

## Biofeedback and Signaled Punishment in the Modification of Inappropriate Sexual Age Preferences

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In the first study, 30 child molesters who had received behavioral treatment designed to modify inappropriate sexual age preferences were followed after their discharge or transfer from a psychiatric institution for an average of 29 months. Posttreatment penile response data in the form of ratio of response to adult stimuli divided by response to child stimuli significantly differentiated the six recidivists from the nonrecidivists, providing support for the external validity of the assessment technique. In the second study, 18 hospitalized child molesters received biofeedback alone or in combination with signaled punishment aversion therapy as methods designed to modify inappropriate sexual age preferences. The biofeedback procedure involved signaling the patient by different colored lights when his penile response to a child or adult slide was above a preset criterion. Signaled punishment was superimposed on the biofeedback procedure and involved programming a mild shock to the arm to occur at intervals when the patient was above criterion during a child slide. The punishment plus biofeedback procedure was more effective in modifying inappropriate sexual arousal both as a first and second treatment type.

Many investigators have used penile response measures of sexual arousal patterns to evaluate the clinical treatment of sexual deviants. In particular, behavioral treatments directed toward modifying child molesters' inappropriate sexual age preferences have commonly employed measures of penile responses to slides of persons who vary in age and sex as an evaluative measure (Quinsey, 1973). The choice of this mea-

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surement strategy is supported by the findings that penile response age and sex profiles differentiate child molesters from non-sex offenders and relate closely to the child molesters' histories of victim choice, whereas their verbal reports do not (e.g., Quinsey, Steinman, Bergersen, & Holmes, 1975).

This evidence for the validity of penile response measures of sexual arousal is, unfortunately, postdictive in nature and, therefore, not directly relevant to the question of whether penile response data are related to subsequent recidivism. Because many child molesters are institutionalized when treated, the question of most interest is the extent to which their sexual preferences as measured after treatment relate to postdischarge sexual offending. Thus, before different methods of modifying inappropriate sexual arousal patterns as measured by penile responses are compared, additional external validity data are required.

External validity data are crucial because it is quite possible that changes in sexual arousal patterns associated with therapy do not persist over time, that penile responses are unrelated to the commission of new offenses, and/or that sex offenders simply fake under treatment conditions. It is known that some normal subjects can influence their penile responses to slides of persons varying in age and sex in accord with instructions even with the presentation of correlated audio material (Quinsey & Bergersen, 1976; Quinsey & Carrigan, 1978). Similarly, Laws and Holmen (1978) found that a child molester could fake penile responses by a variety of methods. More compelling in the present context is the case study by Rosen and Kopel (1977) which found recidivism in a transvestite after a biofeedback program had successfully altered his penile responses to a transvestite-exhibitionist videotape.

The external validity of posttreatment penile response data is best investigated through follow-up research. In the case of child molesters, this involves relating posttreatment sexual age preferences to postrelease offense histories. The purpose of the first study was to gather such validation data by conducting a follow-up of 30 child molesters who had received behavioral treatment and been discharged or transferred.

## STUDY 1 Method

### *Patients*

Each patient had molested a child 13 years of age or younger when the patient was 16 years of age or older and at least 5 years older than the child. Each had received biofeedback or biofeedback plus signaled punishment (as described in Study 2 below) or biofeedback and/or classical conditioning (described by Quinsey, Bergersen, & Steinman, 1976). In addition, many had received heterosocial skills training and/or sex education (Whitman & Quinsey, Note 1).

### *Apparatus*

During their treatment and assessment sessions, patients were seated in a reclining chair located in a sound attenuating and electronically shielded room equipped with a one-way mirror, rear view projection screen, and intercom. During all sessions a "desk top" was placed over the arms of the reclining chair so that the patient could neither see nor manipulate his penis.

