

Classical, Avoidance and Backward Conditioning Treatments of Homosexuality

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Previous studies (McConaghy, 1969, 1970a; McConaghy *et al.*, 1972) evaluated the efficacy of three widely different forms of aversion therapy in treating homosexuality. The methods investigated were aversion-relief, apomorphine therapy, and avoidance conditioning.

With aversion-relief the patient read aloud a series of phrases descriptive of homosexual activity and immediately received a painful electric shock. Each patient experienced over 1,000 pairings of phrases and shocks during the course of treatment. With apomorphine therapy the patient was shown slides of males he found attractive on 28 occasions, each occasion being associated with nausea produced by apomorphine injections. With avoidance conditioning the patient was presented 420 times with similar slides of males, with the possibility of rejecting the slide and so avoiding a painful electric shock on two-thirds of the presentations; on the remaining occasions the patient could not avoid the shock.

The patients' response to treatment was assessed both by reported change in sexual feelings and behaviour and by changes in penile volume to moving pictures of nude men and women. It was concluded that following therapy the patients showed weakening of homosexual feelings. No significant differences were found in response to the three treatments.

The technique of avoidance conditioning used was quite elaborate and was designed by Feldman and MacCulloch (1965) to exploit fully the findings of many thousands of experiments on animal and human conditioning, with the expectation that it would prove much more effective than simpler techniques such as aversion-relief and apomorphine therapy. It has been pointed out (McConaghy, 1969) that it cannot be assumed that aversion therapies

act simply as conditioning techniques. Yet if they have a specific action it would seem likely that widely different techniques would produce different degrees of response.

To obtain further evidence as to whether the aversion therapies employed have specific effects, in the previous studies each patient's response to treatment was compared with his ability to set up a conditioned response in a separate procedure. Before treatment the patient was shown a film which contained ten-second segments of moving pictures of nude women and men. The pictures of women were preceded by shots of a red circle; they alternated at intervals of one minute with pictures of men preceded by shots of a green triangle. The patient's penile volume response was measured throughout the procedure. Conditioned responses occurred to the circles and triangles similar to the unconditioned responses to the following nudes, viz. penile volume increase to the male, and penile volume decrease to the female nudes. There was no consistent relationship between the patients' conditionability as measured in this way and their response to aversion therapy.

In view of these findings the present study was carried out to examine further the problem of whether the aversion therapies act specifically. Avoidance conditioning was compared with a simple classical and a backward conditioning procedure. In backward conditioning the unconditioned stimulus (in this case a painful electric shock) precedes the conditioned stimulus (the slide of an attractive male). It has been established that backward conditioning produces little if any stable conditioning (Pavlov, 1927).

Since aversion therapy involves the use of a painful stimulus, it was decided also to compare each patient's response to this therapy with an

independent measure of his ability to set up a conditioned response with an aversive unconditioned stimulus. In the studies reported above, only the patients' ability to condition to appetitive sexual unconditioned stimuli was investigated. Evidence has been advanced that there is a relationship between a person's ability to set up conditioned responses to appetitive and to aversive unconditioned stimuli, i.e. that a general factor of conditionability exists (Barr and McConaghy, 1972). It is possible that there are in addition subsidiary factors; for example, as Lovibond (1964) has suggested, separate factors for aversive and appetitive conditionability. If this is correct, and there is a relationship between response to aversion therapy and conditionability, this relationship should be more apparent if an aversive procedure is used to measure conditionability.

METHOD

Forty-six homosexual patients referred for aversion therapy were randomly allocated to receive one of three treatments—classical, avoidance, or backward conditioning. Each patient was admitted to hospital for five days for initial investigations and treatment.

Investigations

1. *Appetitive conditionability*: The patient first viewed the film referred to above, containing moving pictures of nude men and women. While he viewed the film, changes in his heart rate, penile volume and galvanic skin response were recorded on a Grass 5D polygraph. The method of recording and scoring these responses has been described elsewhere (McConaghy, 1967; Barr and McConaghy, 1972).

2. *Aversive conditionability*: The patient next received a series of electric shocks of increasing intensity to determine a level at which they were definitely unpleasant without being unbearable. The shocks were generated by a Grass S4 stimulator. They were of one second duration and consisted of one millisecond pulses delivered at the rate of one hundred pulses per second to the tips of the index and ring fingers of the right hand through 1.5 cm. solder electrodes coated with electrode jelly. The level accepted by the subjects varied from 30 to 150 volts. Tones of 500 and 1,500 c.p.s. were then presented alternately at minute intervals. The 500 c.p.s. tones were followed by painful electric shocks at the level of intensity determined. The same physiological responses were recorded throughout as during the film. This condi-

tioning technique has been described in more detail elsewhere (Barr and McConaghy, 1971).

