the animal experiences an unreinforced trial when it does drink. This is a situation it has not encountered during acquisition training. Thus the

conditions for maximum discrimination between acquisition and extinction trials are present, and on the discrimination hypothesis it would be expected that extinction would be relatively rapid from that point.

If, however, intermittent reinforcement were introduced in acquisition training before the first avoidance response, extinction trials would not differ in a clear-cut fashion from acquisition trials. On the first failure of avoidance during extinction, S would experience an absence of reinforcement which, during acquisition, had been followed by further reinforcements. Hence it would be expected that resistance to extinction would be greater than if continuous reinforcement were used during non-avoidant acquisition trials.

It is uncertain whether the first non-avoidance response during extinction would be postponed by intermittent reinforcement. There is some evidence (D'Amato and Gumenick, 1960) that unpredictable shock is more aversive than predictable shock, so that some extension of the period of complete avoidance might be expected. However, the maximum effect would be expected to manifest itself in the prevention of rapid collapse of the avoidance learning following the first non-avoidance response during extinction trials.

Such an effect would be particularly important in the conditioning treatment of enuretics. Relatively few remain perfectly dry following initial arrest and hence there is considerable scope for a procedure which acts to reduce the rate of complete relapse among those children who have a wet bed at some stage subsequent to the conclusion of treatment.

Animal Experiment III was carried out to test the above-mentioned predictions concerning the effects of intermittent reinforcement in passive avoidance learning.

METHOD.

Subjects. The subjects were 24 experimentally naive, male hooded Norwegian rats aged 2 to 3 months.

Apparatus. The apparatus was that described in Experiment II.

PROCEDURE.

General. General procedure was identical with that described in Experiment II.

Habituation Trials. These trials were conducted as in Experiment II with the following amendments:

- (a) The number of trials was limited to 20.
- (b) Maximum latency was limited to 2 minutes.

Avoidance Trials. Following habituation the 24 animals were

divided randomly into four groups each of which was given a different form of avoidance training.

Group C.W. (continuous, weak)

Shock of .3 ma. and 5 seconds duration on every trial.

Group I.W. (intermittent, weak)

Shock of .3 ma. and 5 seconds duration in 50 per cent of trials, random alternation.

Group I.S. (intermittent, strong)

Shock of .6 ma. and one second duration on 50 per cent of trials, random alternation.

Group I.V. (intermittent varied)

Shock of .3 ma. and 5 seconds duration on 25 per cent of trials, shock of .3 ma. and 4.5 seconds duration, followed by shock of 0.6 ma. and 0.5 seconds duration on 25 per cent of trials.

Random alternation of non-shock and two types of shock trials.

Group C.W. served as a base line representing the maximum degree of resistance to extinction with continuous reinforcement. Group I.W. provided a direct comparison of I.R.E. against the continuous reinforcement of Group C.W. Group I.S. was included to check the possibility of interaction between I.R.E. and type of shock.

Thus although short strong shocks resulted in less resistance to extinction with continuous reinforcement, it was possible that this difference would not be present under intermittent reinforcement and that the superior acquisition resulting from short strong shocks would be maintained.

Group I.V. represented an attempt to combine the relatively good acquisition of the weak-strong shock group, in Experiment II, with the maximum resistance to extinction of the weak 5 second shock group in that experiment. In short this group was included in case there was no interaction between type of shock and intermittent reinforcement.

As in Experiment II, blocks of 5 trials per 24 hours were given, but a modified acquisition criterion of four successive trials with latencies of 2 minutes was adopted.

Extinction Trials.

Commencing on the day following acquisition, one extinction trial per day was given for ten days or until an extinction criterion of 3 successive trials with latencies of 2 seconds or less was reached. If an animal began to drink it was allowed to drink for 30 seconds, but if the latency exceeded 2 minutes the animal was removed to the home cage.

The change to one extinction trial per day was made for the following reasons:

- (a) In Experiment II there was a tendency for latencies to increase on the first trial of each day.
- (b) The extinction conditions more closely paralleled those in enuresis conditioning.

The amendments to the procedure of Experiment II were thus:

- (a) Twenty instead of 40 habituation trials.
- (b) Maximum latency throughout reduced from 3 minutes to 2 minutes.
- (c) Strength of shock increased from .2 ma. to .3 ma. (weak) and from .5 ma. to .6 ma. (strong).
- (d) Extinction trials one per day instead of blocks of five per day.

RESULTS.

Habituation. As in Experiment II, habituation proceeded rapidly. By the twentieth trial the latency of every animal was less than 3 seconds.

Avoidance. Even the weak shock was sufficient to produce withdrawal from the bottle. The range and medians of the trials necessary to reach the avoidance criterion are shown in Table 28.

TABLE 28. MEDIAN NUMBER AND RANGE OF TRIALS REQUIRED TO REACH AVOIDANCE CRITERION IN THE FOUR GROUPS.

Group.	Median.	Range.
C.W.	12.5	9 - 25
I.W.	39.0	11 - 50
I.S.	12.5	7 - 29
I.V.	33.0	15 - 49

Table 29 presents the comparable data for Experiment II, using the same acquisition criterion.

TABLE 29. MEDIAN NUMBER AND RANGE OF TRIALS REQUIRED BY SUBJECTS OF EXPERIMENT II TO REACH THE AVOIDANCE CRITERION OF EXPERIMENT III.

Group.	Median.	Range.
S.	7	4 - 18
W.	15.5	8 - 21
S.W.	6.5	5 - 9
W.S.	6.0	5 - 9

From the data in the two tables it can be seen that (a) Acquisition with continuous weak reinforcement (Group W. Experiment II and Group C.W. Experiment III) is slightly

improved in Experiment III, possibly as a result of the increased strength of shock.

(b) Intermittent reinforcement has resulted in slower acquisition, particularly in the case of groups experiencing weak shocks.

(c) Acquisition with strong intermittent shock is comparable with that resulting from continuous weak shock, the difference being insignificant.

(d) The use of 25 per cent strong shocks (Group I.V.) does not result in improved acquisition when intermittent weak shocks are employed. (The difference between Groups I.V. and I.W. is insignificant. (Mann, Whitney test)).

(e) Acquisition is significantly faster in Groups C.W. and I.S. than in Groups I.W. and I.V. (The difference in each case is significant beyond the .01 level. (Mann, Whitney test)).

Extinction. The latencies of the four groups for the ten extinction trials are shown in Figure 4.

Animals which reached the extinction criterion before the tenth trial are given a latency of one second on the remaining trials.