Penile circumference was measured using a mercury-in-rubber strain gauge which the patient placed on the shaft of his penis. The strain gauge was periodically calibrated with metal cylinders of known circumference, and the relationship between pen deflection and circumference was found to be linear within the working range of the gauge. The gauge was connected to a Parks Electronics Model 270 Plethysmograph. Skin resistance was recorded from the left hand during assessment sessions but these responses were not scored.

### *Predictor Data*

Following treatment, each patient received a generalization probe. In each such assessment session there were no slides which were used in the treatment sessions. There were five adult slides, ten child slides, and five neutral slides (landscapes etc.) presented in a fixed order. The order of slide presentation was random with the restriction that no slide type could be immediately followed by a slide from the same category more than once. The adult slides were male, female, or both, depending upon the sex of adult that the child molester stated he would prefer as sexual partner. The age and sexes of the child slides were chosen individually for each patient so as to include the types of children that elicited sexual arousal in the preliminary standard psychophysiological assessment (Quinsey et al., 1975) and the types of children he had chosen as victims.

Each slide was presented for 30 sec and there was a 60 sec period between slides or longer if the patient's penile response did not return to baseline. The reading at slide onset was subtracted from the largest positive deflection in the 2 to 60 sec interval following. Thus there was a minimum 32 sec period between recording intervals.

Age preference ratios were computed for each patient and assessment session separately by dividing the mean raw response to the adult category by the mean response to the child category. These ratios are analogous to the rape index of Abel, Barlow, Blanchard, and Guild (1977). Unfortunately, the sample size was insufficient and the recidivism rate too low to use variables such as diagnosis or type of treatment as predictor variables.

### *Follow-up Data*

Criminal records of each of the patients were obtained from the RCMP. These data included arrest and conviction reports from across Canada.

In addition, any facilities to which the patients had been transferred were contacted by letter to ascertain if the patient had committed sexual offenses while at that facility for which he may not have been charged. Similarly, the files of Oak Ridge were examined to determine whether a readmission had occurred for a new sexual offense; the catchment area of Oak Ridge is all of Ontario. In summary, relatively complete follow-up data were available.

## Results and Discussion

The 30 patients had been released to a less secure setting or the community for an average of 28.55 ( $SD = 21.28$ ) months. During that time 6 committed new offenses against children. There was no significant difference in the number of months the successes and failures had been followed; in addition, many of the failures recidivated early after release. It was predicted that the treatment failures would have lower posttreatment age preference ratios. This prediction was confirmed; the reoffenders' average ratio was 2.88 and the nonoffenders' was 3.65 (Wilcoxon Rank Sum,  $T = 67.5$ ,  $p < .05$ , one-tailed). Individual patient's data are shown in Table 1. As can be seen in the table, a cut off ratio of 1 correctly classifies 21 of the 24 successes and 3 of the 6 recidivists.

While clearly needing replication with a larger sample, these data provide preliminary support for the external validity of the posttreatment penile response measure. Given the small sample size, particularly the small number of reoffenders, and the fact that some patients may have reoffended and not been caught, the finding that a laboratory measure of sexual preference is related to sexual reoffending is impressive.

## STUDY 2

Study 1 provided data which support the external validity of posttreatment penile response assessment data. Unfortunately, however, effective methods of modifying penile responses among child molesters have been difficult to develop. Although aversion therapy is among the most common methods of modifying the inappropriate sexual preferences of sexual offenders, reports of its effectiveness have been mixed. Quinsey et al. (1976), for example, found significant but small changes in the sexual preferences of 10 child molesters associated with a classical conditioning type aversive conditioning paradigm. Both Bancroft (1970) and Callahan and Leitenberg (1973) reported limited success with the use of a shock-punishment procedure with sexual deviates. The limited effectiveness of aversion therapy and its uncertain theoretical base (Hallam, Rachman, & Falkowski, 1972; Quinsey & Varney, 1976) have led investigators to try other techniques of modifying sexual preference. A further impetus to this search is the unpleasant nature of aversion therapy and its negative connotations.

