Brit. J. Psychiat. (1971), **119**, 353–75

Flooding versus Desensitization in the Treatment of Phobic Patients: A Crossover Study

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Over the past five years several studies have suggested that flooding and its analogues reduce fear in animals and in man. The literature on analogues of flooding in animals was surveyed by Baum (1970), who himself demonstrated that prevention of a conditioned avoidance response in rats extinguishes the response (Baum, 1966). The longer the duration of response prevention, the quicker the extinction of the avoidance response (Baum, 1969a). The greater the shock trauma involved in the original learning of the response, the longer the response prevention had to be before the avoidance response was extinguished (Baum, 1969b, 1970). In phobic human volunteers controlled studies showed that flooding in imagination reduced avoidance responses to rats (Hogan and Kirchner, 1967, 1968; Kirchner and Hogan, 1966), and that the technique worked more quickly than desensitization (Barrett, 1969) in improving snake phobias. An analogue of flooding—exposure in real life with response prevention—was also shown to be more effective than desensitization for the reduction of snake phobias (Strahley, 1965). Two studies found, however, that desensitization was superior to flooding for the reduction of snake phobias (Mealiea, 1967) and mouse phobias (Willis and Edwards, 1969), while in a further two reports flooding was not significantly different in effectiveness from desensitization for the reduction of snake phobias (de Moor, 1970) or stage fright (Calef and Maclean, 1970).

Several uncontrolled reports suggested that flooding or related methods might be superior to desensitization in phobic patients (Malleson, 1959; Stampfl and Leavis, 1967; Boulougouris and Marks, 1969). However, these have been difficult to evaluate in the absence of controls because it is well-known that phobic patients fluctuate considerably in their degree of handicap over time without any treatment at all (Marks, 1969). In phobic patients desensitiza-

TABLE I

Design of study

	2½ weeks	6 days	2½ weeks	2 days	1 year follow-up
8 patients had	↓ d d d d (d)(d)	↓	f f f f (f)(f)	↓	
8 patients had	f f f f (f)(f)		d d d d (d)(d)		

treatment order was randomly determined

↓ = ratings by patient, therapist and independent assessor, + physiological assessment

d = desensitisation session in fantasy for 50 minutes

f = flooding session in fantasy for 50 minutes

○ = fantasy session followed immediately by practice session for 70 minutes

tion is usually only partially effective and is time consuming (Marks, 1969). It thus became important to determine whether flooding might be a superior method in the treatment of phobic patients. This paper will report a controlled comparison of flooding and desensitization in patients with phobic disorders who attended a psychiatric hospital.

Method

Design (Table I). At this stage of knowledge it was important to check whether the short-term effects of flooding were superior to those of desensitization. A balanced crossover design was therefore adopted. This design enables meaningful conclusions about short-term effects to be drawn from a small number of patients. However, the design does not allow these conclusions to be extended to results in the follow-up period. Every patient received an equal number of hours and sessions in each treatment, with a similar time for each treatment in imagination and in real life. Several kinds of phobic patient were included, since it was not known in advance for which type of phobia flooding might be applicable. Since the project aimed to discover the utility of flooding under routine conditions, a variety of novice therapists were employed. Both clinical and physiological measures of progress were made.

Before treatment began patients were told that they would be given two different treatments, that both were probably effective, but it was not known which was better. Both treatments involved their imagining phobic scenes, one method in a relaxed manner, the other in a very frightening way. They were free to withdraw at any stage if treatment proved unacceptable, in which case they could have other treatment, but otherwise they had to commit themselves to attendance for 12 treatment and 3 assessment sessions. If their fears were still present at the end of 12 sessions they would receive further treatment with that method which was more effective or preferred by them. All patients were taken off drugs for the duration of the trial, except for an epileptic patient who continued on 30 mgs. of phenobarbitone throughout the trial and another patient who was on amitriptyline 75 mgs. daily throughout treatment and had been on it for a year beforehand.

Sixteen patients were allocated at random to one of two treatment order groups. Eight patients had 6 sessions of desensitization in fantasy followed by 6 sessions of flooding in fantasy, while another eight patients had the same treatments in the reverse order. Delay in crossing over from one treatment to the other was 4 to 8 days, except for 2 patients in whom 41 and 50 days separated the two treatments because the patients had social engagements which prevented them from coming at the appropriate time. These patients were reassessed just before the second treatment was commenced. Each session in fantasy lasted 50 minutes. The fifth and sixth sessions were followed immediately by 70 minutes of desensitization or of flooding in practice. The periods of practice were included to maximize the therapeutic effect of both procedures. Treatment was given 2 to 3 times weekly, and average treatment time was 5 weeks. Patients were accompanied by their therapists during the practice sessions. All patients were asked to practise outside treatment the relaxation or flooding they had received during treatment.

The treatments

In a crossover design the experimental treatments must be given sufficiently long to exert a measurable but incomplete effect so that there is room for further improvement with the crossover procedure. In previous work with novice therapists in phobic patients both desensitization and flooding produced measurable clinical improvement in 6 to 8 sessions of a half to one hour each (Gelder, Marks and Wolff, 1967; Gelder and Marks, 1966; Boulougouris and Marks, 1969). A similar duration was therefore selected for each of the two treatments in this study. Only one session of training in relaxation was given for desensitization, as the previous studies had shown that this was sufficient to achieve good results with desensitization in suitable phobic patients.

I. *Desensitization.* The first of the 6 sessions of desensitization was employed in training patients to relax with an abbreviated form of Jacobsen's technique, and in hierarchy construction. The next 5 sessions involved systematic desensitization for 50 minutes along the lines of Wolpe and Lazarus (1966). All patients except one found it easy to relax. The exception was a severely handicapped in-patient agoraphobic where inability to relax was partially due to his tendency to let his imagery jump from lower items in the hierarchy to scenes too high up which were anxiety-provoking. In some patients anxiety was felt with items even at the bottom of the hierarchy, and the hierarchy had to be reconstructed. Three patients who had improved with flooding as first treatment were unwilling to continue with desensitization, expressing preference for the flooding method, but when they were reminded of the purpose of the trial they co-operated in the desensitization procedure.

The fifth and sixth sessions of desensitization in

https://doi.org/10.1192/bjp.119.551.353 Published online by Cambridge University Press

fantasy were followed immediately by 70 minutes of desensitization in practice. During desensitization in practice patients were encouraged to enter those phobic situations they had been desensitized to in fantasy which they could tolerate without excessive anxiety. Exposure to the real life situation was gradual and was accompanied by the therapist, who gave instructions on relaxation, and reassurance if any anxiety was experienced by the patient. Patients were asked to practise relaxation during exposure.

II. *Flooding.* The first flooding session was employed in training patients to obtain vivid visual imagery, including frightening phobic scenes. The next five sessions involved their visualizing their most frightening phobic images continuously without relief for 50 minutes as the therapist spoke about their phobias, endeavouring all the time to maintain anxiety at maximum pitch. As an example, an agoraphobic might hear the therapist describe that he went out into the street, became anxious, felt like fainting, was bathed in sweat, screamed in despair and shame, tried to run back home but fainted and was taken by ambulance to a mental hospital where he woke up feeling he was going mad. The flooding themes described by the therapist consisted of the most anxiety-provoking fears which had actually been expressed by the patients in preliminary interviews. In agoraphobics these included excessive insecurity, dread of losing control, of being looked at, being humiliated, or being incapable of assuming responsibility because of their phobias. Flooding themes were carefully tailored to the particular fears which a given patient had expressed. Hypothetical psychodynamic cues which might be construed as relevant to a patient's phobias (e.g. sexual problems or childhood conflicts) were not included unless the patient himself suggested they were connected. The flooding themes were described by the therapist in a matter-of-fact voice. Each theme lasted 5–10 minutes. In each session 3 different themes were presented in succession, and a given theme was repeated 2–3 times in each session if anxiety was elicited. Variations were introduced in successive sessions. Themes which did not elicit anxiety were discarded. New material was introduced after discussion with patients at the end of each session about which cues were particularly anxiety-provoking; the degree of anxiety was judged by cues from the patient, such as grimaces, crying, clenching of fists, and from an overall rating by the patient at the end of the session of the maximum amount of anxiety he experienced, on a five-point scale.

The fifth and sixth sessions of flooding in fantasy were followed immediately by 70 minutes of flooding in practice. Patients were asked to enter the most frightening situation related to his fear which had been dealt with during the fantasy sessions. The therapist accompanied the patient as he entered the phobic situation, except with 3 patients who specifically asked to do this alone. When the patient was reluctant to enter the most frightening situation he was asked firmly to enter a slightly less frightening one which he used to avoid before treatment. While patients were in the phobic situation the therapist intermittently recited the flooding themes, and patients were asked to rehearse these themselves as well, silently and aloud.

Therapists. As any treatment is most useful if it can be given with a minimum of training, this trial employed a variety of therapists who differed in their amount of clinical training but were all novices to both desensitization and flooding. Altogether there were 10 therapists—5 were qualified psychiatrists, 4 were psychiatrists in training, and one was a medical student. Each patient had all 12 treatment sessions from the same therapist. Every therapist had to learn both desensitization and flooding by reading relevant literature and then watching actual treatment sessions before he began giving the treatment himself. All therapists were closely supervised by the authors. Therapists found desensitization easy to learn but boring to give. They found it more difficult to learn flooding and to construct appropriate anxiety-provoking themes. Therapists usually felt uncomfortable during the first few sessions of flooding, but this soon dissipated, after which they often found flooding to be boring as well.