Details of treatment

Slide selection: All patients were shown 60 slides of nude or partially clothed male children, adolescents or adults, some with penile erections. Patients having avoidance or backward conditioning were also shown 30 slides of nude or partially clothed young adult women. Each slide was shown for 10 seconds. While viewing it, the patient scored his sexual response as marked, moderate, slight or none. At the same time his heart rate, penile volume and galvanic skin response were recorded. For patients receiving classical conditioning, approximately 15 male slides were selected to which the patient reported the greatest subjective response and showed the greatest penile volume increase. For avoidance or backward conditioning approximately 15 slides each of men and women were selected, ranging from those to which the patient showed greatest subjective and penile volume response to those to which he showed only slight response.

Classical conditioning: The patient was told that he would receive three electric shocks during each session of treatment, and was encouraged to tolerate as strong a shock as possible short of a level which caused him to become emotionally distressed. In each treatment session he was shown three of the male slides selected by the procedure described above. The slides were shown for ten seconds at intervals of approximately four minutes. During the final second of exposure of each slide, and for one second following its removal, the patient received a painful electric shock to the fingers. The shocks were delivered as described above and varied from 60–150 volts in intensity.

Avoidance conditioning: This was based on the procedure described by Feldman and MacCulloch (1965). The patient was first shown the male slide to which he had only slight response in the slide selection procedure. He was instructed to leave it on as long as he found it attractive. After eight seconds he received an electric shock if he had not removed the slide by means of a hand switch with which he was provided. The shock continued until he removed the slide. The intensity of shock used initially was that determined in the aversive conditionability procedure. If the patient did not quickly remove the slide after receiving the shock, its intensity was increased until he did so. The voltage used varied from 30–150 volts. When the patient avoided the shock three times in succession by switching the slide off before eight seconds had elapsed, he was placed on a schedule of

reinforcement. In one-third of the trials he could still switch the slide off whenever he wished; in another third he could switch off the slide after a variable delay; and in the final third he could not switch the slide off until after he had received a shock. On some occasions following the removal of the male slide and cessation of the shock he was shown the slide of a woman to which he had the greatest response in the slide selection procedure. When he no longer had a sexual response to the male slide it was changed for the next one to which he had little sexual response. At the same time the female slide was changed for the next to which he had most response. The patient was shown a male slide thirty times in each session.

Backward conditioning: This was designed to approximate avoidance conditioning in terms of frequency and duration of presentation of slides of males and females and of electric shocks. The patient received a shock of one second duration. After a half-second the slide of a male was shown for four seconds. Following a two-second interval either the slide of a female was shown for sixteen seconds or the screen was left blank for this period of time. After a further half-second the patient received the next shock. This cycle was repeated thirty times in each treatment session. The level of shock used initially was that determined in the aversive conditioning procedure. The patient was told it should be definitely unpleasant but not unbearable, and was requested to inform the therapist if it felt less intense than this at any time, so that it could be increased. The voltage used varied from 30–150 volts. As with avoidance conditioning the male slide used initially was the one the patient found least exciting, and the female slide was the one he found most exciting. Both slides were changed for the next in these hierarchies when the patient reported he no longer felt any sexual response to the male slide.

All patients received 14 sessions of treatment during the five days in hospital. They were asked to return three weeks later for further investigations and treatment. On this occasion they were again shown the film, and the same physiological responses were recorded. Slides were then selected and the first booster treatment given. This was similar to that each patient received in hospital. They then returned at intervals of a month for five further booster treatments. Prior to the last, they were shown the film again and their responses were recorded. After each booster treatment, and six months after the last one, they were questioned about their current sexual feelings and behaviour.