Because biofeedback using penile responses as the criterion variable has been suggested as a viable and more humane alternative to aversion therapy in the modification of sexual preferences (Rosen, 1973) and has

TABLE 1  
AGE PREFERENCE RATIOS IN RELATION TO FOLLOW-UP CATEGORY

No new child offense				New child offense	
Patient	Ratio	Patient	Ratio	Patient	Ratio
1	17.51	13	1.82	1	10.80
2	10.13	14	1.79	2	3.65
3	6.21	15	1.67	3	1.20
4	6.60	16	1.50	4	.84
5	6.08	17	1.35	5	.56
6	5.25	18	1.19	6	.20
7	4.74	19	1.14		
8	4.62	20	1.01		
9	3.88	21	1.01		
10	2.91	22	.85		
11	2.66	23	.84		
12	2.18	24	.67		

been successfully used to increase penile responses in clinical settings (Herman & Prewett, 1974), the purpose of the present study was to compare the efficacy of biofeedback alone and in combination with aversion therapy in the modification of inappropriate sexual age preferences.

In view of the modest changes in sexual age preference found to accompany a classical conditioning type of aversion therapy in our laboratory (Quinsey et al., 1976), a signaled punishment procedure was chosen for the present study. This operant procedure involved programming shocks to the arm to occur at random intervals when a patient's penile response was above a preset criterion in the presence of a child stimulus. This signaled punishment procedure can be viewed as "assisted" biofeedback, since the patient was signaled via colored lights when over a preset criterion. Because patients who responded well to biofeedback were not given biofeedback plus signaled punishment, ethical considerations led us to give biofeedback alone as a first treatment more often than biofeedback and signaled punishment. This experimental arrangement resulted in a conservative assessment of the value of adding an aversion therapy component, since patients would be expected to make some improvement with biofeedback given as a first treatment.

## Method

### *Patients*

Patients were selected according to the following criteria: They (a) had had sexual contact with a child 13 years of age or younger when they were 16 years of age or older and at least 5 years older than the child, (b) showed inappropriate sexual age preferences in their preliminary psychophysiological testing (Quinsey et al., 1975), and (c) volunteered for

treatment by signing a consent form after receiving an explanation of the procedure and a sample shock. It was made clear to all patients that there was no necessary relationship between their participation and their release even if they were to demonstrate desirable changes.

There were 18 patients in the study. Sixteen of them were housed in the maximum security Oak Ridge Division and two in the minimum security Regional Division of the Penetanguishene Mental Health Centre. Their average age was 26.94 years ( $SD = 8.81$ ) at the beginning of their treatment and they had been at the Mental Health Centre for an average of 25.56 months ( $SD = 30.77$ ). One patient was diagnosed as psychotic, thirteen as personality disordered and four as retarded.

### *Apparatus*

The apparatus was the same as that used in Study 1. Shocks of 70 msec duration were administered from a constant current device through electrodes attached to the inner aspect of the left upper arm with a velcro band. The patient selected the shock intensity to be used before treatment and was instructed that it should be mildly painful. Shocks, slide changes, penile responses (at two levels of magnification) and skin resistance were recorded on a Beckman R511 Dynograph. Experimental events were controlled by a Lehigh Valley Programmable Tape Recorder (PTR-001/112-10). The Dynograph and programming equipment were located outside the patient's chamber.

Two Schmitt triggers were interfaced with the Dynograph. One trigger activated a jeweled red light located under the rearview projection screen whenever the patient's penile response surpassed a preset magnitude during, and for 30 sec after, the presentation of a child slide. The other similarly turned on a jeweled blue light during, and for 30 sec after, the presentation of an adult slide.

### *Assessment Sessions*

Each patient was given an assessment session of the type described in Study 1 before and after each treatment type. A treatment type was continued for 10 sessions before an assessment was given.