Patients. The senior author selected 16 patients who had phobic disorders as the dominant problem, with severity of the main phobia at a minimum of 3·5 on a 1 to 5 rating scale filled in by the patient. (Mean rating was 4·2.) Patients who had phobias as subsidiary complaints (e.g. as part of a depressive illness or obsessive neurosis) were excluded. In the absence of other methods, clinical criteria had to be used to decide whether a phobic disorder was the dominant problem or not, along the lines discussed in *Fears and Phobias* (Marks, 1969).

Since the possible indications for flooding were unclear, a range of phobic patients was included, from highly specific phobics (7) to more severe agoraphobics (9), 4 of whom had marked free-floating anxiety. Eleven of the subjects were out-patients and 5 were in-patients. Seven were men and 9 were women.

The clinical and physiological characteristics of patients in each treatment order group are illustrated

TABLE II

Characteristics of patients at start of treatment

Scores are means unless otherwise stated. The 2 treatment order groups did not differ significantly on any variable.

	Group I Before flooding as 1st treatment	Group II Before desensitization as 1st treatment
Number of patients	8 (3 inpts. 5 outpts.)	8 (2 inpts. 6 outpts.)
Age	33	34
Onset age of phobias	21	22
Sex	4F : 4M	5F : 3M
Duration of phobias (years)	11	12
Type of phobia	4 agoraphobic 4 specific phobic	5 agoraphobic 3 specific phobic
Doctors' rating (1–5 scale, therapist and assessor combined)		
main phobia	4·8	4·7
total phobias (mean of 5)	3·5	3·6
depression	1·7	1·4
anxiety	2·8	2·2
depersonalization	1·2	1·3
work	2·9	2·2
leisure	3·6	3·2
sex	2·6	1·6
family relationships	2·0	1·9
other relationships	2·3	2·1
Patient's rating (1–5 scale)		
main phobias	4·1	4·2
total phobias (mean of 5)	3·1	3·3
anxiety	2·9	2·3
depression	2·1	1·9
panic attacks	2·1	1·8
Questionnaire scores:		
Cornell (sections, G, I, J and L to R)	16	17
Tavistock social check list	8	6
Tavistock phobic check list	8	6
E.P.I. 'Neuroticism'	27	26
E.P.I. 'Extraversion'	23	29
Physiological measures		
Heart rate at rest	87·4	88·9
Heart rate increase: Main phobic fantasy	9·5	7·8
Heart rate increase: phobic talk	4·7	11·8
Skin conductance (spon. flucs.)		
at rest	2·1	3·1
main phobic fantasy	5·1	5·1
phobic talk	6·7	5·9
Skin conductance (max. deflection)		
main phobic fantasy	56·8	49·9
phobic talk	73·0	37·6

in Table II. They turned out to be well matched and did not differ significantly on any of the variables. The group which had desensitization first contained 4 severe agoraphobics, (2 of them as in-patients), one mild agoraphobic, and 3 specific phobics (heights, pigeons, dental equipment). The group which received flooding as the first treatment contained 4 severe agoraphobics (3 of them in-patients) and 4 specific phobics (3 spider phobics and one patient who had a phobia of defaecating on trains).

The patients with agoraphobia (8) were severely handicapped by their symptoms, and complained of fears of going out alone, inability to walk in the street unaccompanied 200 yards away from home or

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inability to travel by public transport, and were often dependent on sedatives and/or alcohol to relieve their anxiety. The 4 with free-floating anxiety resembled the severe agoraphobics described by Gelder and Marks (1966).

The patients with specific phobias were much less handicapped; none was an in-patient and only one had been on drugs (amitriptyline).

Assessment. This was made just before treatment and two days after the sixth and twelfth sessions. *Clinical* ratings were by patients, therapists and an independent medical assessor who interviewed the patient separately from the therapist. All three raters rated the following symptoms: main phobia, 4 other phobias, free-floating anxiety, panic attacks, obsessions, depression and depersonalization. Therapists and assessors rated work, leisure, sexual adjustment, family relationships and other relationships. All scales were 1 to 5, with 5 indicating maximum pathology. They were based on scales originally devised by Miles *et al.* (1951) and modified by Gelder and Marks (1966). Before treatment patients also completed (1) a symptom check list consisting of sections G, I, J, and L to R of the Cornell Medical Index, (2) check lists of phobias and social anxiety derived from the Tavistock Self-Assessment Inventory (Dixon, de Monchaux and Sandler, 1957a and b) and (3) the Eysenck Personality Inventory (EPI—A and B forms).

Follow-up was carried out by patients and a doctor rating progress on the clinical rating scales at 1, 3, 6, 9 and 12 month follow-up. Between 5 and 12 months a psychiatric social worker also interviewed relatives of all except one patient.

Reliability. As in previous trials, the clinical ratings of phobias were highly reliable between the three raters. The product-moment correlation coefficients were as follows (figures in brackets are those from Gelder and Marks, 1966): between therapist and assessor: main phobia ·78 (·82), total phobia ·89 (·80); between patient's and combined doctors' ratings: main phobia ·89, total phobia ·94. The detailed reliability of other symptom ratings is not reported further, as this report will concentrate on the ratings of the phobias.

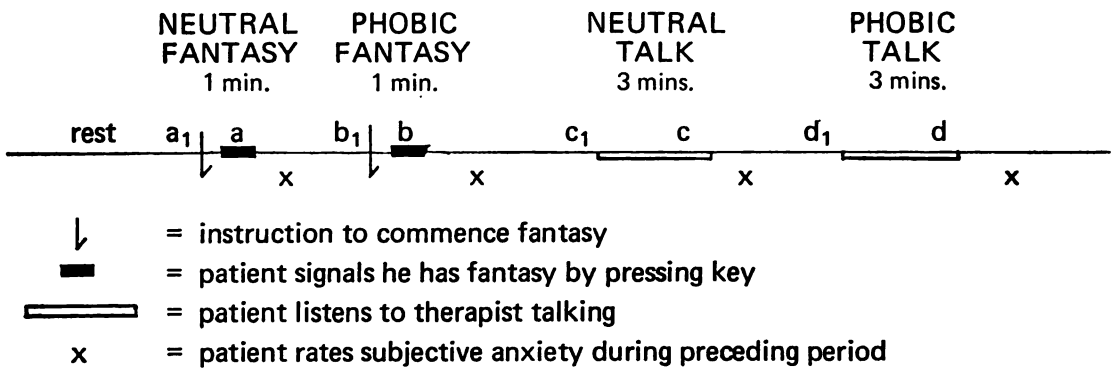
Physiological assessment (Table III). This was of heart rate, spontaneous fluctuations of skin conductance and maximum deflection of skin conductance during the following imagery by the patient: 1. Six 'fantasy' periods, each lasting 60 seconds, during which the patient imagined fantasies of (a) neutral scene, (b) minor phobia and (c) main phobia. Each of the three kinds of fantasies was imagined twice, while the therapist remained silent. (a) Two *talk* periods of 3 minutes each during which the patient was asked to listen to and imagine the therapist's descriptions of (d) neutral scenes and (e) phobic (flooding) scenes described by the therapist. The flooding scenes were employed as they were the most intense phobic stimuli available for physiological assessment. The three kinds of 60 sec. fantasies were presented in random order. The two talk periods then followed and were also given in random order. A given patient had identical fantasies and talks for each of the three physiological assessments. The patient signalled his subjective anxiety after each of the 6 fantasy and 2 talk periods. The patient depressed a key as long as he held a given fantasy. If he was unable to hold a fantasy for 60 seconds it was repeated 2–3 times until he could obtain it properly. With 3 patients the entire recording had to be repeated because they had difficulty in holding the images. A diagrammatic explanation of the physiological measures and the scoring procedure is seen in Table III. All except 2 patients were completely off drugs, and were asked to omit night sedation prior to the recording. The exceptions were the epileptic patient on 30 mg. of phenobarbitone and another on amitriptyline 75 mgs. daily throughout treatment, and even these two omitted their drugs for 10 hours before assessments.

The technique for recording skin conductance was similar to that described by Lader and Wing (1966). Skin conductance and heart rate were recorded on a Grass Model 7 polygraph. The recordings took place in semi-darkness in an isolated quiet room with the subject seated in a comfortable chair. Heart rate was counted for each 20 second period of the recording. The measure employed (see Table III) was the increase in heart rate from the maximum 20 second count in the minute before an instruction to obtain a given fantasy to the maximum during the minute of the fantasy (or last minute of the talk periods). For the same epochs measures were taken of the increase in fluctuations of skin conductance greater than 0·003 log micro mhos, and of maximum deflection of skin conductance (maximum change in level, reckoned from the moment of instruction to the end of the fantasy) calculated in log micro mhos × 1000. These scores will be termed 'uncorrected' measures. The net increase in physiological activity during phobic fantasies and phobic talk was calculated for each patient by subtracting the scores during neutral fantasy and neutral talk periods from the scores during phobic fantasies and phobic talk respectively. These will be referred to as 'ipsative measures'.

