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FADING TO INCREASE HETEROSEXUAL RESPONSIVENESS IN HOMOSEXUALS[1]

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Heterosexual responsiveness, measured by penile responses and reports of behavior, was strengthened in three homosexuals through a fading procedure. Using two slide projectors, colored slides of nude females were superimposed on colored slides of nude males. As the sexual response was emitted, the nude male was faded out and the nude female faded in. Heterosexual arousal decreased when the fading procedure was reversed or stopped and increased once again when fading was resumed. Homosexual arousal remained high during this experiment but had decreased in two subjects at follow-up. The results suggest that fading was responsible for altering stimulus control of sexual arousal and that aversive techniques may not be necessary in the treatment of sexual deviation.

Sexual deviation can be viewed as a problem in stimulus control because sexual arousal occurs in the presence of an inappropriate stimulus. Current treatment approaches concentrate on suppressing deviant arousal through the use of aversive techniques. Although there is evidence that the techniques reduce deviant sexual behavior in some clients (Barlow, 1972; Barlow, Leitenberg, and Agras, 1969; Feldman and MacCulloch, 1971) the development of heterosexual behavior is often left to chance (*e.g.,* Barlow, *in press;* Bond and Evans, 1967).

Another approach to sexual deviation is directly to alter stimulus control of sexual arousal. One procedure effective in changing control in animals (Terrace, 1966) and humans (Moore and Goldiamond, 1964) is fading. The present experiments attempted to alter stimulus control of sexual arousal in three homosexuals by fading in a more appropriate stimulus as the response was emitted. The effectiveness of the fading was analyzed in single case experimental designs where fading was introduced, reversed or stopped, and reintroduced once again, while associated changes in sexual arousal were measured.

METHOD

Subjects

The first subject was a 30-yr-old male who desired "treatment for homosexuality", a decision he had considered for several years due to the "frustration and depression" caused by his homosexual feelings. He reported a 10-yr history of homosexual urges and fantasies and a 5-yr history of homosexual behavior. Heterosexual behavior was limited to an occasional contact with a prostitute, but had not occurred for the previous 5 yr. He was somewhat depressed and drinking heavily when the treatment began. He was seen twice a day as an inpatient. Fading sessions were administered in the afternoon and generalization test sessions were made the following morning.

The second subject was a 21-yr-old male with a 6-yr history of homosexual behavior, usually in the form of anal intercourse. Although he had engaged in heterosexual intercourse on occasion, he currently reported a stronger interest in

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males and feelings of discomfort around girls. All masturbatory fantasy was homosexual. The subject was referred after a suicide attempt by an overdose of tranquilizers following termination of a homosexual affair. He was severely depressed with some agitation on referral and voiced numerous somatic complaints. He reported a long-standing desire (5-yr duration) to change his sexual orientation. The subject was seen as an inpatient twice a day. Fading sessions were administered in the afternoon and generalization test session the following morning.

The third subject was a 29-yr-old, exclusive homosexual with a 14-yr history of homosexual behavior. Although he had never engaged in heterosexual behavior, he reported dating girls on important occasions despite the fact that it made him uneasy and anxious. He had engaged in psychotherapy, for the purpose of eliminating homosexual behavior, on three prior occasions, for a total of 3 yr, without benefit. He referred himself for treatment after reading that aversion therapy might help homosexuality. Upon referral he was mildly depressed, moderately anxious, and was regularly taking minor tranquilizers. This subject was also seen twice a day, with fading sessions in the afternoon and generalization test sessions the following morning.

Apparatus

The apparatus for the fading procedure consisted of two Model 750 Kodak carousel projectors, a 600-W variac, which is a variable voltage transformer (make: Superior Electric; model: Powerstat; type: Q116V; price $31.31), and a 15.2 by 20.3 by 15.2 cm (6 by 8 by 6 in.) box in which several switches were mounted. Since the fans on the projectors stop when the lamps are dimmed, the fan and lamp circuit on the projector were separated and the wires for the fan circuits brought out of the projector to the metal box where they were connected to an on-off switch. The switch for the variac could not be turned on unless the fan switch was on. The secondary from the variac was wired to the lamps so that the lamp in the first projector dimmed and the lamp in the second projector simultaneously brightened as the variac control was rotated.

Measures

One objective measure (penile circumference) and one subjective measure of heterosexual interest were taken. Homosexual interest was also measured by penile circumference.

Penile circumference. Measures of penile circumference in response to colored slides of nude males and females were recorded by a mechanical strain gauge (Barlow, Becker, Leitenberg, and Agras, 1970) using a Grass polygraph. Before the experiment began, the subject was asked to stimulate himself to full erection with the strain gauge in place. When he reported full erection, this was confirmed by the laboratory technician and pen deflection above the recording from a flaccid penis was noted. All penile responses during the experiment were scored as a percentage of full erection. Circumference size of full erection was checked approximately every two weeks and did not change appreciably for any subject.