### *Treatment Sessions*

Each session included 20 slide presentations of 30 sec duration, each separated by a 60 sec interslide interval. There were 10 adult and 10 child slides presented in each session. Different slides were used for each of the first five sessions and different orders of presentation were used in each of the five sessions. These orders were fixed and random with the restriction that no slide category could occur more than three times in a row. After each five sessions, the slides were randomly recombined and the five orders of presentation repeated over the next five sessions. The 100 treatment slides were drawn from the same age and sex populations

as the assessment slides. Recording of penile circumference and skin conductance was the same as in the assessment sessions, except that skin conductance leads were not attached during punishment sessions to avoid artifacts in the skin conductance records.

During the biofeedback sessions, patients were instructed to gain control of their sexual arousal by maximizing blue and minimizing red light time. The criteria for the red and blue lights were initially set as  $\frac{1}{3}$  of the patient's largest penile response to a slide from the relevant category obtained during the assessment sessions before the biofeedback treatment. The child criterion was shifted downward and the adult criterion upward over sessions as the patient progressed. Each shift was approximately 30% (up or down) of the criterion magnitude at which the patient was and would be made when three to four stimuli in the relevant category had produced lights during the preceding session. During the last three sessions in each series of ten, the lights were discontinued to encourage the patients to attend to internal penile response correlates.

The signaled punishment sessions were identical to the biofeedback sessions except that during, and for 30 sec after, a child slide a shock was delivered via a probability generator at the end of 40% of the 5-sec intervals in which the patient was above criterion.

The number and order of the treatment sessions are presented in Table 2. Patient number is not related to the order in which the patients were treated. The first 10 patients who were treated in this study received biofeedback as a first treatment; the remainder received biofeedback or biofeedback plus punishment as a first treatment on an arbitrary basis.

Because the interventions used in this study were intended to have a clinically significant outcome, the data of individual patients received statistical analysis in the form of penile responses to individual slides. Although age preference ratios were calculated for each assessment probe for descriptive purposes, these ratios were not suitable for statistically analyzing changes in individual patient's data because the average penile response to a category was used in the ratio conversions. Prior to analysis, each patient's raw penile response to each slide presentation in a given session was converted to a Z score by dividing it by the standard deviation of all the penile responses in that session. The Z score approach controls for variations in responsivity over sessions and, therefore, is usually a more sensitive measure of changes in relative sexual preference than raw scores. A one-tailed Wilcoxon Signed Ranks Test was computed on the Z scores for each patient comparing the assessment session preceding and following each intervention, as well as the first and last assessment session. For these analyses, increases in response to individual adult slides were scored in the same way as decreases in responses to individual child slides. An identical assessment session was given at the beginning and end of treatment and between each treatment type so that, for example, the evaluation of the effect of a second treatment was performed by comparing assessment sessions two and three.