During the initial assessment patients who later

TABLE III

Imagery and measures during physiological assessments



Measures:

Increase in heart rate:	Unit = beats/min.
Uncorrected measures	
Fantasy periods:	Highest rate during 1′ fantasy—highest rate during 1′ rest before instructions began (i.e. $a–a_1$, or $b–b_1$)
Talk periods:	Highest rate during last 1′ of 3′ sequence—highest rate during 1′ rest before the therapist began talking.
'Ipsative' measures	
Phobic fantasy:	$(b–b_1) — (a–a_1)$
Phobic talk:	$(d–d_1) — (c–c_1)$

Skin conductance : maximum deflection: Unit = log micro mhos × 1000.
Calculations as for heart rate, except fantasy periods reckoned from moment of instruction to end of actual fantasy.

Skin conductance : number of spontaneous fluctuations: Unit = number of flucs. greater than 0·003 log micro mhos per minute.
Calculations as for heart rate.

received flooding showed similar resting levels of heart rate and skin conductance to patients who later received desensitization. Lacey's autonomic lability score was not used. Analysis of the data showed there to be no significant relationship between pre-stimulus levels and subsequent change on heart rate and skin conductance, i.e. the correlation between levels immediately before and change during phobic imagery.

RESULTS

Significant effects of either treatment (Table IV). These were analysed by two tail related t tests. When the first and second treatments were pooled, both flooding and desensitization each produced significant improvement of the main phobia ($p < ·005$, $< ·005$) on doctors' ratings. Flooding also produced improvement of the total phobia and anxiety scores on patients' and doctors' ratings ($p < ·01$, $p < ·005$, $p < ·01$, $p < ·005$). Physiological measures only improved with flooding. Flooding produced significant improvement in heart rate and skin conductance measures during the main phobic fantasy and phobic talk (p ranging from $p < ·05$ to $< ·01$) while skin conductance during phobic talk was actually greater after desensitization ($p < ·05$ to $< ·01$).

When the first and second treatments were considered separately, it was apparent that both flooding and desensitization gave more significant effects as the first treatment than as the second treatment. This was true for clinical and for physiological ratings.

Comparison of flooding with desensitization. Differences for the first or the second treatments were analysed by two-tail unrelated t tests. When the first and second treatments were combined,

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TABLE IV

Variables on which patients improved from start to end of flooding or desensitization

Figures show probability level of improvement on two-tail related t-tests.
pts. = patient rating
drs. = doctors' rating (therapist and assessor combined)
( ) = ipsative measures.
□ = variables on which scores worsened significantly
Flood. = flooding
Des. = desensitization

	A. 1st treatment		B. 2nd treatment		A + B	
	Flood.	Des.	Flood.	Des.	Flood.	Des.
Clinical						
Main phobia—pts.	·01	·05				
—drs.	·05	·05	·05		·005	·005
Total phobia—pts.	·01	·05			·01	·1
—drs.	·01				·005	
Anxiety —pts.	·1		·1		·01	·1
—drs.	·05		·02	·1	·005	
Physiological						
Main phobic fantasy:						
Heart rate	·05 (·05)				·05 (·05)	•
Skin conduc.: spon. flucs.		·05				
Skin conduc.: max. defl.	(·1)			□	(·1)	
Subjective anxiety			·05		·01	
Phobic talk:						
Skin. conduc.: spon. flucs.	·05 (·05)				·01 (·02)	
Skin. conduc.: max. defl.	·1			·01 (·1)	·05 (·05)	·02 (·05)
Subjective anxiety	·1			·05 (·1)	·05	

crossover design analyses of variance were performed in which variances were extracted for (i) type of treatment, (ii) treatment order group—i.e. whether flooding preceded desensitization or the reverse, and (iii) the effect of giving any treatment first or second, regardless of the type of treatment.

When given *as the first treatment* (Fig 1 and Table V), flooding produced greater improvement than desensitization on the following measures: main phobia—doctors' rating ($p < \cdot 01$), total phobia—doctors' rating ($p < \cdot 05$), subjective anxiety during the main phobic fantasy ($p < \cdot 1$), heart rate increase during the main phobic fantasy ($p < \cdot 1$ for ipsative and for uncorrected measures) (see also Fig. 2), spontaneous fluctuations of skin conductance during phobic talk, ($p < \cdot 1$ for ipsative measures) and maximum deflection of skin conductance during phobic talk ($p < \cdot 05$ for ipsative and for uncorrected measure).

When given *as the second treatment*, flooding produced significantly more improvement than desensitization on the following variables (Table V): spontaneous fluctuations of skin conductance during phobic talk ($p < \cdot 05$ for ipsative and $p < \cdot 1$ for uncorrected measure), maximum deflection of skin conductance during phobic talk ($p < \cdot 05$ for ipsative and for uncorrected measure).

When *first and second treatments were combined* (Fig. 3, Table V) analyses of variance showed flooding to be significantly superior to desensitization on: main phobia and total phobia–doctors' rating ($p < \cdot 05$, $< \cdot 05$), heart rate increase during main phobic fantasy ($p < \cdot 05$ for ipsative and $p < \cdot 1$ for uncorrected measure) (see also Fig. 2) spontaneous fluctuations of skin conductance during phobic talk ($p < \cdot 05$ for ipsative and for uncorrected measure), maximum deflection of skin conductance during phobic talk ($p < \cdot 05$ for ipsative and $p < \cdot 01$ for uncorrected measure). Missing data precluded an analysis of variance on subjective anxiety measures.

Flooding thus emerged as significantly

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TABLE V

Significant effects in crossover analyses of variance

Figures refer to p values. Those in brackets are for ipsative scores. ns = not significant ($p > \cdot 10$).

	Main effects: between— treatments	occasions	Interaction effects: treatments & occasions
Clinical variables:			
main phobia: patient's rating	ns	·05	ns
doctor's rating	·05	ns	·01
total phobia: patient's rating	ns	·05	ns
doctor's rating	·05	ns	ns
anxiety patient's rating	ns	ns	ns
doctor's rating	·1	ns	ns
Physiological variables:			
HEART RATE:			
main phobic fantasy	·1 (·05)	ns	ns
minor phobic fantasy	ns (ns)	·05	ns
phobic talk	ns (ns)	ns	ns
SKIN CONDUCTANCE: SPONTANEOUS FLUCTUATIONS			
main phobic fantasy	ns (ns)	·05	ns
minor phobic fantasy	ns (ns)	·05	ns
phobic talk	·05 (·05)	ns	ns
SKIN CONDUCTANCE: MAXIMUM DEFLECTION			
main phobic fantasy	ns (ns)	ns	ns
minor phobic fantasy	ns (ns)	ns	ns
phobic talk	·01 (·05)	ns	ns
All significant results favour:	flooding	first occasion	

superior to desensitization on several clinical and physiological variables, whereas desensitization never produced significantly more improvement on any variable.

Physiological changes during phobic vs. neutral imagery before and after each treatment (first and second treatments combined) (see Fig. 4).

Before each treatment there were many significant physiological changes during phobic as compared with neutral imagery. Did these disappear after each treatment? This was tested by analyses of variance which compared the physiological measures during the three kinds of *phobic* imagery (minor phobic fantasy, main phobic fantasy, phobic talk) with changes during the two kinds of *neutral* imagery (neutral fantasy and neutral talk). Separate analyses of variance were performed before and after each treatment for each of the three physiological measures (heart rate increase, spontaneous fluctuations and maximum deflection of skin conductance) and for subjective anxiety.

Results are seen in Fig. 4. The shaded area denotes the physiological improvement with each treatment. It is obvious that more improvement followed flooding than desensitization. The figures alongside the graph denote significance of the difference between that point and the neutral measures

The significant increases of heart rate during the main phobic fantasy and phobic talk disappeared after treatment by flooding, but remained after treatment by desensitization. Fluctuations of skin conductance during phobic talk were reduced greatly by flooding and during the two phobic fantasies were reduced by desensitization. Flooding abolished significant deflection of skin conductance during the minor phobic fantasy and phobic talk. However, after desensitization the significance of increased deflection of skin conductance during phobic talk was actually increased. Subjective anxiety remained increased after both treatments for the main phobic fantasy and phobic talk, but after flooding was no longer increased during the