For the generalization test sessions each subject chose, from a large collection, 30 male and 30 female slides that were most attractive or least unattractive to him. During these sessions, the subject put on the gauge and at least 30 sec of recording with no pen deflection was required before a slide was shown. This recording served as a baseline for the session. Each subject was then shown three male and three female slides, randomly chosen from his collection, and shown in random order for 2 min each. The interval between slides was 30 sec of baseline recording or return of a response to baseline, whichever was longer. Subjects were instructed not to manipulate their penis since this produced marked "noise" on the polygraph. (For a complete discussion of penile measurement procedures see Barlow *et al.*, 1970.) The responses to the three male and three female slides were averaged to yield a measure of sexual arousal to each gender for the session.

Generalization test sessions were administered the morning after the previous afternoon's fading session for all subjects.

Urges and fantasies. Each subject recorded daily (including weekends), in a notebook, the number of times that he was sexually aroused at the sight of a female (called an "urge"), or had heterosexual fantasies, or engaged in heterosexual behavior. "Urges" and "fantasies" were combined in the compilation of data.

Procedure

Before the first phase began, subjects were told that we would show them slides of nude males and females, sometimes superimposed on each other, to help re-orient their sexual arousal. These instructions were designed to ensure that the same "therapeutic set" would be obtained during both fading and control phases. No other instructions were given.

Baseline procedures. Generalization test sessions, in which penile responses to slides of males and females were recorded, were administered to each subject for six sessions. Subjective reports of heterosexual arousal were also collected.

Fading. Following completion of the baseline, each subject chose two slides, one male and one female. The male slide was chosen from among those that elicited a large penile response of over 80% in Subjects 1 and 3 and over 50% in Subject 2 in pre-treatment assessments. The female slide was typically described as the "least unattractive" and had elicited little penile response. These same two slides were used for the duration of the experiment. By using the two slide projectors, both slides were projected on the screen in such a way that the anatomical features, particularly the genital areas, were superimposed on one another. An increase in the brightness of the female slide then resulted in a simultaneous decrease in the brightness of the male slide. For example, if the brightness of the female slide was increased from 10% to 15%, the brightness of the male slide would decrease from 90% to 85%.

A series of 16 steps, ranging from 0% female 100% male brightness, to 100% female 0% male brightness, was then individually determined for each subject through the psychophysical method of limits. That is, the image over the full range of brightness was shown to the subject and he indicated when the image was 50% female and 50% male. He then judged the halfway point between 0% female brightness and the 50% judgement, the 25% of the 50% judgement, the 50% and 75% judgement, and so on, until 16 steps, judged by the subject to be equidistant on the brightness scale were determined.

Figure 1 illustrates, in black and white still photographs, a series of five representative steps from the 16 steps described for the first subject. In this case, the subject (a black) was attracted to white males and desired to be attracted to black females, hence the choice of slides.

In the fading procedure, the subject was first presented with a 0% female 100% male image. If he emitted the criterion response of at least 75% of full erection as measured by the strain gauge, at any time during the 2-min presentation, he advanced to the next step, which was 6% female and 94% male. The 75% criterion response was chosen because at this level or above, all subjects reported strong arousal and the ability to engage in further sexual behavior. If he did not emit the criterion response during fading, the same image was displayed in repeated trials until he did. Each trial consisted of a 2-min exposure to the image and six trials were held per session. It should be noted that the only contingency on emitting criterion response was advancement to the next step in the series of illuminations. Thus, this procedure differed somewhat from Terrace's (1963).

Control procedures. To analyze the effects of the fading procedure, two control procedures were employed.

(1) For the first subject, the fading procedure was reversed; that is, when the subject was emitting the criterion response to the female

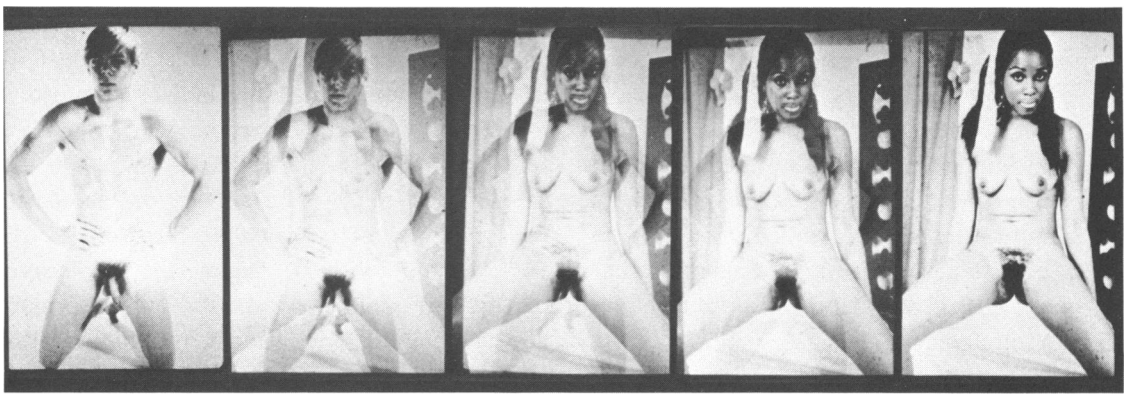

Fig. 1. Five representative images from the series of 16 images used during the fading for the first subject These images were projected in color during the experiment.