All patients completed the sessions of treatment in hospital. One failed to attend for assessment and booster treatment after one month. Twenty-two completed the six booster sessions of treatment, and all

but two of these patients attended for the 12 months follow-up interview. Seven attended for five booster treatments, 6 of them attending for the 12-month follow-up. Fifteen attended for from one to four booster sessions. Only 6 of them attended the one-year follow-up. One patient refused any booster treatments, as he had lost all sexual feeling, both heterosexual and homosexual subsequent to the initial treatment in hospital. At one-year follow-up his sexual feelings had returned to their state before treatment. Apart from this patient's response there were no complications which could be attributed to the treatment. In the year following treatment two patients experienced fairly severe depression, and four others had episodes of milder depression. All six had had many similar episodes in the past. Their reactions could not be regarded as 'symptom substitutions', as all showed minimal response to treatment.

The patient group

As in previous studies (McConaghy, 1970a; McConaghy *et al.*, 1972), all persons conscious of homosexual feeling who wished to have this reduced or eliminated and who were not overtly psychotic were accepted for treatment. The majority of patients were referred by other psychiatrists. Their ages ranged from 15 to 59 years, with a median of 25 years. Seven were married. Twenty-one had been charged in the past with sexual offences, all but one of a homosexual nature; thirteen of these had been charged more than once. Legal action was instrumental in six patients being referred for treatment, but they all claimed they wanted treatment in any case.

Four of the married men were having regular sexual intercourse with their wives. All four had been charged with homosexual offences on one, two, three and seven occasions respectively. This tendency for married men who are having regular sexual relations with their wives and who seek treatment for homosexuality to have been charged for such behaviour has been noted previously (McConaghy *et al.*, 1972). Of the other three married men, one was separated from his wife, and the other two were having intercourse very infrequently. Of the unmarried patients, sixteen had experienced heterosexual intercourse and one had attempted it. In all but four, such experience had not occurred in the year preceding treatment.

Twenty-six patients were having regular homosexual relations until commencing treatment. A further eight had had such relations within the previous six months. Six patients had never had homosexual relations, and a further five none for several years. These patients were all distressed by the intensity of their emotional attraction to males.

RESULTS

Penile volume responses following therapy

In assessing sexual orientation, ten photographs of women and ten of men were shown to the subjects. It had been found previously (McConaghy, 1970a; McConaghy *et al.*, 1972) that the most reliable measure of the resultant penile volume changes was that obtained by testing the difference between the ten volume responses to the pictures of the men and the ten to the women, using the Mann-Whitney U test. This provided a U score for the assessment of each patient's responses which approached 100 the more his responses to the female slides were greater than those to the male slides, and approached 0 the more the responses to the male slides were greater. When the U score is 23 or less and 77 or more, the difference between the two groups of scores is significant at the 5 per cent level.

Details of the U scores of the patients before and at three weeks and six months after treatment are given in Table I. Both at three weeks

TABLE I
Patients' U scores in relation to treatment

U score	Prior to treatment	Three weeks after treatment	Six months after treatment
0-23 ..	23	18	14
23.5-50 ..	13	12	9
50.5-76.5 ..	6	9	8
77-100 ..	4	6	6
Unknown ..		1	9

and six months after treatment the U scores of the patients who attended for assessment changed in the heterosexual direction to a statistically significant degree ($p < .05$ and $< .01$ respectively, Wilcoxon test of paired replicates). There was a marked trend for the scores at six months to have changed further in the heterosexual direction than those at one month, but this trend did not reach significance.

The summed penile volume responses of each subject to the male nudes in the film assessment were significantly reduced both at one month and six months after treatment ($p < .05$,

Wilcoxon). The summed penile volume responses to the female nudes were increased after treatment; this change was statistically significant for those patients who showed a mean negative penile volume response to these nudes before treatment ($p < .02$, Wilcoxon). For those patients who showed a mean positive response to the female nudes there was a non-significant trend for their responses to be reduced following treatment.

Reported subjective responses to therapy

Table II summarizes the feelings and behaviour reported by patients at three weeks, six months and one year after treatment. The estimate of change in heterosexual and homosexual desire was based on the patient's awareness of the amount of sexual interest in men and women and the amount and nature of sexual fantasy, including masturbatory fantasy.

Relationship between response to aversion therapy and conditionability

Each patient's ability to set up conditioned responses was determined in the appetitive procedure by measuring the mean amplitude of the conditioned penile volume and galvanic skin responses to the green triangles which preceded the moving pictures of the men and the red circles which preceded the pictures of the women. To exclude the influence of the amplitude of the unconditioned responses, conditionability was also determined by the use of the modified work ratio obtained by dividing the conditioned response amplitude by the unconditioned response amplitude (Barr and McConaghy, 1971). The patients were divided into two groups as near to the median as possible in terms of the degree of reduction of homosexual feeling they reported at one month, six months and one year after treatment; and were similarly divided into two groups in terms of their reported increase in heterosexual feeling. There was no consistent relationship between conditionability in the appetitive procedure and these measures of response to treatment.