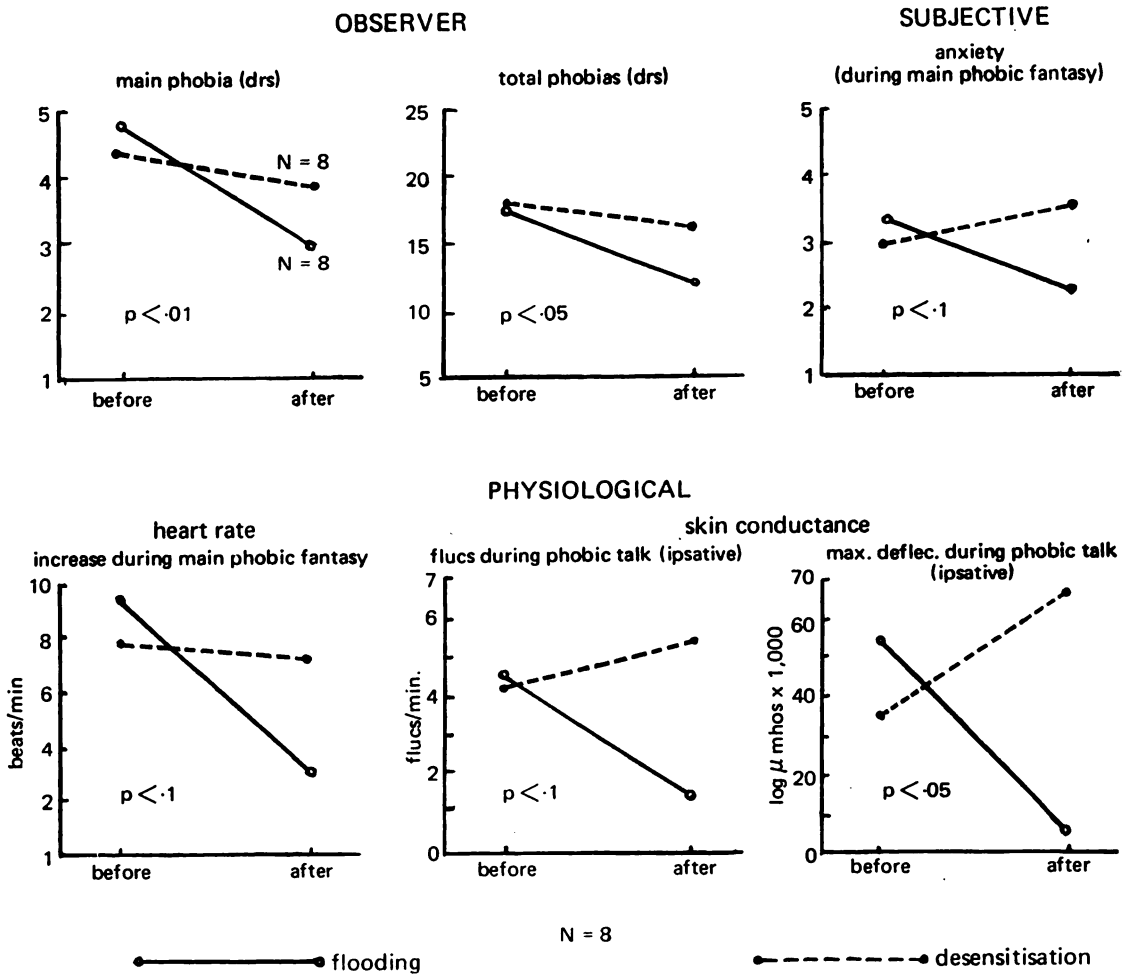

FIG. 1.—Changes with the first treatments: p values indicate significance of the difference between change scores on 2 tail t tests.

minor phobic fantasy, although it remained significantly raised after desensitization.

Figure 4 suggests at first sight that patients were more disturbed physiologically before flooding than they were before desensitization. In fact, this was not so. The graph is a composite of changes after the first and crossover treatments combined, and the apparent differences are due to improvement after flooding as first treatment. By the time patients began desensitization as second (crossover) treatment they had already improved considerably with flooding. The same was not true for patients who began flooding after first having desensitization. Before patients began any treatment at all the two treatment order groups were well matched, both clinically and physiologically.

Effects of giving either treatment first or second. The crossover design analyses of variance found significantly greater improvement with the first than with the second (crossover) treatment, regardless of the kind of treatment,

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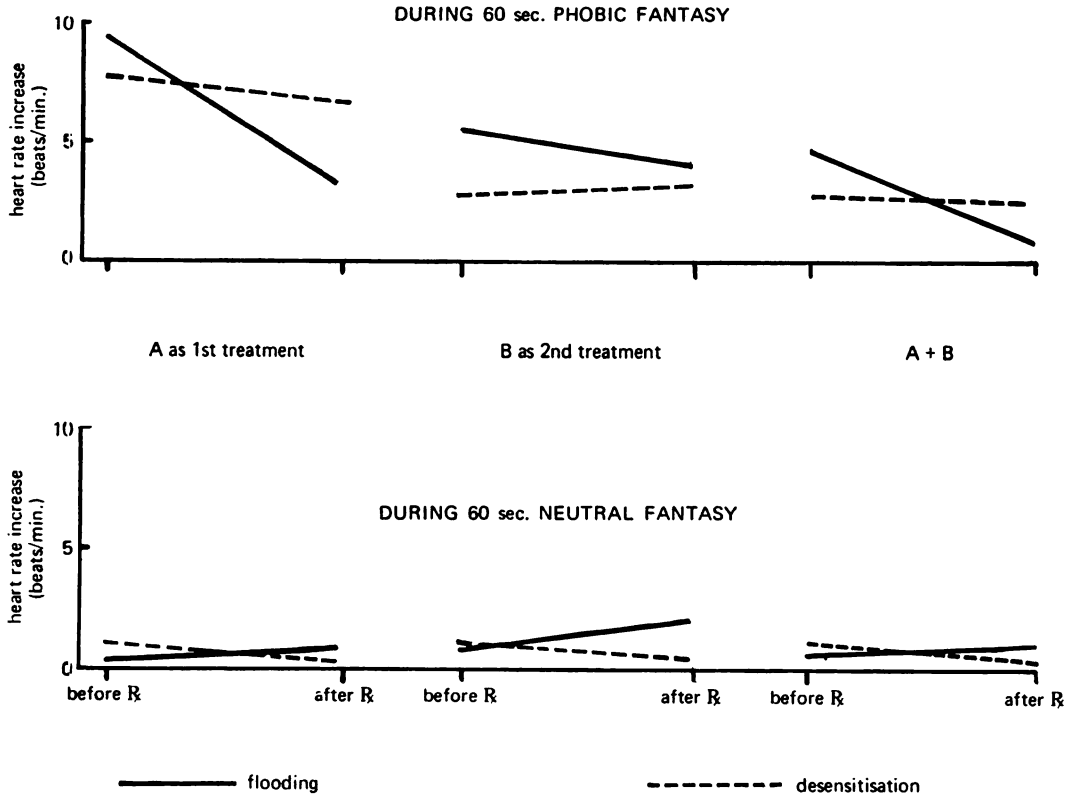

FIG. 2.—Changes in heart rate during main phobic and neutral fantasies.

on the following variables (all $p < \cdot 05$): main phobia-patients' rating, total phobia—patients' rating; spontaneous fluctuations of skin conductance during fantasies of neutral scene, minor phobia and main phobia; heart rate during minor phobic fantasy. Flooding was not significantly superior to desensitization on any of these variables.

Effect of treatment order (Table V). Patients who had flooding followed by desensitization did significantly better than those who had the reverse on one variable—main phobia, doctors' rating ($p < \cdot 01$). This effect was independent of the superiority of flooding over desensitization on that variable. No other significant treatment order effects were found.

Prognostic variables with each treatment. Sixty variables at the start of treatment were correlated with the following four outcome criteria at the end of treatment for flooding and for desensitization—(1) improvement on main phobia (doctors' and patient's ratings combined), (2) improvement in heart rate during the main phobic fantasy (ipsative measure), (3) improvement in spontaneous fluctuations and (4) maximum deflection of skin conductance during phobic talk (both ipsative measures).

Chance alone would produce several significant correlations from a large matrix. However, these would be randomly positive and negative. The significant correlations for outcome to desensitization turned out to be almost uniformly negative (high scores in the matrix indicated maximum pathology or physiological activity). Correlations for outcome to flooding, on the other hand, were nearly all positive. The consistent pattern which emerged is highly unlikely to have arisen by chance ($p < \cdot 000001$ on Fisher's exact test). Furthermore, the pattern of correlations for outcome

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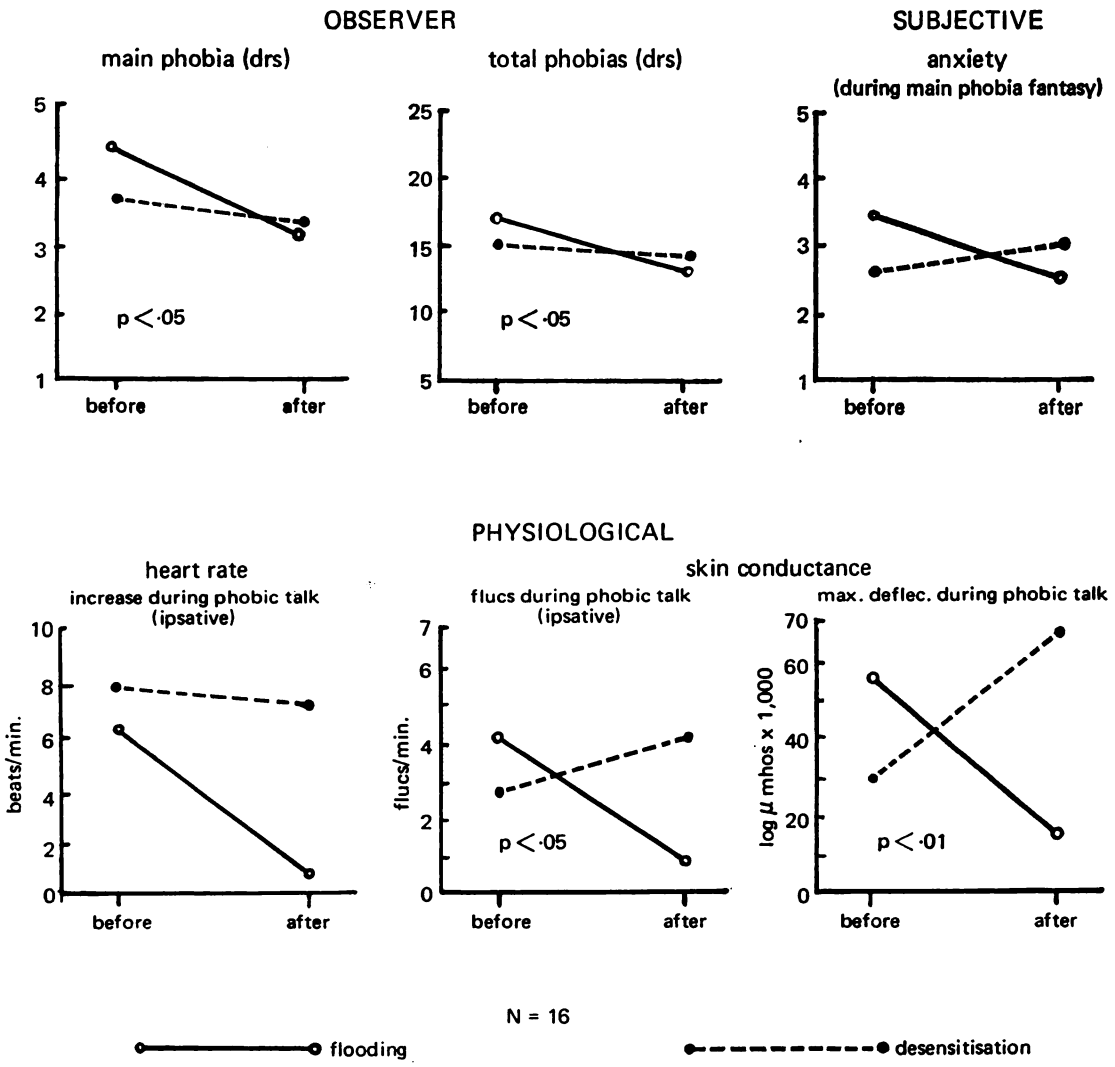