slide alone (100% female 0% male brightness) the contingencies were reversed such that emission of the criterion erection produced an increase in the brightness of the male slide and a corresponding decrease in the brightness of the female slide, until the subject returned to the 100% male 0% female image once again.

One consequence of this procedure, however, is that in the process of fading the subject looks more at the female slide, while in the reverse phase he looks less at the female slide; that is, it faded out. Other data from our laboratory indicate that under some circumstances exposure to erotic heterosexual stimuli alone can increase heterosexual arousal (Herman, Barlow, and Agras, 1971). To determine if this factor was responsible for increases in arousal, a different control procedure was used for Subjects 2 and 3.

(2) When the subject reached the 50% female 50% male illumination point on his scale, fading was stopped. Sessions in the control phase consisted of presenting the two slides at maximum brightness one after the other, for 1 min each, independent of penile response. This was repeated six times in each session. Thus, the subjects were exposed to the slides in this control procedure for the same amount of time as in the fading procedure (12 min per session).

Return to fading. When Subject 1 was again emitting the criterion response to the 100% male 0% female image, the female slide was once again faded in. For Subjects 2 and 3, fading was resumed where it had stopped, at the 50% female 50% male image. No other "therapy" was administered during the experiment and the subjects had scheduled contact only with the laboratory technicians.

Follow-up. Each subject was seen periodically for follow-up sessions in which they reported on their progress. For reasons discussed below, the penile circumference measures were not administered to the first subject. For Subject 2, the penile measures were administered as in the generalization test sessions using the same pool of slide at one, two, three, and nine months. For Subject 3, penile responses were recorded at one and three months.

RESULTS

Fading Sessions

As described in the Procedure, each subject chose one male and one female slide for fading and these same two slides were used throughout the experiment. Table 1 presents results from the fading and control sessions for each subject.

Subject 1. In the first fading session, this subject emitted the criterion erection response of 75% of a full erection in all six trials, thus progressing to the 37% female 63% male

Table 1

Brightest percentage of female illumination, subjectively determined by each subject, to which criterion erectile response was emitted during each fading session for each subject.

Session		*% Female Illumination*	*% Male Illumination*
	SUBJECT 1:		
1	Fade	37	63
2		63	37
3		75	25
4		81	19
5		100	0
6	Reverse Fade	87	13
7		63	37
8		31	69
9		6	94
10		0	100
	(six additional sessions at this illumination)		
17	Fade	19	81
18		37	63
19		44	56
20		75	25
21		100	0
	SUBJECT 2:		
1	Fade	37	63
2		50	50
	Stop Fading for Six Sessions		
3	Fade	87	19
4		100	0
	SUBJECT 3:		
1	Fade	6	94
2		25	75
3		31	69
4		37	63
5		50	50
	Stop Fading for Six Sessions		
6	Fade	56	44
7		63	37
8		69	31
9		75	25
10		75	25
11		75	25
12		75	25
13		75	25
14		81	19
15		94	6
16		94	6
17		100	0

image. Four steps were completed during the second session, bringing him to 63% female 37% male. Progress slowed during the third and fourth sessions to two steps and one step respectively, but in the fifth session the subject emitted the criterion erection in the presence of the female slide alone. Twenty nine trials were required to reach this goal.

At this point, the fading procedure was reversed such that the emission of criterion responses, 75% of a full erection, produced an increase in the brightness of the male slide and a corresponding decrease in the brightness of the female slide. During this phase, the subject moved down the series of illuminations until he responded in the presence of the male slide alone in the first trial of Session 10. Twenty five trials were required to reach this point. To confirm a trend in heterosexual arousal in the separate generalization sessions (see Figure 2) this phase was extended six sessions in which he continued to emit the criterion response in the presence of the male slide alone.

When the female slide was once more faded in, the subject again progressed through the series of illuminations fairly rapidly, with the exception of Fading Session 19 in which one step was completed. This second fading phase required 28 trials.

Subject 2. During the first fading session, Subject 2 emitted the criterion erection in all six trials, advancing to 37% female brightness on his scale. After two trials in Session 2 he had reached the 50% female brightness level and fading was stopped. At this point, the control procedure in which the two slides were shown independently was administered for six sessions.