Conditionability in the aversive procedure was similarly measured by both amplitude and modified work ratio, for penile volume and

galvanic skin responses to the tones preceding the electric shocks. A number of statistically significant relationships were present between these measures of conditionability and response to treatment. These relationships are reported in Table III.

The relationship of each patient's conditionability and his change in U scores with treatment was also examined, both at one month and six months after treatment. There were no consistent relationships with measures of conditioning in the appetitive procedure. However, there were positive correlations between the

change in U scores at six months and all four measures of aversive conditioning—penile volume amplitude and work ratio and galvanic skin response amplitude and work ratio. The correlation between mean conditioned galvanic skin response amplitude and change in U score was statistically significant ($p < 0.05$).

DISCUSSION

Measures of treatment response

In two previous studies (McConaghy, 1970a; McConaghy *et al.*, 1972) a statistically significant relationship was found between decrease in

TABLE II
Reported subjective responses at three weeks, six months and one year after aversion therapy

	Avoidance conditioning			Classical conditioning			Backward conditioning			Total		
	3 wks	6 mths	1 yr	3 wks	6 mths	1 yr	3 wks	6 mths	1 yr	3 wks	6 mths	1 yr
HETEROSEXUAL												
<i>Desire</i>												
Increased	6	8	5	3	2	3	4	4	4	13	14	12
Possibly increased ..	4	0	4	4	1	2	3	3	0	11	4	6
Unchanged	4	3	3	7	6	4	6	5	7	17	14	14
Possibly reduced ..	0	0	0	1	1	0	0	0	0	1	1	0
Reduced	1	2	0	1	2	1	1	0	0	3	4	1
Unknown	0	2	3	0	4	6	1	3	4	1	9	13
* <i>Relations since treatment</i>												
Increased	0	2	2	2	3	5	1	3	2	3	8	9
Unchanged	1	1	1	2	2	1	1	1	2	4	4	4
Reduced	0	0	0	0	1	1	0	0	0	0	1	1
None	14	10	9	12	6	3	12	8	7	38	24	19
Unknown	0	2	3	0	4	6	1	3	4	1	9	13
HOMOSEXUAL												
<i>Desire</i>												
Increased	1	0	0	0	1	0	0	0	0	1	1	0
Possibly increased ..	1	1	0	0	0	0	1	0	0	2	1	0
Unchanged	2	1	1	5	4	4	3	3	4	10	8	9
Possibly reduced ..	3	1	4	1	2	0	2	3	1	6	6	5
Reduced	5	9	6	8	3	4	6	5	5	19	17	15
None	3	1	1	2	2	2	2	1	1	7	4	4
Unknown	0	2	3	0	4	6	1	3	4	1	9	13
* <i>Relations since treatment</i>												
Increased	0	2	1	0	0	0	0	0	0	0	2	1
Unchanged	1	1	1	3	2	2	1	3	2	5	6	5
Reduced	0	5	3	1	1	3	1	3	1	2	9	7
None, reduced ..	10	2	3	9	7	3	10	4	6	29	13	12
None, unchanged ..	4	3	4	3	2	2	2	2	2	9	7	8
Unknown	0	2	3	0	4	6	1	3	4	1	9	13

* Heterosexual relations refers to sexual intercourse; homosexual relations to any contact of a sexual nature.

homosexual feelings reported by patients 6 and 12 months after completion of aversion therapy and increase in U score of their sexual orientation assessment at this time. U score increase reflected the tendency to show less penile volume increase to pictures of nude men as compared with the response to pictures of nude women. A similar relationship was present in both studies between reduction in homosexual feeling and change in U score two weeks after treatment, but it was not statistically significant.

Only penile volume responses occurring within 10 seconds of stimulus onset were measured. They were unlikely to be secondary to consciously induced fantasies and so under voluntary control. It was concluded that both subjective reports and U score changes some months after treatment were valid measures of response. However, during and within the month following treatment most patients reported they were trying to avoid stimulation of homosexual feeling by, say, avoiding looking at men in the street. They seemed uncertain about their ability to assess the strength of their sexual impulses. The lack of a significant correlation

between U score change and subjective reports shortly after treatment was therefore considered to be due to the patients not having had sufficient time to evaluate the changes in their sexual feeling and behaviour. In the present study the final film assessment was made before the last booster treatment. The change in U score of the patients at this time correlated with their reported reduction in homosexual feeling, but not to a statistically significant extent.