FIG. 3.—Changes with first and second treatments combined: p values indicate significance of the difference between change scores on analyses of variance.

to desensitization was similar to that found in earlier studies.

Every significant correlation appears in Table VI and VII, except that for simplification either ipsative or uncorrected physiological variables are shown, not both, since the correlations with both were generally very similar.

(i) *Desensitization* (Table VI). As in previous studies (Lader *et al.*, 1967; Gelder *et al.*, 1967; Marks, 1969), free-floating anxiety and its physiological correlates at the start of treatment all augured a poorer response to desensitization (Table VI), e.g. the ratings for panic attacks at rest (— ·54), the clinical anxiety rating at rest

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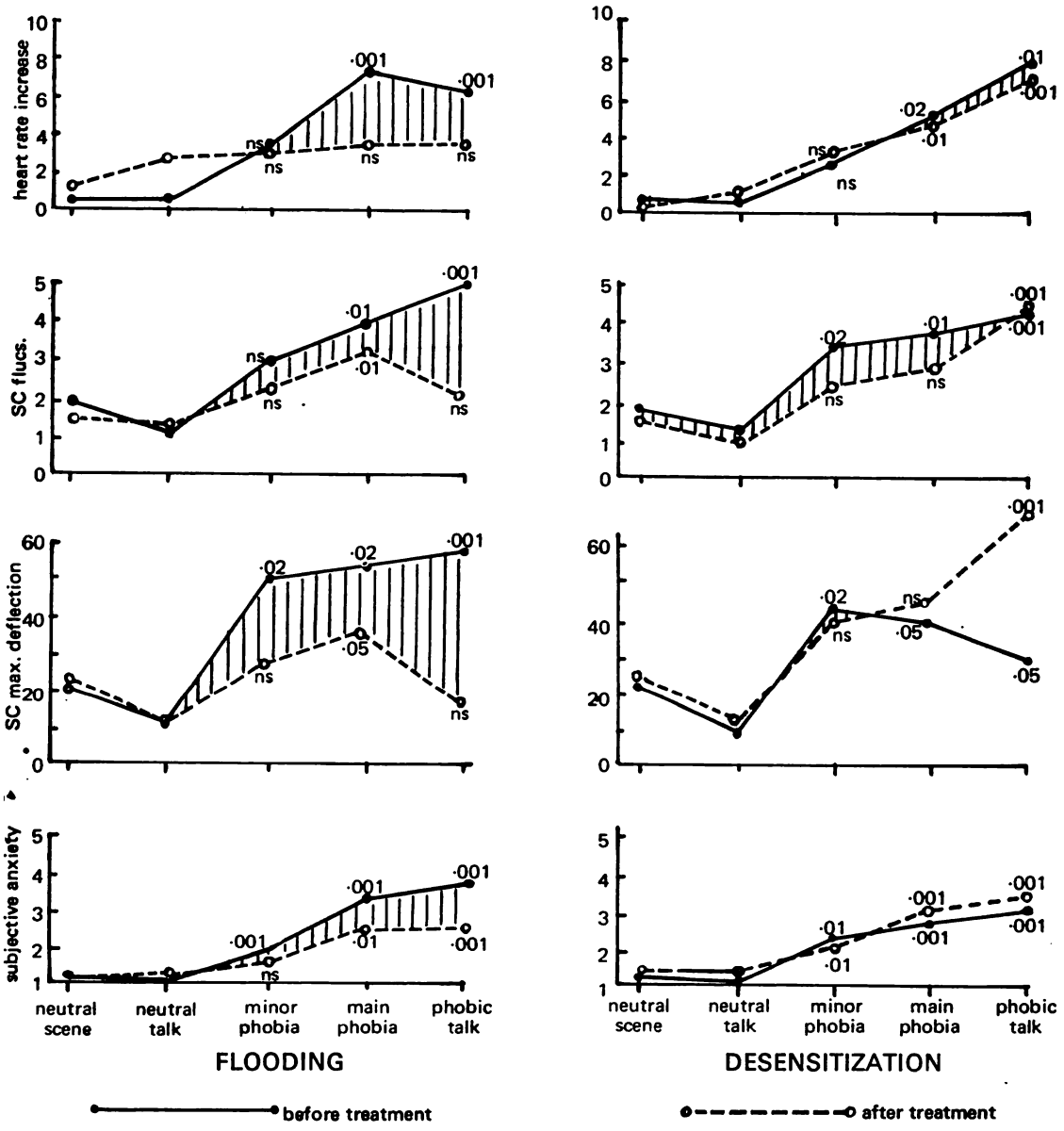

FIG. 4.—Physiological changes during phobic and neutral imagery: p values indicate significance of the difference between phobic and neutral imagery on analysis of variance

(— ·54), and spontaneous fluctuations of skin conductance during neutral fantasy (— ·83) and neutral talk (— ·73). It was noteworthy that almost every indicator of clinical severity or of physiological arousal which correlated significantly with outcome to desensitization did so *negatively*.

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TABLE VI
Prognostic valuables—desensitization

	Improvement criteria			
	1 Main phobia	2 Heart rate	3 SC flucs	4 SC deflec
Correlation with variables at start of treatment:				
agoraphobia			−·74xx	
panic attacks (doctors' ratings)	−·54x			
total phobia (doctors' ratings)	−·51x			
anxiety (doctors' ratings)	−·54x			
work impairment	−·62xx		−·55x	·54x
leisure impairment			−·55x	
introversion (EPI)			−·55x	
spon. fluctuation of SC during:				
neutral fantasy		−·83xxx		
neutral talk		−·73xx		
minor phobic fantasy		−·73xx		
Maxmum deflection of SC during:				
main phobic fantasy				−·51x
neutral talk		−·59x		
Heart rate increment during:				
minor phobic fantasy (ips)	−·79x			
phobic talk				−·53x
Subjective anxiety during:				
neutral fantasy			−·78x	

x = p< ·05 xx = p< ·01
\+ = p< ·02 xxx = 0< ·001
ips = ipsative measure
1 = decrease on 1–5 scale, patient's and doctors' ratings combined
1 = decrease in heart rate increment during main phobic fantasy (ips)
3 = decrease in spontaneous fluctuations of SC during 3rd minute of phobic talk (ips)
4 = decrease in maximum deflection of SC during 3rd minute of phobic talk (ips)
SC = skin conductance.

(ii) *Flooding* (Table VII). The authors had expected the same predictors to operate with flooding as with desensitization, and were surprised to find that the opposite was the case. Several clinical and physiological indicators of severity and physiological arousal correlated significantly positively with outcome after flooding (Table VII), e.g. the amount of depression (·63) and work impairment (·64), as well as maximum deflection of skin conductance during the neutral fantasy (·53 and ·62 on different criteria).

(iii) *The two treatments compared.* On variables which predicted outcome with desensitization the correlation with outcome to flooding was usually significantly different and in the opposite direction, e.g. panic attacks at rest correlated − ·54 with outcome to desensitization, but + ·32 with outcome to flooding. Similarly, maximum deflection of skin conductance during the neutral fantasy correlated + ·62 with outcome to flooding but − ·38 with outcome to desensitization. All significant correlations concerning symptoms and physiological activity appear in Table VIII. The full correlation matrix is available from the author. Thus although as usual desensitization did best in the most focal phobics with the fewest phobias and least physiological activity, flooding did best in the severer phobics with most symptoms and physiological arousal, i.e. it helped those patients who needed help most.