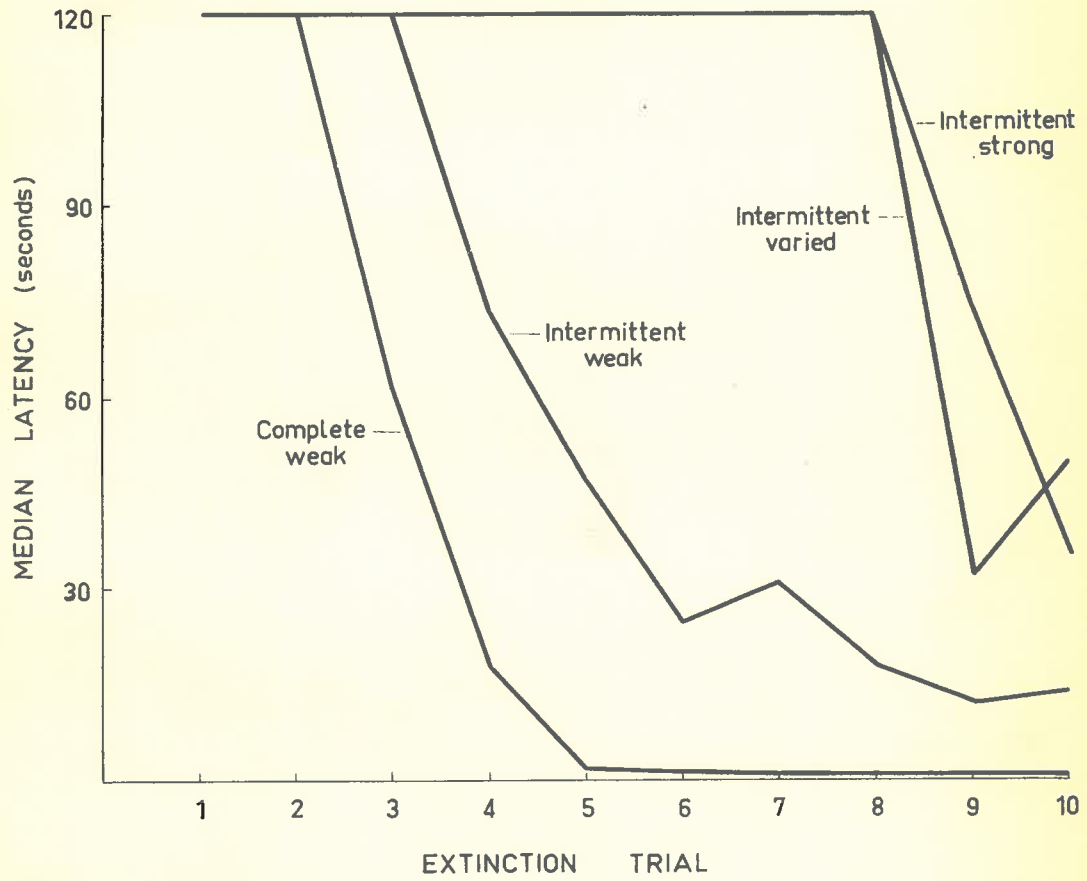


Fig 4. EXTINCTION TRIAL LATENCIES

For purposes of statistical analysis an extinction score for each S was computed. This score was the median latency in seconds for the ten extinction trials. The median extinction score for each group was then computed, and the significance of the difference between the median extinction scores of each pair of groups was tested by means of the Mann - Whitney U test.

The results of the group median extinction score comparisons are presented in Table 30.

TABLE 30. COMPARISON OF GROUP MEDIAN EXTINCTION SCORES.

Groups.	Median Extinction Scores.	P-values (Mann - Whitney)
C.W.-I.W.	1.5 - 36	< .05 (one tail)
C.W.-I.S.	1.5 - 120	< .01 (one tail)
C.W.-I.V.	1.5 - 120	< .01 (one tail)
I.W.-I.S.	36 - 120	< .05 (two tail)
I.W.-I.V.	36 - 120	< .05 (two tail)
I.S.-I.V.	120 - 120	< .50 (two tail)

The data in Table 30 show that the resistance to extinction of all three intermittently reinforced groups is greater than that of the continuously reinforced group (C.W.). Also the Ss trained with intermittent strong shocks are more resistant to extinction than Ss trained with intermittent weak shocks.

The latter finding is consistent with the results of Hulse, (1958) who studied the effects on rats' runway performance of intermittent reinforcement in relation to different amounts of reinforcement. Hulse found that intermittent reinforcement was much more effective in increasing resistance to extinction if the amount of reinforcement (food) was large than if it was small.

A further measure of resistance to extinction which was computed was the latency after non avoidance (L.A.N.A.). This was the latency in seconds of the trial following the first extinction trial on which the animal drank. Two animals which first drank on the tenth trial were given a further trial for the purpose of obtaining this measure. Table 31 contains the L.A.N.A. scores of all animals which drank during the extinction trials. Table 32 shows the combined L.A.N.A. scores for all continuous reinforcement animals of Experiments II and III compared with the L.A.N.A. scores of the intermittently reinforced animals of Experiment III. In both cases the L.A.N.A. scores are significantly higher for the intermittent Ss.

It is clear from these data that intermittent reinforcement of a passive avoidance response leads to slower acquisition (in terms of total number of training trials) and to increased resistance to extinction. The increased resistance to extinction

manifests itself particularly in a slowing down of the rate of extinction after the first complete approach response is made. There is a suggestion that the first approach response is postponed also, if the shock is of a reasonably high intensity, but the present data do not demonstrate this unequivocally.

TABLE 31. L.A.N.A. scores of Group C.W. and combined Groups I.W., I.S., and I.V. in rank order.

<u>Group C.W.</u>	<u>Groups I.W., I.S. and I.V.</u>
4	120
4	120
3	120
2	120
1	70
N = 5	45
Mdn = 3	34
	15
	11
	5
	5
	3
	N = 12
	Mdn = 39.5
P < .05 (Mann - Whitney Test)	

TABLE 32. Median L.A.N.A. scores of all continuously reinforced subjects in Experiments II and III, and all intermittently reinforced subjects of Experiment III.

<u>Continuous Reinforcement.</u>	<u>Intermittent Reinforcement.</u>
N = 36	N = 12
Mdn = 5	Mdn = 39.5
P < .001 (Mann - Whitney Test)	

FIELD EXPERIMENT IV.

The effects of intermittent reinforcement during conditioning treatment.

In order to test the hypothesis that intermittent reinforcement during conditioning treatment would result in an increased resistance to extinction similar to that observed in Animal Experiment III, a fourth field investigation was carried out.

In pilot runs four enuretics were treated with the Mowrer instrument and four with the Twin Signal using a random alternation reinforcement schedule. The Twin Signal was used with the original one minute delay between the first and second signals. The results indicated a marked difference between the two instruments in acquisition.

With the Twin Signal, the number of reinforcements to arrest were 13, 16, 14 and 12 for the four subjects, compared with a median of 13.5 obtained in Field Experiments I, II and III using complete reinforcement.

In the case of the Mowrer instrument none of the four subjects had reached the criterion of 14 days clear after 30 reinforcements. At this point complete reinforcement was

introduced and the subjects required 25, 15, 8 and 12 further reinforcements to reach the criterion. These acquisition results are comparable with those obtained in Animal Experiment III, in which acquisition training was unduly prolonged by intermittent reinforcement when weak shocks were used for part or all of the reinforced trials (Groups IV and IW).

The results further confirm the superior acquisition of the Twin Signal and indicate that intermittent reinforcement is impracticable with the Mowrer instrument. Not only would treatment be unduly protracted with this apparatus, but the possibility of failure to reach the acquisition criterion would probably be increased. Consequently further work with intermittent reinforcement was restricted to the Twin Signal.

METHOD.

Subjects. The subjects were fourteen enuretics aged 6 - 14 years obtained by incidental referral as in the previous experiments. Ten were males and four were females.