When fading was reintroduced, the subject successfully emitted the criterion erection in the presence of each new illumination until he was responding in the presence of the female slide alone, which occurred on the second trial of the fourth fading session. The minimum of 16 trials was required to reach this goal.

Subject 3. During the first fading phase, Subject 3 progressed more slowly than the others. He progressed one step in the first session but was unable to emit the criterion response in the presence of any greater female illumination. He progressed three more steps in the second session,

one step each in the third and fourth sessions, and, finally, two steps in the fifth session, at which point the 50% female brightness level on his scale was reached and fading was stopped.

During the control phase, which was administered for six sessions, the subject reported feeling depressed over not doing well in treatment.

When fading was reintroduced, advancement was once again relatively slow. In each of Fading Sessions 6 to 9 the subject progressed one step until he was emitting the criterion response at the 75% female level. At this point, the male features were barely visible and the subject failed at the next step on his scale, 81% female brightness, for three sessions. Dropping back to 75% female brightness in Session 13 occasioned a criterion erection and in four additional sessions the subject was responding in the presence of the female slide alone. One hundred and five trials were required to reach this goal.

Generalization Test Sessions

During the generalization test sessions, penile circumference response to the three female and three male slides were recorded as described in the procedure. For all subjects, generalization test sessions were held the morning after the previous afternoon's fading session. Subjects were not seen on weekends, hence the generalization test corresponding with a Friday afternoon fading session was administered on Monday morning. On the other hand, the subject kept a record of his heterosexual urges and fantasies seven days a week.

Subject 1. Figure 2 presents mean penile response to slides of nude females and males during generalization test sessions for the first subject. Responses are presented session by session. Homosexual arousal during each session is presented at the top of the figure.

Baseline measurement procedures indicated a low level of penile response to females, between 11 and 19%. During the first fading phase, heterosexual arousal in the generalization test session rose to 37.5%. When fading was reversed, heterosexual arousal continued to rise. However, when this phase was extended six trials to confirm the trend, heterosexual arousal dropped to as low as 13.5% and averaged 23.6% over the last six trials. When the female slide was once again faded in, heterosexual arousal in the separate generalization test sessions rose rather quickly, averaging 44.5% during this phase.

Homosexual arousal remained high throughout the experiment, averaging 50.3% during baseline procedure and 59.0% during the first fading phase. A great deal of variability was evident in the generalization test sessions during the reverse fading phase but the average was again 51.4%. During the final fading phase, homosexual arousal averaged 50.9%.

Reports of heterosexual urges and fantasies were low during baseline procedure, averaging 0.5 per day with a range of zero to two. During fading, these reports increased to an average of 2.0 per day with a range of zero to four. These reports remained high, at 2.2 per day, with a range of zero to five, but dropped rather sharply during the last fading phase to 1.0, with a range of zero to two. This drop in reports of arousal is in contrast to objective indices of heterosexual arousal during generalization test sessions which increased.

Subject 2. Figure 3 presents mean penile response to slides of nude females and males during generalization test sessions for the second subject. Homosexual arousal is presented at the top of the figure.

During baseline procedures, heterosexual arousal was relatively low, ranging from 36% to 23%. When fading was introduced, heterosexual arousal increased to 56% in the generalization test sessions. After two fading sessions, fading was stopped but heterosexual arousal continued to rise, as it did in the first subject, before dropping to 34%. When fading was resumed, heterosexual arousal rose to 66% in the last session.

Homosexual arousal also remained relatively high throughout the experiment, for this sub-