In the previous two studies it was shown that the U scores of homosexual patients did not change significantly over a three-week period when treatment was withheld. Following aversion treatment, the U scores changed significantly in a heterosexual direction. In the present study, it was not considered necessary to replicate the finding that U scores did not change without treatment. As in the previous studies, at the initial follow-up after aversion therapy the U scores of the patients had changed significantly in the heterosexual direction.

The changes in mean penile volume response amplitude to the film shots of men and women were also similar to those found in the previous

TABLE III
Significant relationships between measures of conditionability and reported response to treatment

Measure of conditionability	Measure of response to treatment	Level of significance (one-tailed)
Penile work ratio (tone and shock) ..	Homosexual feeling definitely reduced at three weeks	0.05
Galvanic skin response work ratio (tone and shock)	Heterosexual feeling possibly or definitely increased at three weeks	0.05
Penile work ratio (tone and shock) ..	Homosexual feeling definitely reduced at six months	0.025
Mean amplitude conditioned penile volume response to tone	Homosexual feeling definitely reduced at six months. Heterosexual feeling possibly or definitely increased at six months	0.025 0.05
Penile work ratio (tone and shock) ..	Homosexual feeling definitely reduced at one year	0.025
Mean amplitude conditioned penile volume response to tone	Homosexual feeling definitely reduced at one year	0.025
Penile work ratio (tone and shock) ..	Heterosexual feeling possibly or definitely increased at one year	0.01
Galvanic skin response work ratio (tone and shock)	Heterosexual feeling possibly or definitely increased at one year	0.025

studies: a significant reduction in response to pictures of men, but a significant increase in response to pictures of women only in those patients who showed a negative penile response to these pictures before treatment. These data are consistent with the conclusion (McConaghy *et al.*, 1972) that following aversion treatment there is a decrease in homosexual and in negative heterosexual feelings but no actual increase in positive heterosexual feelings.

Although following treatment the U scores for sexual assessment of the patients as a whole changed significantly in a heterosexual direction, those of fifteen patients changed in a homosexual direction. In all three studies this has occurred much more frequently when the patients' pre-treatment U scores were over 40, this trend being statistically significant in the first study. U scores of over 40 should indicate a more heterosexual orientation than scores of 40 or less. This has been observed in the previous two studies. In the present study, patients with U scores over 40 more frequently reported heterosexual desire, intercourse and masturbatory fantasies. The difference in respect of masturbatory fantasies was statistically significant (χ^2 with Yates' correction). It can be concluded that U scores of over 40 are valid indicators of a more heterosexual orientation.

U scores approach 100 the more the subject's penile volume responses to pictures of women are greater than those to pictures of men. Hence as U scores approach 100 they are determined more by the responses to pictures of women rather than by those to pictures of men. The results of our studies indicate that aversion therapy for homosexual feelings reduces penile volume responses to men, but has negligible effect on positive responses to women. It would therefore have negligible effect on the U scores, which are largely determined by the latter responses—i.e. U scores over 40. Such scores should randomly shift either in the homosexual or heterosexual direction following treatment, i.e. approximately half should shift one way, half the other. In the initial study, of the U scores over 40, five shifted in a heterosexual, nine in a homosexual direction. In the second study the comparable figures were seven and six, and in the third, ten and nine.

Negative penile volume responses

In the present and the two previous studies, of the 126 subjects presenting for aversion therapy of homosexuality 16 showed at initial assessment mean negative penile volume responses to moving pictures of both nude men and women. It was originally decided that such responses would be interpreted on the principle that the sex of the nudes which produced the greater mean volume decrease was that to which the patient was attracted. Hence in calculating the U score in these patients the negative responses were treated as positive and vice versa. Dividing these patients into two groups according to whether their resultant U scores were above or below the median (44.5), those with higher scores reported more heterosexual desire, intercourse and masturbatory fantasy. The relationship between these U scores and the patients' sexual feelings and behaviour was comparable to that between these two variables in patients with the usual type of response, i.e. mean penile volume increase to one sex and decrease to the other. It would therefore seem that these aberrant responses are most appropriately scored in this way.