TABLE 2  
INDIVIDUAL PATIENT'S DATA FOR PRE-POST ASSESSMENT PROBES<sup>1</sup>

Pa- tient	A1 ratio	First treat- ment	A2 ratio	A1 vs. A2	Second treat- ment	A3 ratio	A2 vs. A3	Third treat- ment	A4 ratio	A3 vs. A4	A1 vs last
1	.73	10 Bio	3.28	.005							.005
2	.14	10 Bio	17.52	.005							.005
3	1.58	10 Bio	6.21	.05							.05
4	3.49	10 Bio	4.29	<i>NS</i>							<i>NS</i>
5	.37	10 Bio	1.47	.05	10 Pun	3 18	.005				.005
6	.83	10 Bio	1.16	<i>NS</i>	10 Pun	10 81	.005				.005
7	.98	10 Bio	.78	<i>NS</i>	10 Pun	5.90	.005				.005
8	.57	10 Bio	.26	<i>NS</i>	10 Pun	41.13	.005				.005
9	1.03	10 Bio	1.53	<i>NS</i>	10 Pun	10.13	.01				.005
10	1.22	10 Bio	.85	<i>NS</i>	10 Pun	1.15	<i>NS</i>				<i>NS</i>
11	.92	10 Bio	1.94	<i>NS</i>	10 Pun	1.85	<i>NS</i>				<i>NS</i>
12	.50	10 Bio	.24	<i>NS</i>	10 Pun	.49	<i>NS</i>				<i>NS</i>
13	.65	10 Pun	39.80	.005							.005
14	.17	10 Pun	5.82	.005							.005
15	.56	10 Pun	12.58	.005							.005
16	.18	10 Pun	10.57	.005							.005
17	.27	10 Pun	.73	.01	10 Bio	.76	<i>NS</i>	5 Pun	1 49	.005	.005
18	.06	10 Pun	.42	<i>NS</i>	10 Bio	.20	<i>NS</i>				<i>NS</i>

<sup>1</sup> The number for each entry in the treatment column is the number of sessions (Bio = biofeedback, Pun = signaled punishment). The Ax vs Ax + 1 probabilities refer to the significance level of a one-tailed Wilcoxon Signed Rank Test (*NS* = not significant). "A1 Ratio" refers to the adult/child preference ratio for the first assessment session

## Results

With respect to biofeedback as a first treatment, 4 out of 12 patients showed significant improvements in the pre- and post- 10 session assessment (or generalization) probes, whereas 5 of the 6 patients who received biofeedback plus signaled punishment showed significant improvement (see Table 2). With respect to these procedures as second treatments (sessions 10 to 20), 0 of 2 and 5 of 8 patients showed significant improvement with the biofeedback and biofeedback plus signaled punishment procedures, respectively. Considering biofeedback and biofeedback plus punishment successes and failures and disregarding whether the treatment was given first or second, the biofeedback plus signaled punishment procedure was successful with a significantly larger proportion of patients than the biofeedback procedure, ( $\chi^2 (1) = 5.14, p < .05$ ). Patient 17 showed the most impressive difference between the two treatments, as the biofeedback plus punishment procedure effected significant improvement as a first and third procedure whereas biofeedback was ineffective



as a second treatment. Overall, 13 out of the 18 patients showed significant improvement.

## DISCUSSION

These data indicate that the biofeedback plus signaled punishment aversion therapy was more effective than the biofeedback procedure alone in altering the inappropriate sexual age preferences of child molesters. Biofeedback plus signaled punishment also appears to be superior to the classical conditioning aversion therapy procedure employed by Quinsey, Bergersen, and Steinman (1976). In the classical conditioning procedure, significant within-subject improvements in the pre- and post-treatment assessment data (generalization probes) were achieved with 1 out of 10 patients after 20 sessions; in the present study, 5 out of 6 patients receiving the biofeedback plus signaled punishment procedure as a first treatment made significant improvements in 10 sessions. It should be noted that the methods of subject selection, assessment, and data analysis were identical in the two studies. Direct comparisons between the biofeedback plus signaled punishment procedure employed in this study and the results of other investigators who have attempted to modify inappropriate sexual age preferences are difficult to make because of differences in patient selection, instructions, and details of the treatment procedure. The results of the present study do, nevertheless, appear to indicate that biofeedback plus signaled punishment can effect large changes in inappropriate sexual age preferences in child molesters as measured by psychophysiological procedures.

The biofeedback procedure, while relatively ineffective, was associated with significant improvements in the penile responses of some individual patients. Whether these changes are due to nonspecific effects of the treatment procedure or whether they are equivalent in terms of outcome with changes associated with the punishment plus biofeedback procedure is unknown. Follow-up research based on a fairly large number of cases would be required to address this question.

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- 1 Whitman, W. P., & Quinsey, V. L. Heterosocial skills training for institutionalized rapists and child molesters. Unpublished manuscript, 1979.

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