Mean improvement in the main phobia (doctors' and patient's ratings combined)

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TABLE VII
Prognostic variables—flooding

	Improvement criteria			
	1 Main phobia	2 Heart rate	3 SC flucs	4 SC deflec
Correlation with variables at start of treatment:				
depression (doctors' ratings)			·63+	
work impairment	·64xx			
sexual impairment	·51x			
social phobia checklist	·55x			
phobic checklist	·52x		·56x	
introversion (EPI)	·62+			
maximum deflection of SC during:				
main phobic fantasy			·60+	
minor phobic fantasy			·71+	·68+
neutral phobic fantasy			·53x	·62+
phobic talk (ips)			·87xxx	·71xx
Heart rate increment during:				
minor phobic fantasy	·76xx	·63x	·80xx	

x = $p < ·05$ xx = $p < ·01$
\+ = $p < ·02$ xxx = $p < ·001$
ips = ipsative measure
SC = skin conductance. EPI = Eysenck Personality Inventory
1 = decrease on 1–5 scale, patient's and doctors' ratings combined
2 = decrease in heart rate increment during main phobic fantasy (ips)
3 = decrease in spontaneous fluctuation increment during 3rd minute of phobic talk (ips)
4 = decrease in maximum deflection of SC during 3rd minute of phobic talk (ips).

with desensitization was ·74 for specific phobics but only ·22 for agoraphobics. For flooding the respective figures were ·65 and 1·29. Desensitization thus produced best results in specific phobics, flooding in agoraphobics. Desensitization and flooding produced comparable improvement in specific phobics. It is relevant here that because the authors began this trial thinking that phobics with severe free-floating anxiety would do badly with flooding (as they do with desensitization), they had excluded two very anxious patients from participation in the trial. However, the doctors in charge of these two patients flooded them outside the trial, and both patients made remarkable improvement, thus according with the findings just noted.

Subjective anxiety during flooding sessions and subsequent outcome.

Figure 5 shows the ratings for anxiety during flooding sessions for the most and the least improved patients. The most improved patients already showed less anxiety before their first practice period (i.e. during the fifth flooding session in fantasy). In contrast the least improved patients had not yet shown any decline of anxiety by the fifth session. Decreased subjective anxiety during the sessions thus presaged better outcome. It is possible that in the least improved patients subjective anxiety during the sessions would have decreased with additional treatment. This is hinted at in the slight decrease from the fifth to the sixth sessions, between which there had been a practice period.

Anxiety was not always maximal during the first session, which sometimes elicited only slight anxiety, reaching a peak in the second or third sessions.

Drop-outs. Two patients left treatment after the third flooding session, while none dropped out of desensitization. Both drop-outs were replaced by others. One was a social phobic who had shown no anxiety during the flooding procedure. The other reported slight improvement after the first two sessions, but after the

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TABLE VIII
Prognostic variables: Flooding vs. desensitization

	Improvement criteria							
	1 Main phobia		2 Heart rate		3 GSR flucs		4 GSR deflec	
Correlation with variables at start of treatment	FLO	DES	FLO	DES	FLO	DES	FLO	DES
Agoraphobia					−·23	(−·74xx)		
panic attacks—doctors' rating	·32	(−·54x)						
total phobia —doctors' rating	·30	(−·51x)						
anxiety —doctors' rating	·30	(−·54x)						
depression —doctors' rating					·63+	(·12)		
work impairment	·64xx	(−·62xx)			·25	(−·55x)	−·06	(·54x)
leisure impairment					·50	(−·55x)		
sexual impairment	·51x	(−·38)						
social phobia checklist	·55x	(−·32)						
phobia checklist	·52x	(−·50)			·56x	(−·22)		
introversion (EPI)	·62+	(−·36)			·16	(−·57x)		
GSR fluctuations during:								
neutral fantasy			−·09	(−·83xxx)				
neutral talk			−·23	(−·73xx)				
minor phobic fantasy			−·06	(−·73xx)				
GSR maximum deflection during:								
main phobic fantasy					·60+	(·24)	·40	(−·51)x
minor phobic fantasy					·71+	(−·04)	·68+	(−·45)
neutral fantasy					·53x	(−·14)	·62+	(−·38)
phobic talk (ips)					·87xxx	(·04)	·71xx	(−·21)
Heart rate increment during:								
minor phobic fantasy	·76xx	(−·78xx)						
phobic talk							·19	(−·53x)
Subjective anxiety during:								
neutral fantasy						(−·78x)		

x = $p < ·05$ from correlation of 0. xx = $p < ·01$ ips = ipsative measure FLO = flooding
\+ = $p < ·02$ xxx = $p < ·001$ DES = desensitization
1 = decrease on 1–5 scale, patient's and doctors' ratings combined
2 = decrease in heart rate, increment during main phobic fantasy (ips)
3 = decrease in spontaneous fluctuations increment during 3rd minute of phobic talk (ips)
4 = decrease in maximum deflection of GSR during 3rd minute of phobic talk (ips).

third stopped because of a panic the previous day. He declined further treatment by desensitization outside the trial. This patient had dropped out of treatment twice before, once during insight psychotherapy and once during desensitization.

Effect of therapist experience and attitude. The amount of clinical experience a therapist had was not associated with outcome in any detectable way. The same improvement in main phobia (patient's or doctors' ratings) was found with experienced and with inexperienced therapists.

Most therapists began this trial with no expectations about the relative efficacies of desensitization and of flooding. There were some exceptions, but in these therapist attitude did not necessarily reflect outcome. One patient whose therapist favoured desensitization in fact did better with flooding. Of two anxious in-patients whom the therapist did not expect to improve with desensitization, one did not change with either treatment, while the other improved only with flooding.

Patients' reactions to flooding. Every patient was asked to comment in detail about his experiences with both treatments, and these were illuminating. Most were distressed during

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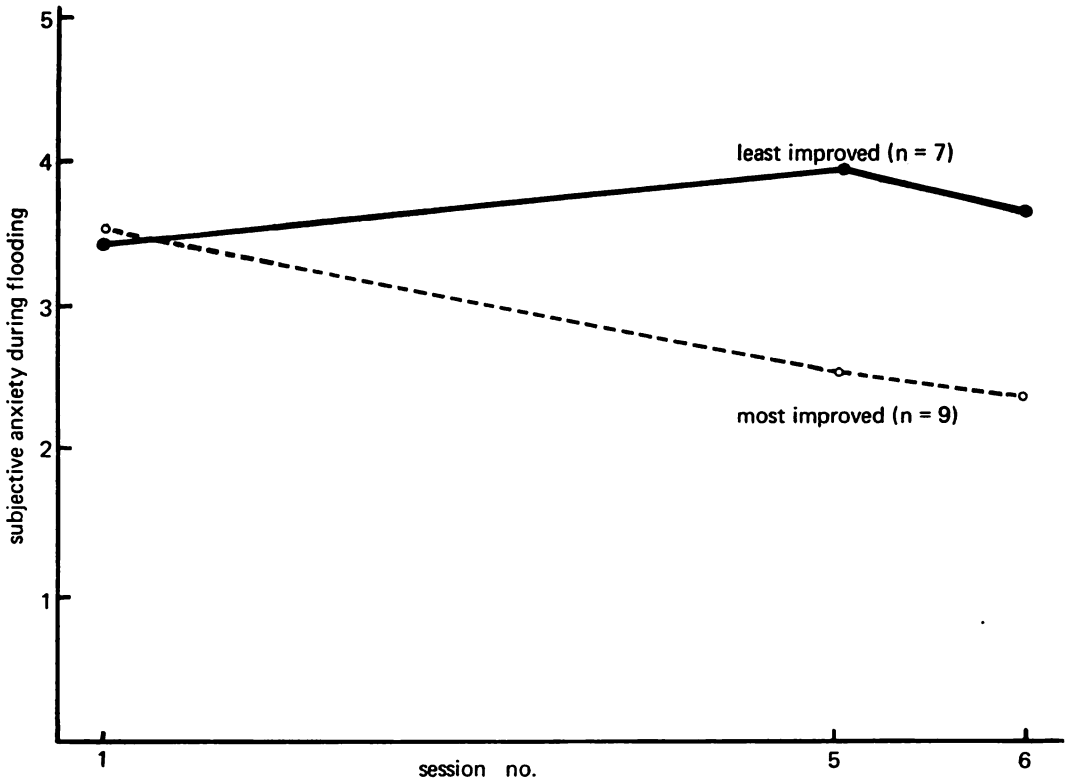

FIG. 5.—Subjective anxiety during sessions and outcome.

the first few flooding sessions: 'The first four treatments were horrible experiences. I could feel a great muddle of emotions—anger and sheer misery—pulling me apart. The misery was uppermost. . . . It seemed as if a mirror was being held up to me showing all my faults, making me weak and just a mess emotionally. . . . I felt such a lousy character after these sessions. . . .' This same patient remarked that she no longer felt anxiety in the final sessions: 'I fell asleep during the fifth treatment and the sixth left me similarly unmoved.' She then noted the way she felt challenged by the treatment: 'After the fifth and sixth sessions I went out with Dr. . . . to London where we did a tour of the underground railways and all the busier streets, and had an extremely horrid experience on a rush hour train—packed like sardines in the guard's van. All during the trip and the next Dr. . . . tried to make me panic, muttering all the words most frightening for me to hear. My reaction was "I *won't* panic no matter what you say", but, of course, I did experience one or two nasty moments especially on the underground.' Finally this patient described how cognitive processes might have played a role in her treatment: 'If I suddenly thought I was going to have a fit I could talk myself out of the feeling—I suppose because the imagined scenes (during flooding) were so horrific that I rejected my own small panics.' Another patient commented on the cognitive aspects, saying that 'the reality never matched up to the horrors of the fantasy'. Other patients also emphasized the element of challenge they felt during treatment: 'The goading was very successful . . . my reaction was "I'll show you"'; 'This treatment certainly appealed to what was left of my combative spirit'; 'I did something to show that I am not as bad as the

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insult implied, like getting on a crowded bus when I haven't been on one for six months.'