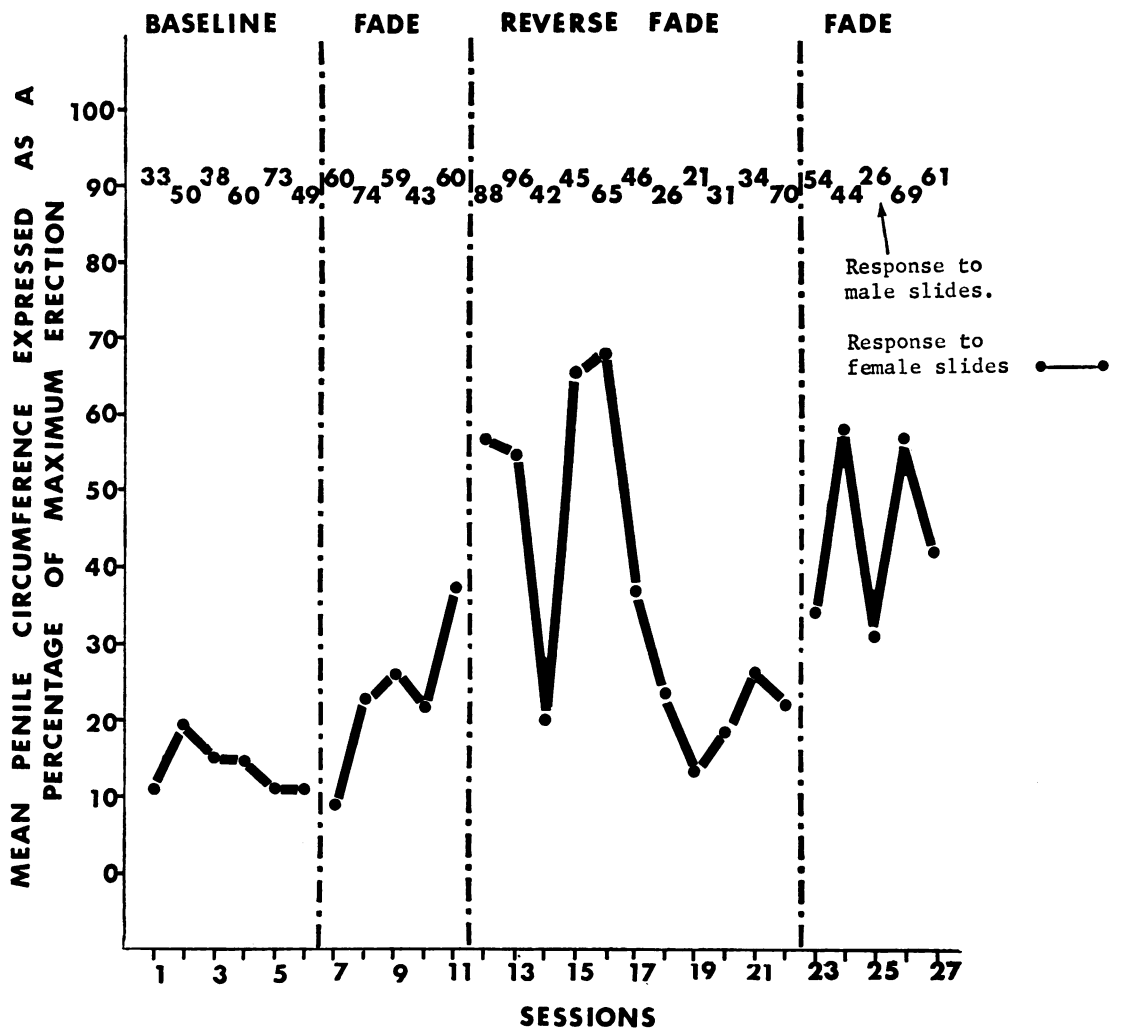

Fig. 2. Mean penile circumference expressed as a percentage of full erection for Subject 1. Percentage of homosexual arousal is presented numerically. Lower scores indicate less sexual arousal.

ject, averaging 40% during baseline procedure, 61% during the first fading phase, and 70% and 61% respectively during the control phase and the last fading phase.

This subject did not report any heterosexual urges or fantasies throughout the experiment.

Subject 3. Figure 4 presents mean penile responses to slides of nude males and females during generalization test sessions for the third subject. Once again, homosexual arousal is presented at the top of the graph.

Heterosexual arousal averaged below 10% during baseline procedures but rose to 45% during the first fading session. When fading was stopped, heterosexual arousal dropped back to baseline levels, but rose once again, when fading was resumed, to 52%. Although there were 12 fading sessions, equipment failure caused cancellation of the twelfth generalization test session. Thus, the second fading phase contains only 11 points.

As for the other subjects, homosexual arousal remained high, averaging 76% during baseline procedure and 68%, 75%, and 62% respectively, during fading, control, and fading procedures.

Subject 3 reported no urges or fantasies during baseline procedures. When fading began, he