PROCEDURE.

All subjects were treated with the Twin Signal Instrument in the standard manner previously described, with the exception that reinforcement was given according to a random alternation schedule. Parents were provided with a reinforcement schedule

and instructed to leave the apparatus off the bed when a non-reinforcement was scheduled. No concurrent complete reinforcement control group was used on the grounds that the results of the previous experiments furnished ample control data.

RESULTS.

The results of the experiment are presented in Table 33. For comparative purposes the summarized results of the three previous field experiments and the present experiment are shown in Table 34.

TABLE 33. RESULTS OF TREATMENT WITH TWIN SIGNAL USING INTERMITTENT REINFORCEMENT.

<u>Subject No</u>	<u>Age in years</u>	<u>Sex</u>	<u>No. of stimuli to arrest</u>	<u>Relapsed after months</u>	<u>Months since treatment</u>
1	6	M	13	-	9
2	7	M	16	-	8
3	9	M	4	-	8
4	14	M	14	-	7
5	10	F	12	-	5
6	12	F	10	-	4
7	13	M	7	-	3
8	9	M	27	-	3
9	8	M	26	-	3
10	6	M	15	-	2
11	7	F	15	-	2
12	12	F	23	-	1
13	6	M	4	-	1
14	8	M	20	-	1

TABLE 34. COMPARATIVE RESULTS OF COMPLETE AND INTERMITTENT REINFORCEMENT TREATMENT.

<u>Instrument Reinforcement</u>		<u>Median No of stimuli to arrest</u>	<u>Per cent relapses 0-3 mths</u>	<u>Per cent relapses 3-12 mths</u>
Mowrer (n = 34)	Complete	17.5	20	15
Twin Signal (n = 34)	Complete	13.5	25	19
Twin Signal (n = 14)	Intermittent	14.5	0	0

These results confirm the indication from the first five subjects that intermittent reinforcement would not significantly impair acquisition with the Twin Signal. To date no relapses have occurred in the intermittent treatment group. Two subjects had four consecutive wet nights soon after the completion of treatment. In each case wetting ceased before re-treatment could be instituted and neither child has since had a wet bed.

The results suggest that intermittent reinforcement may have the effect of increasing resistance to extinction at least over the initial period when more than half the relapses ordinarily occur. However too few cases have yet been treated to permit rejection of the null hypothesis of no difference and it will clearly be

necessary to extend the follow up over 12 months or more before it can definitely be concluded that an overall reduction in the relapse rate can be achieved by the use of intermittent reinforcement.

Subsidiary Findings of Field Experiments.

1. Prediction of outcome of treatment.

During the course of the Field Experiments not a single predictor of therapeutic outcome was observed. None of the reported predictors such as age, sex, primary or secondary enuresis, general adjustment, frequency of wetting etc. was significantly related to response to therapy, although this response was highly variable. The strongest non-significant relationship found was that between wetting frequency and treatment response. There was a tendency for both very frequent wetters (several times per night) and sporadic wetters to be more difficult to cure.

2. Treatment of relapses.

It has often been reported in the literature that children who relapse almost invariably respond well to a second treatment and most remain dry subsequent to re-treatment.

re-

In the present study the response to treatment was variable. Forty per cent of the thirty children re-treated responded more rapidly on re-treatment. In 30 per cent of the cases initial and re-treatment response did not differ appreciably. In the remaining 30 per cent of cases the response to re-treatment was definitely slower than to initial treatment. Three subjects whose wetting had been arrested rapidly by initial treatment, and who had remained dry for several months, required prolonged treatment (>40 reinforcements) on the second occasion. No reasonable hypothesis to account for these results can be offered.

To date only 10 per cent of the re-treated cases have relapsed a second time (follow up period 3-36 months). One child relapsed three times but has remained dry for 6 months following the fourth treatment. None of the three subjects who required prolonged re-treatment has since relapsed.

3. Prediction of relapse.

Just as no prediction of initial response to treatment was possible, no reliable predictor of relapse or response to re-treatment has been found. However, there is a suggestion from the results that relapse is more likely if initial response is either very rapid or very slow.

CHAPTER XIII.

CONCLUSIONS, SUGGESTIONS FOR FURTHER RESEARCH,
AND GENERAL IMPLICATIONS.

Conclusions and Suggestions for Further Research.

The results of the present investigation permit the following general conclusions:

- (1) Direct conditioning methods of treating enuresis are remarkably effective in bringing about an initial arrest of bedwetting but the rate of subsequent relapse is high.
- (2) The therapeutic effects of conditioning methods are the result of the specific stimulus patterns presented by the instrument and are not to be accounted for in terms of suggestion or therapist/child relationships.
- (3) Conditioning methods of treating enuresis produce no undesirable psychological side effects. On the contrary successful use of these methods is often followed by an improvement in certain aspects of the child's adjustment.
- (4) The enuretic population differs little from the general population of children in terms of psychological adjustment.
- (5) It is doubtful if the form of either the diurnal or the nocturnal toilet training adopted by parents is of critical importance in the aetiology of enuresis.

(6) The mechanism of conditioning treatment in all probability follows the avoidance rather than the classical paradigm, and its further investigation may most fruitfully be carried out by a combination of animal and field experiments.

(7) Escape learning probably facilitates acquisition of passive avoidance learning only if the avoidance response to be learned is not a simple unconditioned response to the aversive stimulus.

(8) When the avoidance response to be learned is a simple unconditioned response to the aversive stimulus, very strong shocks facilitate learning. When the avoidance response to be learned is complex or is not an unconditioned reaction to the aversive stimulus, very strong shocks are detrimental to learning. In the former case facilitation results from the increased vigour and decisiveness of the reaction to the aversive stimulus.

(9) Escape learning may have detrimental effects on the maintenance of passive avoidance responses owing to limitation of the opportunity for strong aversive reactions to the conditioned stimulus to develop.

(10) Intermittent reinforcement produces increased resistance to extinction in passive avoidance learning. This effect is probably due chiefly to an increase in the similarity of training and extinction trials, but it may result in part from an increase in

the aversiveness of the conditioned stimulus.

From the point of view of practice, the main problem still appears to be the reduction of the relapse rate. In this connection the effects of intermittent reinforcement during training warrant further investigation in both laboratory and field investigations. Similarly the effects of deliberately varied conditions of reinforcement might repay investigation, as varied reinforcement has been shown to retard extinction in a manner similar to partial reinforcement in laboratory studies. (Macnamara and Wike, 1958)

It has been suggested that the non-escape Mowrer instrument gives better resistance to extinction than the Twin Signal with complete reinforcement because of the increased opportunity for conditioned aversion to develop when the noxious stimulus cannot be turned off once it is allowed to start. On the other hand the Twin Signal with intermittent reinforcement promises to give greater resistance to extinction than the standard Mowrer.

It might be possible to combine the virtues of both instruments by using, say, six consecutive non-escape presentations of the bell at the beginning of treatment, followed by

intermittent reinforcement with the short duration hooter stimulus. This would facilitate development of conditioned aversion reactions initially and then facilitate avoidance responding by provision of a stronger stimulus. The intermittency of the strong reinforcement should tend to maintain the conditioned aversive reactions.