One patient described how anxiety during treatment made her angry: 'The first time Dr. . . . made me go upstairs on the bus and said we were going on a train I felt like punching him, for I felt very anxious, but it quickly passed, that attitude.'

Follow-up. All patients were followed-up to the end of one year, except one who has only reached 6 months, and 3 who have only reached 9 months. Mean follow-up period to date is one year. Relatives of all except 2 patients were interviewed during follow-up to check patients' reports of improvement. The reports of relatives agreed well with those of patients about their fear and other behaviour.

Ten patients had further treatment during early follow-up to consolidate their improvement. Of these 7 had a mean of 5 sessions flooding in practice and 2 had a mean of 11 sessions of desensitization in fantasy and practice. One patient was readmitted at 6 months follow-up to have ECT for a depressive illness, after which he improved. He had had a previous depression which responded to ECT several years earlier.

During follow-up the patients continued to improve, especially in the first 3 months, during which time many had further treatment. During the last 9 months of follow-up the group as a whole remained static in its adjustment. No patient who improved during treatment showed significant relapse during the follow-up period. Mean scores for the 16 patients on the main phobia scale were (patient's and doctors' ratings combined) before treatment—4·6, after 12 sessions—3·1, and at follow-up—after one month 2·5, 3 months 2·4, 6 months 2·5, 9 months 2·3, and the end of one year 2·3. Importance of this follow-up lies in the fact that improvement in this group was lasting, not transient. We cannot tell the respective contributions of desensitization or of flooding to the end result, since every patient had both treatments.

Discussion

The main finding to emerge was the superiority of flooding over desensitization for the reduction of pathological fear. This was noted by observers (doctors' ratings of the phobias), subjectively (anxiety during phobic imagery) and physiologically (heart rate and skin conductance measures during phobic imagery). Agreement on these three dimensions was impressive, the more so since such agreement is rarely obtained in this field. Improvement was maintained to the end of follow-up one year after treatment, and relatives confirmed patients' reports of change.

It is unlikely that any carry-over effect from one treatment to the other accounted for the superiority of flooding, since this superiority was found both as first and as second treatment. On those variables where flooding produced significantly more improvement than desensitization the effect of first versus second treatment (regardless of kind of treatment) was not significant.

Were the significant results an artefact resulting from a few out of many measures happening to reach the 5 per cent level? This does not explain the patterning of the results. The significant differences only favoured flooding. They never favoured desensitization, and moreover only occurred on measures of phobias, not of neutral stimuli. The clinical and physiological results were all part of a consistent pattern in which flooding produced greater improvement on several measures of phobias.

Did flooding simply help patients become resistant to the effects of flooding talk? In fact the superior improvement was not only on changes during phobic talk (which was similar to the flooding themes employed in treatment) but also on non-flooding measures like the clinical ratings and the main phobic fantasy.

Did 'placebo effects' or subtle differences in therapist enthusiasm perhaps produce the differences between the two treatments? Patients were told that both forms of treatment were useful but it was not known which was best. The expectancy or placebo effect thus operated in both treatments. The authors and most of the other therapists began the trial with an open mind about the merits of the two procedures. Unwitting bias may of course still have been present, but we have no way of detecting this. It was, however, impressive

how anxious patients whose prospects seemed gloomy improved against therapist expectations.

It is unclear why both treatments had superior effects when given first rather than second. Perhaps placebo effects operate more in the first phase of treatment. Alternatively, marked fear might be easier to reduce to a moderate level than moderate fear to a minimum level.

In this study, patients not only improved in their capacity to enter their formerly phobic situation (avoidance response) but also showed less subjective anxiety while thinking about it (conditioned fear response). Relatives noted that improvement generalized as well to everyday activities outside the hospital. Baum (1970) has cited evidence that in some animal experiments avoidance responses were extinguished, yet signs of fear continued. It is possible that this is a sign of incomplete flooding and that had flooding continued longer then fear as well as avoidance would have extinguished.

Adequacy of the desensitization

Was the superiority of flooding due to inadequate desensitization? Comparison with previous studies makes this unlikely. The significant but small amount of improvement with desensitization was to be expected, as 6 sessions of desensitization are usually too few to produce marked improvement in phobic patients (Marks, 1969). In comparable previous studies, the mean improvement on the main phobia scale (combining the ratings of patients and doctors) after 6 sessions of treatment was ·74 with phobic out-patients (Gelder *et al.*, 1967; Marks *et al.*, 1968) and ·20 for anxious phobic in-patients (Gelder and Marks, 1966). In the present study, improvement on the same criterion of a mixture of in-patients and out-patients was ·66 after 6 sessions of desensitization when it was given as the first treatment; that for flooding was 1·58. The superiority of flooding in the present study was thus probably due to something in the technique itself.

Both the desensitization and the flooding in this trial were designed for use under routine clinical conditions, since a technique which can only be given under ideal conditions loses much of its practical value. The treatments were given long enough to produce measurable improvement while leaving room in the design for further improvement with the crossover procedure. Patients who were not sufficiently improved at the end of the experimental period were treated further thereafter until worthwhile clinical improvement was obtained. In the authors' opinion the desensitization given in this trial was adequate to produce measurable improvement in suitable phobic patients and did in fact do so. It was similar to that which had proved effective previously in phobic out-patients (Gelder *et al.*, 1967; Gelder and Marks, 1968), only one session being devoted to training in muscular relaxation.

Some desensitizers spend many hours training subjects in muscular relaxation before presenting images from the hierarchy. Such might feel that the desensitization in this study was inadequate. There is little controlled evidence in volunteers, and none in patients, that prolonging training in muscular relaxation contributes significantly to the efficacy of desensitization. The 'best' form of desensitization is not known at the present time, despite premature tendencies to ritualize the procedure. The studies of Perloff (1970), Mathews (1969) and Benjamin (1970) suggest that the role of muscular relaxation is less crucial than was once thought. Even the custom of going up the hierarchy could be questioned from the work of Welch and Krapl (1970), who found similar results whether desensitization items were presented going up, down or randomly from the hierarchy. After 15 years research in the area it is still unclear what all the effective ingredients are in the assembly of operations known as desensitization. The assembly is effective even with novice therapists in patients with focal phobias who have little pervasive anxiety, and ineffective even with experienced therapists in anxious agoraphobics who have marked non-situational anxiety. Given therapists who have had reasonable experience of clinical psychiatric problems and understand the principles of desensitization, the major determinant of outcome with desensitization appears to be the kind of patient being treated rather than the duration of therapist experience with desensitization (Marks, 1969; McReynolds, 1970). It has yet to be demonstrated that

prolonged experience of desensitization per se is an important variable even for the treatment of phobic volunteers.

Did patient selection in some way bias outcome against desensitization? The indications for flooding were not known at the outset, so a range of phobic patients was chosen, including 4 anxious in-patients who from past experiments were expected to do badly with desensitization. The authors expected them to do badly with flooding as well. The rest of the patients were regarded as suitable for desensitization, although it was not known how they would fare with flooding. Necessarily, patient selection was on the basis of clinical evidence, as detailed elsewhere (Marks, 1969), since alternative methods of selection are not available. It is relevant, however, that questionnaire scores for phobic and other neurotic symptoms were similar in this group of patients to those in previous patient populations at the Maudsley Hospital who improved with desensitization given in the same manner as in this study.

Acceptability of flooding

How acceptable is flooding to patients? The authors were originally reluctant to use flooding as a treatment technique, since unpleasant techniques are to be avoided if effective pleasant alternatives are available. Only when early indications showed promise for the technique was this study embarked on. Flooding proved surprisingly acceptable to most patients, and three even indicated a preference for flooding to desensitization because they felt it did more for them. Subsequent to this study other patients who were offered desensitization insisted that they wanted flooding. The fact that a treatment is anxiety-provoking does not necessarily make it unacceptable to patients. It is true that patients in this study had to be quite highly motivated before they were accepted into the trial. They had to commit themselves to attending at least 15 sessions (12 for treatment and 3 for assessment) before they could start and had to agree to listen to frightening descriptions of their fears during the treatment. Furthermore, they were told that if for any reason they stopped treatment prematurely during flooding, they might be made worse rather than better, hence the importance of completing treatment. Two patients did drop out during flooding while none did from desensitization in this trial, though one of these drop-outs had earlier dropped out from desensitization treatment elsewhere. In the study of Gelder *et al.* (1967) there were 4 drop-outs out of 16 patients being desensitized, which is a higher rate than from flooding in the present study. The drop-out rate in this study was thus unremarkable.

If there were ways of making the treatment less anxiety-provoking these would be desirable. Perhaps it might be worthwhile to sedate patients and to withdraw sedation slowly over successive flooding sessions, or to carry out prolonged flooding sessions, each session starting under the influence of sedation, and ending without it. Several experiments suggest that psychological treatments of phobias might be facilitated by the use of various drugs. The effect of desensitization was significantly enhanced by the use of intravenous methohexitone in one controlled study (Mawson, 1970). Another showed that imipramine, which is an antidepressant and not a sedative, benefited agoraphobics by reducing their panic attacks outside the phobia situation (Klein, 1964). The same author produced evidence that imipramine might speed the return of school phobics to school.