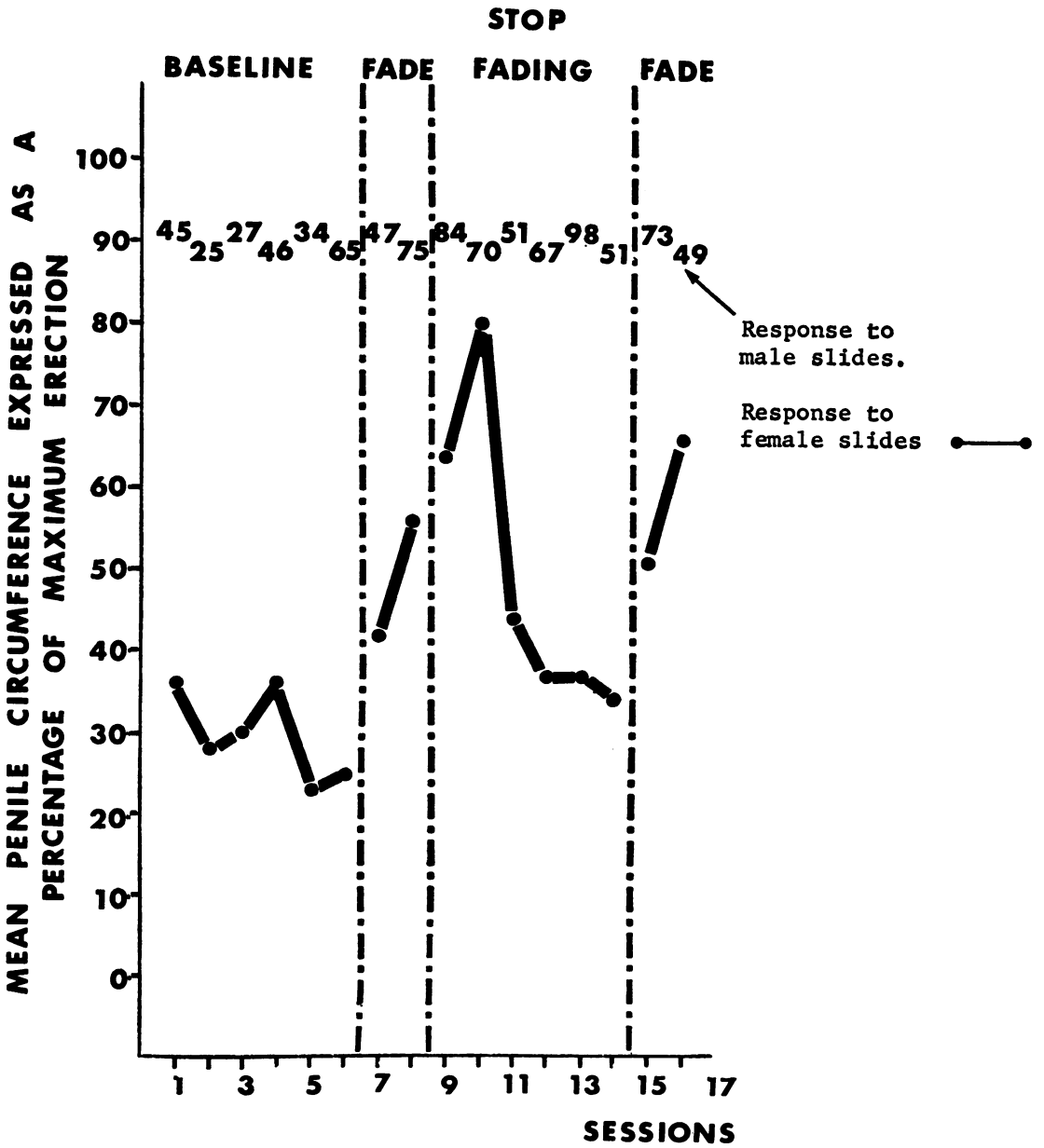

Fig. 3. Mean penile circumference expressed as a percentage of full erection for Subject 2. Percentage of homosexual arousal is presented numerically. Lower scores indicate less sexual arousal.

reported heterosexual urges and fantasies for the first time, averaging one a day with a range from zero to three. These reports continued to increase during the control phase to an average of 1.8 per day with a range of zero to three and remained high in the final fading phase at 1.5 per day, with a range of zero to three.

FOLLOW-UP

Subject 1

Due to continued strong homosexual arousal, which was a source of concern to the subject, an aversive technique was initiated in an attempt to suppress deviant arousal. During this period,