The relations between various shock patterns and acquisition and retention of avoidance responses deserves more detailed study. An understanding of the mechanism of the effects observed in the present experiments would facilitate the development of more effective treatment techniques. It has been suggested that the role of escape learning may well differ in shuttlebox and passive avoidance learning. Similarly there may be important differences between passive avoidance learning involving locomotion and that involving only a limited muscle group.

These are problems worthy of study in their own right, but from the point of view of treatment technique, it may be advisable to work with responses in animals which are more closely analogous to inhibition of micturition than is withdrawal from a water bottle. It may in fact be feasible to train animals, e.g. rats, to micturate during the waking state

only when placed in a special cage by shocking them when they micturate in the home cage. Urine activated electrodes for this purpose should not be difficult to devise.

With the present conditioning methods, when the wet spot has been reduced in size to an inch or two in diameter, it seems certain that the sphincter has already closed by the time the noxious stimulus is presented. (This is particularly likely to be the case when pad type electrodes are used).

On these trials the avoidance response itself is punished and this would ordinarily be expected to interfere seriously with the final development of the conditioned avoidance response. The fact that in almost all cases urination is subsequently totally arrested suggests that punishment of the correct response may not interfere with learning in the passive avoidance situation. This may be due to the fact that the response to be learned occurs automatically in the presence of the aversive stimulus and does not have to be selected from a range of responses.

This question could readily be decided by animal experimentation. A similar explanation of the apparent irrelevance of escape learning in the passive avoidance situation has already been suggested. It has been assumed that the present experiments

have sufficiently demonstrated that response control of the aversive stimulus in passive avoidance is not only unnecessary but may be detrimental to maintenance of the avoidance response. However in neither the animal nor the field experiments has response control of the aversive stimulus been direct. Direct response control could easily be achieved in animal experiments by arranging for the act of drinking to trigger the aversive stimulus.

The problem of direct response control in conditioning treatment is more formidable but one possible answer suggests itself. If muscle action potentials generated by the response of urination could be picked up, their onset could be used to trigger the aversive stimulus and their cessation could be arranged to turn the stimulus off. The feasibility of such an arrangement would seem to depend on the enuretic's use of striped muscles to initiate micturition.

The work of Ditman and Blinn (1955) suggests that at least in the case of older enuretics, the rectus abdominus muscles are used. If sufficiently specific potentials could be isolated, a small battery operated transistorized audio oscillator could be built to fulfill the required functions.

The problem of the aetiology of enuresis still awaits

a solution. In this connection the outcome of the present investigation has been almost wholly negative. Considerable doubt has been thrown on the hypothesis of "psychological stress" as a critical causal factor. As a group enuretics have been shown to differ little from non-enuretics in basic adjustment so that important differences in psychological stress over an extended period are unlikely to have been present.

It is possible, however, that there is a critical period for the development of continence between two and three years and that stress at this stage can result in failure to acquire cortical control. Incontinence may subsequently acquire the form of a learned habit. Psychological stress at the age of two years is usually thought of as being linked with attempts at continence training, particularly the use of harsh or rigid procedures. The present investigation produced no evidence to suggest that rigid toilet training is related to the development of enuresis.

It remains possible nevertheless that the emphasis on toilet training has resulted in other significant sources of stress being overlooked. It is unlikely that retrospective investigations can provide the evidence necessary to decide this question. What is required is an observational study

of a group of young children living under communal conditions.

The hypothesis that enuresis results from the absence of the required conditions of learning at a critical stage, and that these conditions are provided by conventional toilet training has likewise received no firm support from the present evidence. A consistent trend towards laxer or more lenient training and expectations among the mothers of enuretics has been demonstrated. This is consistent with the findings of Dimson (1959). However, in both the present study and that of Dimson, the evidence was obtained retrospectively following the known failure of the enuretics to develop normal continence.

Ideally, evidence concerning training procedures and expectations should be obtained from mothers of first children at the time the children are about 12 months of age, with a subsequent follow-up to obtain the history of continence/enuresis development.

The hypothesis that a constitutionally low level of conditionability operates as a causal factor in enuresis is weakened by the failure to find evidence that a process of conditioning underlies normal continence development and by recent failures to demonstrate a general factor of condition-

ability (Jones, 1960). Nevertheless this line of research needs to be followed through to the point where firm conclusions can be drawn. Problems to be faced include

- (a) the difficulty of deciding whether a process of conditioning (and if so, what type) underlies the development of enuresis as well as continence, and
- (b) the difficulty of finding tests of conditionability suitable for children.

Doubt concerning a general factor of conditionability suggests that tests of conditioning should be made as analogous to the criterion situation as possible. The present study indicates that conditioning treatment follows the passive avoidance paradigm and it is tempting to hypothesize that a similar process underlies normal continence development.

The possibility that Crosby's somatic discomfort stimulus may fulfill the function of the aversive stimulus for this learning is given some indirect support by the findings of Despert (1944). Despert reports that infants in her study seemed to react to being wet in widely different ways. Fifteen children were spontaneously described by their mothers as showing a dislike of being wet at an early age. "Dislike" was "expressed by screaming, squirming and a facial expression

akin to grimacing". (p. 297) The average time at which bladder control was achieved by this group was 14.5 months for day and 18.6 months for night. These figures are significantly lower than the group averages (21.4 months for day, 27.3 months for night, n = 60).

It is a common observation that enuretics are quite undisturbed by urine soaked bed clothes but this is probably a matter of adaptation rather than constitutional insensitivity. However, Despert's findings do suggest the possibility that the wet urinous state may function as an aversive stimulus despite the fact that it fails to inhibit urination once the act has been initiated.

The plausability of this hypothesis would be increased if it could be shown that rats placed in the situation of Animal Experiments II and III learn to avoid drinking when this act results in a shock of insufficient intensity to stop drinking once it has started. Should the hypothesis that the wet urinous state acts as an aversive stimulus receive further support, tests of conditionability in a passive avoidance situation would be indicated.

The recent findings of Hallgren (1957) suggesting a genetic factor in enuresis, are consistent with the hypothesis

that there are temperamental differences between enuretics and non-enuretics which are not necessarily related to neuroticism or maladjustment. Further support for this view is provided by the work of Cust (1958) and Dimson (1959). The data of these investigations agree with those of the present study in showing no significant relationship between toilet training and enuresis. However, both Cust and Dimson found a highly significant tendency for their enuretics to have been strongly resistant to toilet training.

In the case of Dimson's subjects, resistance occurred with both strict and lenient training. The relationship between these findings and those of Despert (1943) mentioned above is not obvious and research might profitably be directed towards an elucidation of the temperamental factors giving rise to both sets of observations.

Despite the attractiveness of the hypothesis that normal continence results from the passive avoidance of the wet urinous state, it must be recognized that the most parsimonious interpretation of the present evidence is that the development of continence is not a psychological problem at all. It is entirely possible that continence occurs when a maturational process, independent of specific life conditions, brings control

of the bladder under cortical inhibition which must be negated by voluntary effort for micturition to occur.

Enuresis might then result initially from a specific maturational deficiency or a high degree of stress at a critical period, and be maintained as an habitual reaction. Persistent enuresis would thus be a psychological problem whereas the development of continence would not.