Such mean negative penile volume responses to pictures of both men and women were also found in the film assessment of two of twenty-nine patients with sexual deviations other than homosexuality. One patient had a fetish concerning babies' napkins. The other only became sexually aroused by fantasies of bound women. No such responses were found in eleven heterosexual students (McConaghy, 1967); nor in sixty students asked to volunteer for a conditioning experiment (Barr and McConaghy, 1971). This suggests that such responses may be associated with sexual pathology.

Comparison of treatments

The patients were randomly allocated to classical, avoidance or backward conditioning. It is becoming a common practice in the psychiatric literature that when patients are randomly allocated to different groups the distribution of various characteristics in the resultant groups are reported and differences tested for significance. This is statistically inappropriate. It appears to be based on the

misconception (Frank, 1959) that 'successful' randomization results in equivalent groups, the characteristics of which are distributed equally. In fact it results in groups in which the characteristics are distributed randomly, i.e. by chance. Rather than being equal this distribution must frequently be unequal, and for every twenty characteristics unequal to a statistically significant extent (at the 5 per cent level). This chance distribution of characteristics of the groups is essential for the appropriate use of statistical tests applicable to random samples. The fact that an unequal distribution of such characteristics will at times result in a significant difference in outcome is basic to the statistical use of randomization: A difference is accepted as not due to chance when the probability that it is due to (a) chance (distribution of variables) is 5 per cent (or whatever level of significance is arbitrarily chosen). This is of course responsible for inevitable false positive Type I errors.

If randomly selected groups do differ markedly in the distribution of certain characteristics which are important in determining the outcome of the study, this unequal contribution must contribute to the result. However, testing differences in distribution of the characteristics does not allow one to do more than suggest that a Type I or Type II error has occurred, at a possibly higher level of probability than one would have expected. It implies that the author was not content with randomization as a method of selection, and indeed many statisticians would agree that it is inappropriate to use this method to control variables known to markedly affect outcome.

The distribution of characteristics reported to affect the outcome of aversion therapy for homosexuality (MacCulloch and Feldman, 1967) is given in Table IV for the groups allocated to different treatments in the present study. The group which received backward conditioning was significantly older. MacCulloch and Feldman found that patients under 30 years of age responded better than those over 30. In our studies no consistent relationship has been found between age and any one measure of response.

There seemed to be little difference in the efficacy of classical, avoidance or backward

TABLE IV
Characteristics of Patients allocated to different aversion therapies

		Avoidance conditioning	Classical conditioning	Backward conditioning
Age	.. Mean ..	27.1 yrs	26.5 yrs	32.1 yrs
	.. St. dev. ..	9.6	6.9	12.9
Kinsey rating ..	6	3	2	3
	5	—	3	5
	4	9	5	5
	3	2	3	—
	2	1	2	2
	1		1	
Heterosexual intercourse prior to treatment ..		6	9	8
Homosexual relations prior to treatment ..		12	14	14

conditioning. Though there was a trend for more patients to report increased heterosexual and decreased homosexual feeling following avoidance therapy, more patients initiated or increased the frequency of heterosexual intercourse following classical conditioning; and more ceased homosexual relations following backward conditioning. There was no significant difference in changes in penile volume response to pictures of nude men and women following each of the treatments.

Effect of booster treatment

All patients were asked to attend for booster treatments. Lacking a satisfactory comparison group, this study cannot provide definite evidence as to whether such treatments increase the effectiveness of aversion therapy. Compared with the results of aversion therapy when booster treatment was not used (McConaghy, 1970a; McConaghy *et al.*, 1972), those of the present study were superior in most respects. At follow-up, more subjects reported increased heterosexual and decreased homosexual feeling, four reporting no homosexual feeling. In the previous studies all patients were aware of some homosexual feeling at follow-up. There was no trend for more patients in the present study to initiate heterosexual intercourse, but more ceased

homosexual intercourse. Following booster treatment the U scores of the patients' penile volume responses changed in the heterosexual direction to a marked degree; this had not occurred in the previous studies at follow-up. Though these changes could be due to differences between the groups of patients in the three studies, they indicate the need for a controlled investigation.