The relationship of drug effects to recovery will be difficult to work out. Many agoraphobics take sedative drugs regularly without lasting benefit. Not a few progress to drug dependence without losing their phobia. However, such drug dissociative behaviour might not always occur, and experiments on this problem are needed in patients.

Anxiety during and after flooding sessions

Anxiety during sessions varied greatly. Some patients seemed only slightly perturbed, while others spent every session crying, grimacing and clenching their hands. Anxiety during the first few sessions did not seem to predict outcome, but the measure employed was crude.

Usually after the end of a flooding session anxiety quickly dissipated. However, one patient (spider phobic) had nightmares for two nights

after the first session. Another patient (severely agoraphobic) had mild mood swings which required no special treatment. A third patient (also agoraphobic) became depressed after the fifth flooding session. He had a history of two previous depressive episodes which had been treated by electroconvulsive therapy, and had E.C.T. for the third time 6 months after he completed treatment in the present trial.

Mechanisms of action of flooding

Flooding might reduce fear in a variety of ways which are not mutually exclusive. First, it might block the conditioned avoidance response which phobics rapidly develop to the phobic situation. During treatment they face their phobias first in fantasy and then in real life. This is analogous to the facilitation of extinction of a conditioned avoidance response in rats by prevention of the avoidance response in the presence of the fear stimulus (Baum, 1966 and 1969). Phobic patients often do not want even to think about their phobic situation, and flooding in fantasy forces them to do so. It is not clear how relevant the flooding ideation must be to the phobic situation. Recent experimental evidence (Watson and Marks, 1971) indicates that simply making the patient frightened about *anything*, not necessarily his phobias, increases his ability to cope with frightening situations.

Flooding could also reduce fear by abreaction. It is well known that psychiatric symptoms of many kinds, not only fear, can remit, at least temporarily, after out-pourings of affect (Kennedy, 1960; Sargant, 1957). Well-being is said to result from catharsis by Voodoo trance, spirit possession and related phenomena. Flooding might be a novel form of abreaction. It is possible that the intense experience of any emotion, not only fear, might lead to reduction of phobias. Prolonged anger, laughter or sexual excitement might achieve the same end. This point is difficult to test.

Another potential mechanism is that of challenge. Many patients in this study felt that flooding challenged them to prove that they could face the phobic situation, and so exposed themselves to the phobic object for the first time in years. However, some patients improved without mentioning this.

The cognitive aspects of flooding deserve consideration, since patients are asked to imagine the worst possible events which might occur to them in the phobic situation (e.g. going mad, being enuretic in public, etc.) and yet when they actually encounter the situation the worst never happens. Several patients noted that this played a part in their treatment. Other studies have shown that cognitive processes can reduce fear. Hart (1966) found that when snake-phobic students simply prepared a tape recording designed to allay other snake phobics' fears their avoidance behaviour decreased significantly compared to a control group. Valins and Ray (1968) noted that false feedback of slow (normal) heart rate enabled volunteers to approach snakes more readily. Lazarus *et al.* (1962) found that subjects who view a frightening film with an accompanying sound track, or following a preorientation that encourages fear-competing attitudes (e.g. intellectualization or denial), report less fear on a variety of paper and pencil tests, and show reduced heart rate and skin conductance during the film. At the anecdotal level, giving patients the set to 'ride out the panic and never leave the phobic situation until you feel completely calm' can by itself be helpful. The cognitive aspects of flooding thus require investigation.

It is probable that, like desensitization, flooding is an assembly of several procedures acting together to reduce fear. It is likely that duration of flooding may be one of the key factors. A study on volunteers, by Rachman (1966) employed periods of flooding as short as 2 minutes; some increase in fear was noted thereafter. In the present study, patients who heard 3 minutes of phobic talk during assessment increased their skin conductance deflection at subsequent testing after they had had desensitization, but not after flooding (Figs. 1 and 3). In studies of rats by Baum (1968), longer durations of flooding (response prevention) were much more effective than shorter periods in extinguishing a conditioned avoidance response. Furthermore, the greater the shock trauma received by the rats before avoidance

training, the longer the response prevention they needed before avoidance responses were extinguished. In successful studies of flooding (Malleson, 1959; Barrett, 1969) subjects were flooded for at least 35 minutes continuously, and in the present investigation flooding continued non-stop for 50 minutes. What the optimum time for flooding might be is not clear at the present time. It is possible that if patients are flooded continuously until they can no longer feel anxiety, for hours if need be, then the quickest improvement will be obtained. In Barrett's (1969) study, where flooding worked more quickly than did desensitization even in specific snake phobias, this criterion was used for terminating a session. His sessions went on for up to 2½ hours (personal communication). Willis and Edwards (1969) used a similar criterion to no avail, but their flooding sessions never lasted longer than 30 minutes, with an average duration of only 18 minutes. If duration of flooding is confirmed as a key variable, this would explain why in clinical experience patients who are forced into a phobic situation for brief periods are often made worse. They panic and then escape, which reinforces their avoidance response.

Clinical implications

That present results could be obtained by therapists who were novices to the techniques though they had clinical training, indicates that flooding, like desensitization, has potentially wide application. However, because flooding might increase phobias if wrongly applied, its use should be limited to skilled personnel until the relevant therapeutic parameters have been carefully defined in systematic experiments.

It is difficult to explain why flooding did better in patients who were most disturbed in terms of number of phobias, amount of depression (this was never more than moderate in this sample) and physiological arousal. The finding was unexpected. On the basis of past studies we expected patients with fewest phobias and lowest physiological arousal to do well with desensitization, and precisely this was found. We had expected the same with flooding, but the prognostic correlations consistently suggested that opposite processes augured outcome with desensitization and with flooding.*

The value of desensitization is limited clinically in that it is of least benefit to the handicapped anxious phobics who need it most. This restriction might not apply to flooding.

Although prolonged experience of anxiety can lead to the reduction of fear, one wonders how necessary it is for phobic patients to experience anxiety in order to lose their phobias during flooding. It is possible that anxiety is an unfortunate by-product of exposure to the phobic situation, both in fantasy and in real life, and that exposure without escape is the keynote for success rather than the experience of anxiety itself. Put in another way, blocking the conditioned avoidance response alone might result in extinction both of the avoidance response and of the conditioned emotional response. If this were true it would open up pleasanter ways of treating phobics by prolonged exposure.

Another important variable is prolonged exposure without avoidance in real life rather than in fantasy. Preliminary experiments give the impression that this is a powerful influence. Specific phobics have improved dramatically after one to two afternoons, continuous exposure to the phobic stimulus without deliberate attempts to evoke anxiety in them (Watson, Gaind and Marks, 1971). Hardy (1969) described the treatment of agoraphobics by prolonged exposure for up to 8 hours at a time. It is not clear what the optimum duration of exposure is for a given patient, whether it is facilitated by a flooding type commentary, or whether it can be done in groups.

If the experience of anxiety is eventually found to be helpful, the questions will arise on the optimum way to produce it. In this study the flooding themes did not include cues about dynamic conflicts which could be hypothesized to underly the phobias. The cues were directly concerned with fears which

* This finding has now been replicated. In a second study of flooding (Watson and Marks, 1971) good outcome at the end of treatment again correlated significantly positively with physiological arousal before treatment began. Measures of arousal were heart rate and skin conductance during neutral and phobic imagery.

patients had overtly expressed, and the consequences of those fears, e.g. in an agoraphobic mother who expressed guilt about neglect of her child because of her phobias these feelings were introduced into the flooding themes. Stampfl and Levis (1967) go further and introduce into their implosive technique many feelings which the patient may never have expressed but which the therapists regard as potentially important for the patient. It is noteworthy that results of the present study were obtained without utilizing such feelings. It is possible, of course, that utilization of such cues might further enhance the value of flooding.

Flooding is not a new cure-all. It does cut down treatment time for agoraphobics, although when given under conditions of the present study residual symptoms were still the rule despite the fact that patients' lives became far less restricted. More prolonged flooding might reduce the residual symptoms. It is by no means clear how beneficial flooding might be for patients with anxiety states or obsessive-compulsive neuroses, although preliminary results suggest that the latter condition might improve with response-prevention.

An important variable for future investigation is the efficacy of flooding in practice (in the real life situation) compared with flooding purely in fantasy. Preliminary impressions suggest that flooding in practice may be more efficient at reducing fear. The flooding procedure employed in the present trial probably contained redundant elements. Work is in progress to determine the minimum therapeutic ingredients necessary for the rapid treatment of phobic disorders. One might speculate that desensitization is an inefficient form of treatment by exposure. The inadequacy of our knowledge about the effective aspects of fear-reducing procedures is emphasized by the conflicting results in volunteer studies alluded to in the introduction to this paper. Minor procedural differences might be important for the success of flooding, but these cannot be specified at the present time. All we can conclude at the moment is that flooding or some of its components are promising techniques for the reduction of pathological fear.

ACKNOWLEDGEMENTS

This project was supported by the Medical Research Council of Great Britain, and by a World Health Organization Fellowship to Pedro Marset. We wish to thank the doctors who referred patients for this trial, and the therapists who devoted so much time to the treatment. Many thanks are also due to Messrs. John Huson and Brian Everitt and to Miss Barbara Kinsley for statistical help. Dr. Malcolm Lader, Mr. Andrew Mathews and Mr. John Teasdale made valuable comments on the manuscript. Part of this work is based on a thesis submitted for the M.D. degree at Athens University by J. C. Boulougouris.

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A synopsis of this paper was published in the February 1971 *Journal*.

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(*Received 8 September 1970*)