General implications for theory and practice in the field of
psychological disturbances.

The results of direct conditioning treatment of enuresis are paralleled by the results obtained in the treatment of other behavioural disorders by direct conditioning methods.

(Liversedge and Sylvester (1955), Raymond (1956), Jones (1956), Myer (1957), Yates (1958), Wolpe (1958).

It can be argued that the therapeutic results of the above-mentioned studies cannot be attributed to the specific stimulus combinations presented during therapy because, as in most reports of the results of psychotherapy, adequate control data are lacking. It is true that in some of these cases confirmation of rigorously derived predictions of the outcome of changes in therapeutic technique provides strong evidence

of internal consistency, but the need for controlled group studies remains. The conditioning and treatment of enuresis is unique in having been subjected to such investigations.

There is one respect, however, in which the results of all published reports of direct conditioning treatment are unequivocal and are in complete accord with results obtained from studies of conditioning treatment of enuresis. In none of these studies has symptom substitution been observed, nor has there been an exacerbation of anxiety despite the effective removal of "symptoms".

These results suggest that theories which predict undesirable side effects as a consequence of direct conditioning methods must be called seriously into question. This does not necessarily imply that "wrong habit" theories such as that of Eysenck give an adequate account of all neuroses or psychological disturbances, nor that direct non-verbal conditioning methods are the only appropriate methods of treating psychological disorders. In this connection it can be argued that no theory which disregards the processes of consciousness can ever give a full account of all the varieties of neurotic disorder or serve as a sufficient basis for their treatment.

From this point of view an adequate general theory of behaviour must be a centralist theory; one which gives appropriate emphasis to central integrating and regulatory processes. From their neuro-physiological aspect these processes may be regarded as autonomous cerebral processes (Hebb 1949), and from their psychological aspect they may be regarded as the processes of consciousness. The essence of consciousness in this sense has been well stated by Collier (1956) who defines consciousness as an awareness field in which processes which may eventuate in action have increased chances of interaction and modification.

The behavioural disorders which have been treated by direct conditioning methods (enuresis, frequency of micturition, writer's cramp, phobias, fetishes, tics) all appear to have the characteristic of being necessarily outside the field of possible central interaction and modification. Given the appropriate stimulus conditions they occur automatically and uncontrollably.

It seems probable that most of these disorders were acquired under conditions of trauma or extremes of excitation (e.g. phobias, fetishes, writer's cramp, etc.) and consist essentially of systems of direct S - R linkages. Consequently

a direct attack on these maladaptive behavioural patterns is not only feasible but is the only approach with a high probability of being successful.

This still leaves room for a good deal of psychological disturbance in which there are no specific overt behavioural disorders of the kind discussed, but which have as their subjective manifestation generalized anxiety, depression, feelings of worthlessness, dissatisfaction, unhappiness, morbid introspectionism and the like.

These disturbances appear primarily to involve central structures which in psychological terms may be called attitudes and which are intimately related to the system of social relationships in which the individual finds himself. The treatment of such disturbances will often require a fundamental central restructuring. (In some cases restructuring of the external circumstances may be the only effective procedure.)

Such a restructuring is theoretically possible because the elements are potentially available for central interaction and modification. Since the structures involved are primarily based on language symbols, it follows that verbal methods or the methods of psychotherapy will be necessary to bring about the required change. The form of such psychotherapy is of course a matter for research.

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SUMMARY.

SUMMARY.

The general aim of the investigation is to relate developments in the theory and method of conditioning to the therapy of enuresis.

The therapeutic effectiveness of existing conditioning instruments is studied in comparison with that of an instrument modified on the assumption that conditioning treatment follows the avoidance rather than the classical conditioning paradigm.

A series of animal experiments and related field studies is carried out to test methods of reducing the high relapse rate observed in the first field experiment.

The general psychological effects of conditioning treatment are investigated by means of pre and post treatment personality testing of enuretics with suitable control procedures.

A survey of micturition in relation to parental practices, attitudes and expectations concerning toilet training is undertaken with groups of enuretic and non-enuretic children.

It is concluded that the results of the study as a whole strongly support the habit deficiency theory of enuresis and

the use of direct conditioning methods of treating behavioural disturbances.

It is argued that it does not necessarily follow that wrong habit theories offer an adequate account of all behaviour disorders, or that treatment by the verbal methods of psychotherapy has no place.

Suggestions for further research are offered.

APPENDIX 1.

TWIN SIGNAL (a) CIRCUIT & (b) LEGEND.

TWIN SIGNAL CIRCUIT LEGEND.

- B1 P. Coote Bed Pad.
- C1 500 microfarad 6VW Electrolytic Capacitors.
- D1 0A73, 0A85, 0A91, 0A95, 0A200, 0A210, 0A211, 0A214.
- F 2 Amp glass enclosed fuse and holder.
- J1 2 line Jack.
- L 6.3V Dial Lamp (Philips 8008D or 8073D)
- PL 2 line Plug for Jack.
- R1 330 Ω 5W wirewound.
- R2 560 Ω 5W wirewound.
- R3 68 Ω $\frac{1}{2}$ W carbon (not needed if 0A210, 211 or 214 used)
- S1 2 pole 2 position 250V 2 Amp Mainswitch.
- S2 2 pole 2 position Oak wafer switch.
- S3 1 pole 3 position Oak wafer switch.
- T Filament Transformer Trimax TP1684 (240V Primary,
2 X 6.3V 3 Amp Sec.)*
- V1 Ediswan DLS10 or DLS16 Vacuum Thermal Delay Tube.
- W1 RVB Model A5 X 240V 80VA Warning Signal.
- W2 Federal Electric Bell HL3 or Electric Gong HL5.

* Practically any radio power transformer is satisfactory.
The only requirements are a 6.3V secondary and some form
of electrostatic shield.

APPENDIX 2.

DESCRIPTION OF TWIN SIGNAL CIRCUIT OPERATION.

Description of Twin Signal Circuit Operation.

The circuit is arranged to present either

- (a) a blast from an industrial warning signal, approximately one second in duration, followed about 45 seconds later by the ringing of an electric bell, or
- (b) immediate ringing of the electric bell.

In either case the bell continues until the instrument is turned off. The intensity of the warning signal stimulus is approximately 100 db above a reference level of .0002 dynes/cm² at a distance of 3 feet.* The intensity of the bell is approximately 80 db similarly measured.

The circuit is activated when urine on the bed pad closes the A.C. path to the bridge rectifier thus energizing a 500 ohm coil 3000 type relay. This relay is fitted with

- (1) a set of normally open contacts in parallel with the bed pad to lock the circuit once it is triggered.
- (2) a set of normally open contacts which on closing either switch on the electric bell or pass current through a thermal delay switch which is also fitted with normally open contacts. When the thermal delay switch closes, the electric bell rings. These alternatives are selected by one pole of a two pole, two position oak switch.

* This is the most commonly used intensity given by one step from maximum attenuation.

(c) a set of changeover contacts, the common contact of which is connected to a 500 microfarad capacitor. The normally closed contact is connected to a 6V D.C. supply, and the normally open contact is connected to a second 500 ohm coil 3000 type relay through the other pole of the two pole, two position oak switch. If this switch is in the appropriate position, the 500 microfarad capacitor discharges through the second relay when the first relay closes and operates a set of heavy duty normally open contacts which switch on the industrial warning signal for the duration of the discharge (about one second).