Only 20 of the 46 patients attended to receive all six booster treatments. At follow-up, these twenty reported a much better response to treatment than did those patients who had attended for five or less boosters. The difference approached statistical significance as regards increase in heterosexual intercourse and was statistically significant for cessation of homosexual relations ($p = .05$, Exact test). It has been advanced (Bagley and Greer, 1971) that improved response in a group receiving more compared with one receiving less prolonged treatment indicates a causal relationship between the treatment and good outcome. Unfortunately this need not be so; the relationship could be due to the patients who are doing well for independent reasons attributing this to the treatment and so continuing, while those doing badly drop out, with or without the consent of their therapist.

Relationship of response to conditionability

As shown in Table III, there was a consistent relationship between the patients' ability to set up aversive conditioned responses and their reported response to treatment, as measured by reduction in homosexual and increase in heterosexual feeling. This was true both for measures of absolute amplitude of conditioned responses and for those with the effect of the amplitude of the unconditioned responses excluded by using the modified work ratio.

It has been argued above that aversion treatment does not appear to increase heterosexual feeling. The relationship between conditionability and this measure of response may seem to contradict this. However, it has been pointed out (McConaghy *et al.*, 1972) that in previous studies patients who reported reduction in homosexual feeling tended to report increase in heterosexual feeling. This tendency was again present in this study and was statistically

significant ($p < .05$, Exact test) for the patients' responses at six months. This relationship means that variables which correlate with reported decrease in homosexual feeling would also correlate with reported increase in heterosexual feeling, whether this increase was apparent or real. It is suggested that the increase was apparent, and due to the patients' greater awareness of their previously existing heterosexual feeling when their homosexual feeling was reduced.

Relationship of response to other factors

As might be expected, in the present as in the previous two studies there was a strong tendency for patients who had experienced sexual arousal in heterosexual relationships before treatment to initiate or increase the frequency of heterosexual intercourse following aversion therapy, as compared with patients without such experience. This relationship has been reported by other workers (MacCulloch and Feldman, 1967).

Increasing age was prognostically related in this study only to change in heterosexual behaviour. Patients under thirty years were more likely to commence heterosexual intercourse following treatment. This may have been determined by motivation. Many patients over thirty said they were not strongly interested in developing heterosexual relationships; all they wanted from treatment was reduction in strength of their homosexual feelings so that they could control these and avoid feelings of guilt, or social and legal embarrassment.

There was no relationship between the intensity of voltage accepted by the patient in treatment and the patient's response.

Comparison with other studies

The results of the two previous studies (McConaghy, 1970a; McConaghy *et al.*, 1972) were compared with those of Freund (1960), who treated 67 male patients with apomorphine therapy, and MacCulloch and Feldman (1967), who treated 43 patients with avoidance learning. It was concluded that at least in terms of loss of homosexual feelings and interest the results of MacCulloch and Feldman were markedly superior to those obtained in the two previous

studies and those of Freund. As Feldman and MacCulloch (1965) reported they used booster sessions of treatment, these were included in the design of the present study. Subsequently it was learned (Feldman, 1969) that only three or four of their patients received booster treatment. The results of the present study were still markedly inferior to those obtained by Feldman and MacCulloch in respect of loss of homosexual feeling and interest.

Bancroft (1969) treated ten homosexual patients by giving them painful electric shocks when they developed a certain level of erection while producing erotic homosexual fantasies looking at photographs of males. The reported response of his patients was poorer than that of the subjects of the present and the two previous studies, but not markedly so. Subsequently Bancroft (1970) compared the response of 15 patients to a similar treatment with that of an equal number of patients treated with systematic desensitization for heterosexual anxiety. Details of sexual behaviour following treatment were not given; hence it was not possible to compare his results with those of other studies.

Bancroft (1970) also reported changes in penile responses to pictures of men and women. Following both desensitization and aversion treatment his patients showed smaller penile volume increases to homosexual stimuli and greater increases to heterosexual stimuli. It is not possible to compare these findings with those of the present study. Bancroft used a strain gauge which measured changes in penile diameter rather than volume changes. His patients were asked to fantasy erotically in relation to the pictures of men and women. It was not reported how long after they began to view the picture penile amplitude was measured. In the present as in previous studies the patients were given no instructions to fantasy, the pictures of men and women were shown for ten seconds only, and the penile volume response was recorded at the end of this time. Penile volume responses as measured in this way would be more likely to reflect strength of sexual drives. They showed characteristics of unconditioned responses to sexual stimuli. They could be conditioned and correlated strongly in

amplitude with the resultant conditioned responses (McConaghy, 1970b; Barr and McConaghy, 1971). It is likely that the responses recorded by Bancroft would be more a measure of the motivation of the subjects to co-operate with the request to fantasy, and with their ability to learn to do so over a number of trials. Bancroft's patients had a series of tests during treatment in addition to the one at an unstated time following treatment. He does not appear to have controlled for the effect of a series of such tests without treatment.