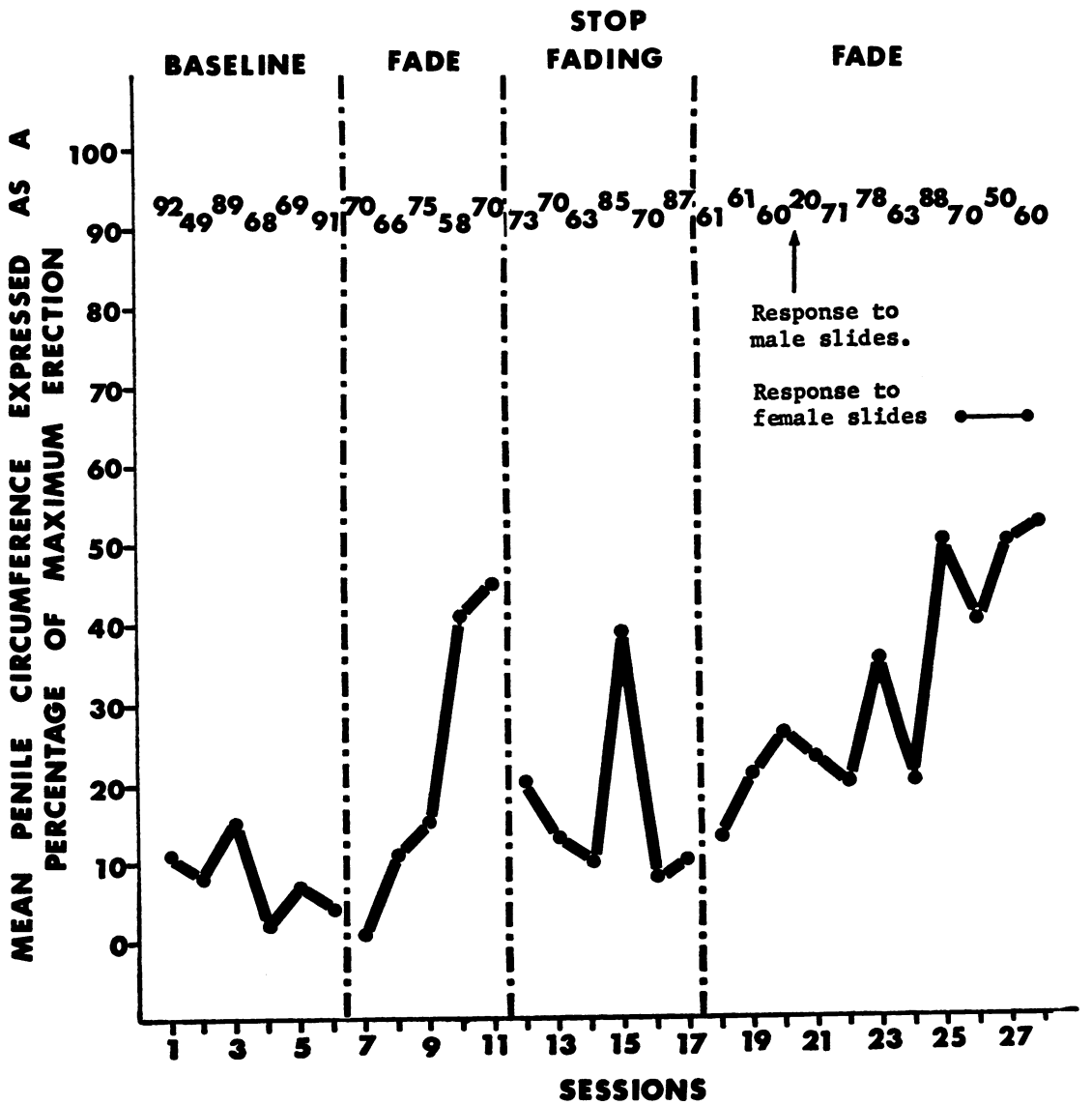

Fig. 4. Mean penile circumference as a percentage of full erection for Subject 3. Percentage of homosexual arousal is presented numerically. Lower scores indicate less sexual arousal.

the subject continued to doubt his newly acquired heterosexual arousal and attributed it to various internal states. As a consequence, he did not approach girls despite the urging of the therapist, a report confirmed by some of his friends. After several sessions of aversion, deviant arousal was somewhat suppressed. However, the subject did not return for treatment after a visit to his home. One year later, the subject returned briefly and reported that he had still not approached females and had not engaged in sexual behavior of any kind during the year. In fact, he had seldom left his home.

Subject 2

Due to a minor surgical procedure, this subject remained in hospital for one month after treatment. Although he also expressed concern over his continued homosexual arousal, it was decided to withhold additional treatment such as aversive techniques while continuing to take measures of sexual arousal. Interestingly, hetero-

sexual arousal continued to rise to 74% at one month and to 82% at two months. Homosexual arousal, on the other hand, dropped to 33% at one month and 22% at two months, despite no therapeutic attempt to accomplish this goal. After completion of fading, the subject began meeting and dating girls frequently and engaged in heterosexual intercourse. Unfortunately, it was not possible in this case to confirm these reports with his new female friends. At a three month follow-up, heterosexual arousal, as measured by penile recording to slides of females, was over 80% and homosexual arousal was 13%. At a nine month follow-up, heterosexual arousal was 60% and homosexual arousal was 20%. He reported strong heterosexual interests and behavior, no subjective homosexual arousal, and was considering marriage.

Subject 3

Due to the drop in homosexual arousal after treatment in the second subject, aversive treatment was also withheld from the third subject. During this period, the subject successfully engaged in heterosexual intercourse for the first time and repeated it up to five times a week. After one month, heterosexual arousal continued to rise to 65% and reports of heterosexual urges and fantasies to 11 per day. Although homosexual arousal had diminished to 30%, it was still bothersome to the subject and aversion was administered, since he had to leave town and could not be closely followed. At a three-month follow-up, a measurement session was invalidated due to procedural difficulties, but the patient reported no homosexual arousal and a marked improvement in work and social life. Reports of heterosexual intercourse, confirmed by the patient's new girlfriend, were frequent. At nine months, reports of continued heterosexual intercourse were again verified by his girlfriend and he reported no further problems.