The instrument is reset by turning off the mains switch for a few seconds. The intensity of the warning signal is controlled by a one pole three position oak switch which inserts resistors in series with the mains.

The bed pads are manufactured by P. Coote of 35 Bluff Road, Black Rock, Victoria. They consist of strips of flattened metal braid sewn on a rubber backing about $\frac{3}{4}$ of an inch apart and connected alternately to the 6V A.C. circuit.

The use of A.C. current virtually eliminates the corrosion which severely limits the life of the braid. It also prevents the deep seated burns on the subject's thighs and buttocks which often occur with direct current.

APPENDIX 3.

INSTRUCTIONS FOR USE OF ENURESIS APPARATUS.

(TWIN SIGNAL)

Instructions for use of Enuresis Apparatus.
(Twin Signal)

1. Place apparatus on table near the head of the bed.
N.B. The round fabric covered aperture should face directly towards the child's head and should be at a distance of not more than three feet.
2. Plug apparatus into 240 V A.C. power point and switch on.
3. Place electrode pad across bed in such a position that the child's genitals will be over the centre of the pad.
Ensure that the pad is smoothed out, place draw sheet over pad and tuck ends under mattress.
N.B. It is essential that the bed be reasonably rigid or otherwise the pad will be damaged. If the bed tends to sag it must be packed up with boards or something similar.
4. Plug leads of electrode pad into apparatus.
5. Test apparatus by shorting across wires of pad with piece of metal.
6. Enter date and bed time on recording sheet.
7. Ensure that child is unclothed from the waist down when retiring. (If the child objects to this procedure his pyjama pants may be removed after he is asleep).

8. When the loud signal is heard, indicating that the child has urinated, go quietly to the child's bedside and observe the extent to which he has been disturbed (see Record Sheet last heading).
9. If the child is not fully awake do not disturb him until the buzzer comes on. As soon as the buzzer comes on turn off the apparatus, get the child out of bed. Ensure that he is properly awake and take him to the toilet to urinate in the graduated container. Note amount of urine passed and enter this on record form. If child refuses to urinate use only gentle persuasion and if this fails allow the child to return to the bedroom.

(If the child is fully awakened by the loud signal, it is not necessary to wait for the buzzer before getting him out of bed).
10. Note size of wet spot on pad and enter this on record sheet.
11. Remove draw sheet and use dry part to wipe damp spot on pad.
12. Place a dry sheet in position, switch on apparatus and check to see that panel light is burning. If a signal results the pad requires further drying.

13. Allow child to re-enter the bed and ensure that all appropriate columns of the data sheet are filled in.

14. In the morning note child's time of awakening, get him to urinate in the graduated container and enter data on record sheet.

N.B. CEASE ALL OTHER FORMS OF TREATMENT.

e.g. Do not raise child to pot.

Do not restrict fluids.

APPENDIX 4.

SOCIAL UNDERVALUATION AND NEUROTIC INVENTORY.

SOCIAL UNDERVALUATION AND NEUROTIC INVENTORY.

Directions: Say, "I'm going to read to you some things which boys I know have said, and I want to find out if you are like the boy I mention".

Read item and ask -

"Are you exactly like (boy's name)?" 3 points.

"Do you feel like (boy's name) a little bit?" 2 points.

If negative response to both questions ask -

"Are you quite sure you are not like (boy's name) at all?"

Probe all positive answers and record results. If subject is doubtful, earlier questions may be repeated. If subject answers "sometimes", 2 points are scored. (Girl's names are substituted if testee is a girl.

SOCIAL UNDERVALUATION TEST.

Trial items (a) Ned said: I'm not as lucky as other boys.

(b) Eric said: I'm not much good at games.

1. Roy said: Some members of my family aren't fair to me.
2. Allan said: No-one ever praises me.

3. Len said: People often think I'm queer.
4. Eric said: The others are always trying to make fun of me.
5. Jack said: Teachers try to make out I cant read as well as other boys.
6. Ned said: I don't think the other boys like me.
7. Bob said: Everyone tries to make out that I'm not clever.
8. Joe said: No one ever gives me presents.
9. Harry said: I'm often a failure.
10. Don said: The others tell lies about me.
11. Noel said: I've hardly any friends at all.
12. Ben said: My teachers are always complaining about my arithmetic.
13. Dan said: I'm always being scolded or punished by someone.
14. Eric said: I'm never allowed to do anything I want to do when I'm at home.
15. Colin said: I never seem to be allowed to keep anything of my own.
16. John said: Teachers reckon I can't spell.
17. Ned said: I'm always being blamed for other people's faults.
18. Bill said: The others are always calling me names.
19. Don said: I'm not allowed to play when I want to.
20. Stan said: Teachers always hurry me too much with my schoolwork.

NEUROTIC INVENTORY.

Trial item. Bill said: I spend a lot of time reading comics.

1. Harry said: Almost every day something happens to
frighten me.
2. Bill said: I get a lot of headaches.
3. Roy said: At times I have very much wanted to leave home.
4. Fred said: In school I find it very hard to talk in front
of the class.
5. Ted said: I'm not likely to speak to people until they
speak to me.
6. Len said: I often feel sick in the stomach.
7. Dan said: I worry quite a bit about things which might
happen.
8. Bob said: I often do things which I'm sorry about
afterwards.
9. Frank said: Most of the time I feel down in the dumps.
10. Jim said: I hardly ever enjoy my meals because most
times I'm not hungry.
11. Len said: I dream nearly every night.
12. Don said: I often find myself worrying about something.

13. Noel said: I often get a stomach ache.
14. Ben said: I wish I could be as happy as other boys.
15. Colin said: I've often been punished for nothing.
16. John said: I often have some sort of ache or pain.
17. Bill said: I wish I wasn't so shy.
18. Sam said: I seem to be frightened of more things
than my friends are.
19. Tom said: Most mornings I'm still tired when I wake up.
20. Ned said: I'm unhappy most of the time.

APPENDIX 5.

BEHAVIOUR RATING SCALE.

BEHAVIOUR RATING SCALE.

Instructions. (Personally administered)

I have here a list of questions about the behaviour of your child. In each case I want you to tell me which phrase best describes his behaviour.

For each question you'll notice the phrases range from one type of behaviour to its opposite. Try to make your rating by comparing your child with children of his own age. Also, try to consider each behaviour quite separately from all the others.

When you've decided on the most appropriate descriptive phrase I'll put a mark beside it.

Don't take any notice of the small numbers under the phrases.