Mode of action of aversion therapy

It has been accepted that aversion therapy acts by setting up a conditioned reflex (Feldman and MacCulloch, 1965). It was pointed out, however (McConaghy, 1969), that this is unlikely. There is no evidence following treatment of the expected conditioned reflex. For example, the overt unconditioned response to painful electric shocks to the hand is arm withdrawal. The conditioned reflex to photographs of males reinforced by such shocks would be arm withdrawal accompanied by anxiety. Patients treated with aversion therapy in this way do not show arm withdrawal or report anxiety if they view such pictures after they have completed treatment; they do report less sexual interest and demonstrate less penile volume increase to these pictures.

In the present study, backward conditioning proved as effective a therapy as avoidance and classical conditioning. Yet the backward procedure produces little if any stable conditioning (Pavlov, 1927). This makes it highly improbable that the aversion therapies investigated in this study were acting by setting up conditioned reflexes.

Another finding of the present study was a number of significant relationships between response to aversion therapy and various measures of conditioning in an independent aversive procedure. Of course, these findings require replication. If valid, they may appear to be at variance with the above conclusion concerning the mode of action of aversion therapy. It was suggested (McConaghy, 1969) that a more satisfactory rationale for this therapy could be found in a report from Pavlov's

laboratory concerning animal behaviour following an experimental neurosis (Ivanov-Smolenski, 1954). The animal not only ceased to show conditioned responses, but showed no unconditioned responses either; for example, it would fail to salivate to food and often would refuse to eat. It was considered that this was due to an irradiation of the inhibitory process to the sub-cortical regions associated with the unconditioned responses. Aversion therapy might act similarly by inhibiting neural mechanisms associated with homosexual feelings.

In the present and the two previous studies there has been no evidence of a significant disturbance of general behaviour in patients treated with aversion therapy. Hence it would have to be argued that the change following treatment was limited to sexual functioning only. However, evidence of this possibility exists in Pavlov's description (1927) of 'abnormal foci', where the disturbance consequent on production of an experimental neurosis remained strictly localized.

The initial method discovered for setting up an experimental neurosis in animals was in Pavlov's terms (1927) to bring about a conflict between excitatory and inhibitory processes. Aversion therapy based on a backward conditioning schedule does involve the alternation of excitatory (slides arousing homosexual feeling) and inhibitory (painful electric shocks) stimuli. The theory that the aversion therapies act by irradiation of inhibition from 'abnormal foci' would therefore account for their effectiveness whether administered according to a forward or backward conditioning procedure. It would also explain the absence of conditioned responses following this therapy. Pavlov (1927) found that the ability of dogs to succumb to experimental neurosis was related to their conditioning performance. This theory as to the mode of action of the aversion therapies is therefore compatible with the finding that response to such treatment is related to the ability to set up aversive conditioned responses.

SUMMARY

Forty-six patients were randomly allocated to receive aversion therapy for homosexual im-

pulses according to a classical, avoidance, or backward conditioning paradigm.

Before and three weeks after five days of treatment they were shown a film containing pictures of nude women preceded by pictures of a red circle and of nude men preceded by a green triangle. Prior to treatment they were also conditioned to tones followed by painful electric shocks. During all procedures their galvanic skin and penile volume responses were measured.

Three weeks after treatment the patients showed significantly less penile volume increase to the pictures of men and less penile volume decrease to the pictures of women; but no penile volume increase to the pictures of women. Subsequently each patient was to receive six booster treatments at monthly intervals. Twenty attended for all six. These patients responded better than those who received fewer booster treatments.

At one year following treatment approximately half the patients reported a decrease in homosexual feeling and half an increase in heterosexual feeling. Approximately a quarter reported an increase in heterosexual intercourse and a quarter a cessation of homosexual relations. There was no significant difference in efficacy between the three forms of treatment. The fact that backward conditioning was not less effective than the other two forms was considered to support the contention that these aversion therapies do not act by setting up conditioned reflexes. An alternative mode of action is suggested, compatible with the finding that measures of conditioning in the aversion procedure administered prior to treatment correlate with treatment response.

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