DISCUSSION

These data indicate that it is possible to alter directly the stimuli controlling sexual arousal in homosexual subjects, since penile erection was brought under the control of a stimulus (pictures of girls) that had not previously set the occasion for sexual arousal. The effects of the fading procedure were separated from the effects of therapeutic instructions, or simple exposure to female stimuli, since these factors were present in the control phase, and yet heterosexual arousal declined.

These conclusions were weakened somewhat in Subjects 1 and 2 because heterosexual arousal continued to rise initially in the separate generalization test session during the control phase despite the fact that the fading procedure had reversed or stopped. It is not clear why this occurred. It is interesting to note, however, that the first subject who completed fading by reaching the 100% female illumination in the first phase, took the longest to reverse, whereas the second subject, who stopped fading at 50% female illumination, reversed more quickly. It is possible that heterosexual arousal is stronger or more permanent after the course of fading is completed and the subject is able to respond to heterosexual stimuli alone.

Since heterosexual arousal diminished when fading was reversed or stopped in the control procedure, even for the first subject who had completed fading, why was heterosexual arousal sustained in two subjects after the experiment was over?—most probably because the subjects encountered different contingencies after fading. All subjects reported unsuccessful or unsatisfactory heterosexual approach behavior previous to fading. Subjects 2 and 3, however, reported successful approaches leading to heterosexual intercourse after fading, presumably due to their newly acquired arousal. In these two subjects, heterosexual arousal then continued to increase. For the first subject, however, increased heterosexual arousal did not lead to heterosexual behavior due at least in part to a failure to approach females. Most likely, heterosexual arousal diminished once again. This suggests that environmental contingencies are necessary to maintain and perhaps further strengthen hetero-

sexual arousal after completion of fading. Without these contingencies, heterosexual arousal would probably extinguish as in the control phases.

The failure to approach females by Subject 1 suggests that an additional important step in the treatment of sexual deviation is to teach the client the necessary social behavior needed to implement newly acquired arousal and thus ensure the presence of positive environmental contingencies. Subjects 2 and 3, on the other hand, had an adequate repertoire of social behavior and did not require instruction or urging from the therapist to meet girls once they acquired sufficient heterosexual arousal. Acquisition of successful heterosexual behavior is particularly noteworthy in the third subject, as an exclusive homosexual, due to the consistent failure of other procedures such as aversive techniques to change patterns of arousal in exclusive homosexuals (Feldman and MacCulloch, 1971).

When one considers the oft-noted difficulties in modifying patterns of sexual arousal (*e.g.*, Bieber, Bieber, Dain, Dince, Drellich, Grand, Grundlach, Kremer, Wilbur, and Bieber, 1963) the speed with which these changes occurred is remarkable. The second subject, with some prior heterosexual experience, successfully completed treatment in the minimum of 16 trials or four, half-hour sessions. The first subject, with only an occasional contact with a prostitute, took five sessions and 29 trials. The third subject, who had no heterosexual experience and very strong homosexual arousal, took 17 half-hour sessions and 105 trials. A fourth subject, to whom fading was administered previous to the above subjects and without an experimental analysis of the procedure, took four half-hour sessions and 24 trials to complete fading and was able to implement his arousal in the environment by engaging in heterosexual intercourse for the first time in his life.

Although reports of sexual behavior can be confirmed by independent checks with sexual partners, heterosexual urges and fantasies, of course, are not reliable in the sense of being publicly observable and thus must be interpreted with caution (Nelson and McReynolds, 1971; Simkins, 1971). We have shown previously (Barlow, Agras, Leitenberg, Callahan, and Moore, 1972) that instruction alone can influence reports of arousal, often producing divergence between trends in these reports and objective measures of arousal. A divergence was also noted in this experiment when reports of heterosexual arousal, from two subjects who reported these, continued to rise slightly during control phases despite drops in heterosexual arousal objectively measured. Presumably this was due to the "therapeutic set" in these phases created by the therapeutic instructions administered at the beginning of the experiment (see Procedures). Under some conditions, however, the validity of these reports has been established, usually through correlates with objective measures. In some instances, examination of these reports and their relation to the objective measures may provide additional useful information on the effects of various procedures (Barlow, Leitenberg, and Agras, 1969; Callahan and Leitenberg, *in press*).

Finally, homosexual arousal did not diminish during treatment as a result of increasing heterosexual arousal. However, after treatment was completed, homosexual arousal either diminished, as in the third subject, or was virtually eliminated, as in the second subject, concurrent with development of alternative behavior. This finding is consistent with several anecdotal case studies (*e.g.*, Huff, 1970; Kraft, 1967; LoPiccolo, 1971) and suggests that aversive techniques may not always be necessary in the treatment of homosexuality.

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