1. Does he live in a dream-world or is he wide awake? SCORE.

Continually absorbed in himself	Frequently day dreams	Usually present minded	Wide- awake.	Keenly alive and alert.	
(5)	(4)	(2)	(1)	(3)	_____

2. Is his attention sustained?

Distracted: jumps from one thing to another	Difficult to keep at task until completed	Attends adequately	Is absorbed in what he does	Able to hold attention for long periods.	
(5)	(4)	(3)	(1)	(2)	_____

3. Is he indifferent or does he take an interest in things?

Is indifferent, unconcerned	Uninquisi- tive, rarely interested	Displays usual curiosity and	Interests are easily aroused	Has consuming interest in most every- thing	
(5)	(4)	(1)	(2)	(3)	_____

4. Can he compete with others on a physical basis?

Weak and handi- capped	Has some physical difficulties	Can hold his own	Is stronger than most	Has excep- tional strength	
(5)	(3)	(2)	(1)	(4)	_____

5. What is his output of physical energy?

Extremely sluggish	Slow in action	Moves with required speed	Energetic, vivacious	Over-active, never still	_____
(5)	(3)	(2)	(1)	(4)	

6. Is he easily fatigued?

Shows quick exhaustion	Does' not have ordinary endurance	Endures satisfactorily	Rarely shows fatigue	Unusually vigorous and robust	_____
(4)	(3)	(1)	(2)	(5)	

7. Does he lack nerve, or is he courageous?

Excessively fearful	Gets "Cold feet"	Will take reasonable chances	Resolute	Dare- Devil	_____
(4)	(3)	(1)	(2)	(5)	

8. Is he quiet or talkative?

Speaks very rarely	Mostly quiet	Upholds his end of talk	Talks more than his share	Jabbers	_____
(3)	(1)	(2)	(4)	(5)	

9. What are his social habits?

Lives almost entirely to himself	Follows few social activities	Pursues usual social activities and customs	Actively seeks social pleasures	Prefers social activities to all else	_____
(4)	(3)	(1)	(2)	(5)	

10. Is he shy or bold in social relationships?

Painfully self-conscious	Timid frequently embarrassed	Self- conscious on occasions	Confident in himself	Bold, insensitive to social feelings.	_____
(4)	(2)	(1)	(3)	(5)	

11. How flexible is he?

Stubborn, hidebound, non-confor- mist	Slow to accept new customs and methods	Conforms willingly as necessity arises	Quick to accept new customs and methods	Easily persuaded unstable	_____
(5)	(3)	(2)	(1)	(4)	

12. Does he give in to others or does he assert himself?

Never asserts self	Generally yields	Holds his own, yields when necessary	Assertive	Insistent, obstinate	_____
(5)	(4)	(1)	(2)	(3)	

13. Is he even-tempered or moody?

Stolid, rare changes of mood	Generally very even- tempered	Is happy or depres- sed as conditions warrant	Has strong and fre- quent changes of mood	Has periods of extreme elation or depression	_____
(3)	(1)	(2)	(4)	(5)	

14. Is he easily discouraged or persistent?

Melts before slight obstacles or objections (5)	Gives up before adequate trial (3)	Gives everything a fair trial (1)	Persists until convinced of mistake (2)	Never gives in, obstinate (4) _____
---	--	---	--	--

15. Is he generally depressed or cheerful?

Dejected, melancholic, in the dumps (3)	Generally dispirited (4)	Usually in good humour (1)	Cheerful animated chirping (2)	Hilarious (5) _____
--	--------------------------------	--	---	------------------------

16. How does he react to frustrations or to unpleasant situations?

Very submissive, long suffering (3)	Tolerant, rarely blows up (2)	Generally self- controlled (1)	Impatient (4)	Easily irritated hot-headed explosive (5) _____
---	--	---	------------------	---

17. Does he worry or is he easy-going?

Constantly worrying about something, has many anxieties (4)	Apprehensive, often worries unduly (2)	Does not worry without cause (1)	Easy- going (3)	Entirely carefree, never worries light hearted (5) _____
---	---	--	-----------------------	--

18. Is he emotionally calm or excitable?

No emotional responses, apathetic	Emotions are slowly aroused	Responds quite normally	Is easily aroused	Extreme reactions hysterical high strung	_____
(4)	(2)	(1)	(3)	(5)	

19. Is he negativistic or suggestible?

Negativistic, contrary	Complies slowly	Is generally open minded	Rather easily persuaded	Follows any suggestions	_____
(5)	(4)	(1)	(2)	(3)	

20. Does he act impulsively or cautiously?

Impulsive, bolts, acts on the spur of the moment	Frequently unreflective and imprudent	Acts with reasonable care	Deliberate	Very cautious and calculating	_____
(5)	(4)	(2)	(1)	(3)	

TOTAL SCORE _____

APPENDIX 6.

EXTRAVERSION SCALE.

ITEM RATINGS.

1. Is his attention sustained?

Distracted: jumps from one thing to another	Difficult to keep at task until completed	Attends adequately	Is absorbed in what he does	Able to hold attention for long periods.	_____
(4)	(3)	(2)	(1)	(0)	

2. What is his output of physical energy?

Extremely sluggish	Slow in action	Moves with required speed	Energetic, vivacious	Over-active, never still.	_____
-	-	(0)	(2)	(4)	

3. Is he quiet or talkative?

Speaks very rarely	Mostly quiet	Upholds his end of talk	Talks more than his share	Jabbers.	_____
(0)	(1)	(2)	(3)	(4)	

4. What are his social habits?

Lives almost entirely to himself	Follows few social activities	Pursues usual social activities and customs	Actively seeks social pleasures	Prefers social activities to all else.
(0)	(1)	(2)	(3)	(4) _____

5. Is he shy or bold in social relationships?

Painfully self-conscious	Timid, frequently embarrassed	Self-conscious on occasion	Confident in himself	Bold, insensitive to social feelings.
(0)	(1)	(2)	(3)	(4) _____

6. Is he easily discouraged or persistent?

Melts before slight obstacles or objections	Gives up before adequate trial	Gives everything a fair trial	Persists until convinced of mistake	Never gives in. obstinate.
(4)	(3)	(2)	(1)	(0) _____

7. Is he generally depressed or cheerful?

Dejected, melancholic, in the dumps	Generally dispirited	Usually in good	Cheerful animated, chirping	Hilarious.
-	-	(0)	(2)	(4) _____

8. How does he react to frustrations or to unpleasant situations?

Very submissive, long- suffering	Tolerant rarely blows up	Generally self- controlled	Impatient	Easily irritated hot-headed, explosive.
(0)	(1)	(2)	(3)	(4) _____

9. Is he emotionally calm or excitable?

No emotional responses, apathetic	Emotions are slowly aroused	Responds quite normally	Is easily aroused	Extreme reactions, hysterical, high strung.
-	-	(0)	(2)	(4) _____

APPENDIX 7.

BEHAVIOUR PROBLEM RECORD.

10. Does he act impulsively or cautiously?

Impulsive, bolts, acts on the spur of the moment	Frequently unreflective and imprudent	Acts with reasonable care	Deliberate	Very cautious and calculating.
(4)	(3)	(2)	(1)	(0) _____

BEHAVIOUR PROBLEM RECORD.

I have here a list of behaviour problems sometimes found in children. Will you please tell me how frequently such behaviour has occurred with your child.

Score Weights.

<u>Category.</u>	<u>Weight.</u>
Has never occurred	0
Has occurred once or twice but no more.	1
Occasional occurrence	2
Frequent occurrence	3

BEHAVIOUR PROBLEM	FREQUENCY OF OCCURRENCE				SCORE.
	Has never Occurred	Has Occurred Once or Twice but No More	Occasional Occurrence	Frequent Occurrence	
Marked over-activity					
Temper outbursts					
Speech difficulties					
Imaginative lying					
Stealing					
Night terrors					
Nail biting					
Eating difficulties					
Aches and pains					
Stomach upsets					
Anxieties and Fears					
Restlessness & Fidgetting					
Irritability					
Destructiveness					
Tics or nervous twitches					

TOTAL SCORE.....

APPENDIX 8.

INSTRUCTIONS TO SUBJECTS - MOVIE STORY TEST.

INSTRUCTIONS TO SUBJECTS - MOVIE STORY TEST.

This is a test of your imagination. It is called the Movie Story Test. Your task is to look at the wall and to try to imagine a moving picture being shown on it - a home movie about family life. You will be asked to imagine several movies and each time you will be told who is in the film.

Your task then is to imagine the movie and tell me -

- (1) what happens.
- (2) what the people are like (what sort of people they are).
- (3) what they think and feel about each other.

I'll write it down.

You can put anything you like into your movie stories as long as it makes a story. The best stories are those where you just let your imagination go and put as much feeling into your stories as you can. You might find it helpful if you look at the wall with your eyes half closed and try to imagine the people and what might happen.

Remember - say what happens, what sort of people they are and what they think and feel about each other.

Right. The first movie is about a boy and his mother.

APPENDIX 9.

CATEGORIES USED IN CONTENT ANALYSIS OF M. S. T. PROTOCOLS.

CATEGORIES USED IN CONTENT ANALYSIS OF M.S.T. PROTOCOLS.

1. Parent is liked, loved, missed, cared for.
2. Parent helps, loves, encourages, sacrifices or cares for, understands or worries about S.
3. Parent and S live happily together.
4. Parent and S carry on joint activity, but no particular feeling is expressed.
5. Parent exerts control which is accepted.
6. No evidence concerning parent/child relationships.
7. Parent coerces, restrains, gives distasteful duties or S reacts against parent with misdemeanours.
8. Parent threatens punishment but relents, reprimands, punishes mildly, punishes or treats S badly but then P and S "make it up" or either P or S realises the error of his ways.
9. Parent thrashes, abuses, severely admonishes or otherwise severely punishes S, causing resentment with no reconciliation.
10. Parent is drunkard, thief, gambler, wife-beater etc.
11. Parent is actively disliked or hated.

APPENDIX 10.

ENURESIS SURVEY.

ENURESIS SURVEY.

DATE OF INTERVIEW:

SURNAME (Block letters) :

INITIALS:

ADDRESS:

PHONE NO:

HUSBAND'S OCCUPATION (Details) :

CHILDREN:

Name.	Sex.	Age.	Birthday.	School.	Grade.
1.					
2.					
3.					

Q1. Could you tell me first of all at what age your child/
children first acquired bladder control during the day?

("Control" is able voluntarily to inhibit urination and
to make the need for urination known to the mother)

Child 1.

Child 2.

Child 3.

Age in
years
and
months.

Q2. At what age did your child first acquire bowel control during the day?

("Control" is able voluntarily to inhibit bowel motion and to make the need for defecation known to the mother)

Child 1.

Child 2.

Child 3.

Age in
years
and
months.

Q3. Did you use any form of training before your child/children gained bladder and bowel control during the day?

(If so, obtain details)

Child 1.

Child 2.

Child 3.

Q4. (If not already given) Did you use the method of "holding out" or regular potting during the day? (If so, fill in details)

Age potting
commenced
in months

Times of potting
during day

Child 1.

Child 2.

Child 3.

Q5. Was any other method used, e.g. rewards or punishment?

(Record details)

Child 1.

Child 2.

Child 3.

Q6. Has the child had any trouble with wetting during the day since he first became dry?

Q7. At what age do you think a child should acquire bladder control during the day?

Q8. At what age do you think a child should acquire bowel control during the day?

Q9. That will do for the day time - could we now consider the night time? This is where many parents have trouble - in fact bed-wetting is much more common than many people suppose. Has it been a problem with your child/children at all? (Refers only to children 6-8 years)

In the case of children over six years of age who wet the bed no more than once per month, complete Schedule A.

In the case of an enuretic child over the age of five years, proceed to Schedule B.

Schedule A. (Non-enuretic children)

Q10. At what age did your child/children between six and eight years become dry at night?

("Dry" is not more than one wet bed per month)

	Child 1.	Child 2.	Child 3.
Age in years and months.			

Schedule B. (Enuretic children)

Q11(a). How many times per week does the child wet the bed on average? (Answer by encircling appropriate figures)

1-2 times. 3-4 times. 5-7 times.

Q11(b). Has the child wet the bed since birth?

Q12. If not, at what age did he/she first become dry at night? (as accurately as possible)

Q13. At what age did he/she start wetting the bed again?
(as accurately as possible)

Q14. Are you able to recall any unusual circumstances associated with the child's becoming wet again?
(If nothing recalled, record this and then prompt with "Such as illness, change of school, etc.")

Q15. Have any measures been taken to overcome the bed-wetting?
(List measures taken)

Schedule C. (all parents)

Q16. Did you use any form of night training with your child/
children? (Record details)

Child 1.

Child 2.

Child 3.

Q17. (If not already given). Did you use the method of "potting",
i.e. waking the child at regular times to use the pot?

Q18. (If so) At what age was potting at night commenced?
(as accurately as possible)

Child 1.

Child 2.

Child 3.

Q18a. To what extent did the child usually wake up when potted
at night?

Almost fully awake

Only half awake

Scarcely

awake at all.

Q19. Was any other method used, e.g. rewards or punishment?

(Record details)

Child 1.

Child 2.

Child 3.

Q20. At what age do you consider a child should be dry at night?

Q21. At what age do you consider special corrective measures should be taken if a child continues to wet the bed?

Q22. Do you think a child of say 6 years, who still wets the bed, has any control over his wetting?

Q23. What do you consider to be the main cause of bedwetting?

Q24. Have you heard about the apparatus called the Dri-Nite for treating bed-wetting by presenting a stimulus when the child urinates?

Show illustration and explain:

- (1) the genital electrodes
- (2) the sounding of a buzzer and presentation of a mild electrical stimulus to the child's loin region when he urinates at night.

Q25. If you had a child who was still wetting the bed continuously at eight years of age, how would you feel about having him treated by this method?

(Record reply and then show categories below and have respondent select one by encircling)

1.	2.	3.	4.
Would feel quite happy about using the apparatus.	Would be willing to use the apparatus but would not like the idea very much.	Would consent to use of the apparatus only with the greatest reluctance.	Would not consent to use of the apparatus under any circumstances.

Q26. There is another method which is similar, but the child sleeps on a special pad instead of having to wear a belt. Also it does not use an electrical stimulus - only a loud bell.

How would you feel about the use of this apparatus under the same circumstances?

(Record reply, then show categories below and have respondent select one by encircling)

Would feel quite happy about using the apparatus.

Would be willing to use the apparatus but would not like the idea very much.

Would consent to use of the apparatus only with the greatest reluctance.

Would not consent to use of the apparatus under any circumstances.

Q27. If you knew that both methods were equally effective, which of these two methods would you prefer?

(Encircle appropriate name)

Dri-Nite

Bell method.

Q28. Encircle electrode you prefer:

pad

genital.