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Imagery in Therapy: An Information Processing Analysis of Fear – *Republished Article*

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An analysis of fear imagery in behavior therapy is developed from the combined perspectives of information processing theory and psychophysiology. Recent thought on imagery processing and storage is considered, and it is argued that affective images are best viewed as propositional structures rather than as iconic or holistic sensory representations. A method is presented for manipulating the image through instructions, and an image taxonomy of stimulus and response components is described. The usefulness of bioelectric measurement is emphasized throughout, and this is illustrated in an experiment derived from the "constructive" concept of imagery. The implications of this approach are then developed for behavior modification research: Desensitization and flooding are analyzed, comparisons are made among media, imaginal, and *in vivo* fear treatments, and the significance of image analysis is elucidated for both overt and covert modeling. In conclusion, a general model for fear processing is described and directions for future research are outlined.

The use of imagery manipulations in the context of behavioral treatment was the seminal idea of Wolpe, and my debt to his thought is gratefully acknowledged. The writing of this paper was supported in part by NIMH Grant No. MH I0993. Some of this material was presented at the Association for Advancement of Behavior Therapy meetings in San Francisco, December 1975, and in a lecture delivered at the Institute of Psychiatry, Maudsley Hospital, London, February 1976. I have discussed these ideas with a number of investigators, and their comments and criticism have been of great assistance. I would like to thank particularly Victor Broekema, Isaac Marks, Richard McFall, Barbara Melamed, Arne Ohman, Stanley Rachman, my students at Wisconsin, Cyril Franks, and the anonymous referees of *Behavior Therapy*. Requests for reprints should be sent to Peter J. Lang, Department of Psychology, University of Wisconsin, Madison, WI 53706.

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THE ROLE OF IMAGERY in therapy poses a perplexing question for a natural science of behavior. Philosophers tell us that images are private events, available only to human introspection. As their observation cannot be shared or their dimensions measured by any instrument, they cannot be data in a scientific analysis. The founder of systematic desensitization therapy, Joseph Wolpe, recognized this limitation of the subjective construct. Thus, he proposed an alternative view, that images were "specific neural events" which formed part of the pattern or neural sequence previously evoked by specific external stimuli. As they shared a common neurophysiology, the image could "stand in" for an objective stimulus, and the consequences of its manipulation were held to be similar to those that might be occasioned by the object itself. Speaking of desensitization, he states that "a basic assumption underlying this procedure is that the response to the imagined situation resembles that to the real situation" (Wolpe, 1958, p. 139). However, the initiating stimulus in therapy is not the "neural events"; it is a set of instructions, which include the admonition to adopt an imaginal set and a description of the things to be imagined. Furthermore, we are unable to manipulate directly the complex neurophysiology implied by Wolpe's analysis. Thus, while the neural image may be an ultimate reality, the practical utility of the concept is limited. Nevertheless, we should not be wholly dismayed. As it is not a knowledge of chemistry which guides the chef to a good bouillabaisse, but knowing which fish to use and how to cook them, so in trying to understand the practical effect of desensitization, the primary task may not be

facilitated by reductionism, but by a direct analysis of the information content of the image and the manner of its functional processing.

A starting place for this enterprise is found in a study of systematic desensitization conducted by Lang, Melamed, and Hart (1970). They noted several consistent relationships between physiological reactivity to fear imagery and successful therapeutic outcomes. Subjects who profited from desensitization had faster heart rates during scenes said to evoke fear than during scenes they did not find frightening. Furthermore, successful subjects reported scenes to be unusually fearful during sessions when their tonic heart rates were relatively high. Finally, subjects who improved with treatment showed a systematic reduction in heart rate with repeated scene presentation, which was in turn associated with fewer fear signals. This covariation between verbal report and cardiac activity was not found for those who failed to show improvement with treatment. These data suggest a relationship between the physiology of instructionally evoked imagery and emotional behavior change. More specifically, they imply that the psychophysiological structure of imagined scenes may be a key to the emotional processing which the therapy is designed to accomplish.

In the following pages an information processing analysis of emotional imagery will be described. An effort will be made to show that the image can be a meaningful psychophysiological construct, that it can be defined in terms of measurable response events, and that these responses are controlled by identifiable external stimuli. In the first part of this paper, consideration is given to the recent thought of cognitive psychologists, as they have reexamined issues of imagery processing and storage. It will be argued that affective images are best conceptualized as propositional structures, rather than as reperceived raw, sensory representations. We will show that the former view logically permits experimental manipulation of the image through instructions and development of an imagery taxonomy of stimulus and response components. An experiment will be described which illustrates the utility of this approach. In the second half of the paper the implications of image analysis for an understanding of behavior therapy process and outcome are elucidated. The importance of psychophysiological measurement in therapy is emphasized. Differences are examined between flooding and desensitization, the therapeutic processes initiated by exposure to objective fear stimuli and those prompted by imagery procedures are compared, and therapeutic modeling is analyzed in terms of the propositional image. Finally, a tentative model for fear processing is proposed with suggestions for future research.

Imagery Processing and Storage

There are two basic ways in which the imaginal act has been conceptualized. From the first viewpoint, sensory images are presumed to be the primary products of external observation. They are stored in the brain as primitive, nonreducible units, having a fundamental geometric (if visual) or iconic representation in storage. The act of imagining involves the scanning, inward perceiving, or interpreting of this raw harvest of sensory observation. Advocates of the second viewpoint do not assume that the brain is such a silo of unprocessed *appearances;* the brain stores *knowledge* (to use the philosophic terms). We have information about objects or events, not pictures or representations of them. We are culturally conditioned to speak of "seeing" images in the "mind's eye," but this is no more than a compelling metaphor. The phenomenal image masks a more fundamental code. This alternative view begins with the assumption that the image in the brain is more like an elaborated description, an integration of specific affirmations about the world. The image is a functionally organized, finite set of propositions. Such propositions are assertions about relationships, descriptions, interpretations, labels, and tags, which prompt percept-like verbal reports, but which are more basically the units of a preparatory set to respond.

It will be argued in this paper that behavior therapists and researchers in psychopathology should not adopt the picture metaphor, but should embrace the propositional conception of information storage, retrieval, and processing. We are guided in the following argument by an excellent theoretical paper by Pylyshyn (1973), whose explication of this problem is commended to serious students of cognitive imagery.

Pictures in the Head

For many psychologists, the verbal report of an image is viewed as a product of perceptual processing in the absence of an external stimulus. The mental image is a kind of picture in the head, which may be faint and fleeting, or in the case of idetics it may be so vivid as to ape an external observation. As Pylyshyn points out, "The whole vocabulary of imagery uses a language appropriate to describing pictures and the process of perceiving pictures. We speak of clarity and vividness of images, of scanning images, of seeing new patterns in images, and of naming objects or properties depicted in images" (p. 8).

The implications of this language are that object representations are stored in the brain in analog form, that they may be removed from files and

"subsequently scanned perceptually in order to obtain meaningful information regarding the presence of objects, attributes, relations, etc." While subjective experience clearly commends this view, there are practical and logical reasons for its rejection. To begin with, the assumption of analog representation places" an incredible burden on the storage capacity of the brain." If the "pictures" held in storage are really in raw form, containing in fine grain the same detail that could have been read off the retina or basilar membrane at the time of external observation, then no serious, current neural theory of memory could explain how the finite sum of cells in the human brain could accommodate this wealth of information. We would be inundated with neuronal snapshots well before the first month of life. Furthermore, the notion that perceptual scanning and interpretation are secondary to a retrieval process introduces a time delay, which is often inconsistent with the rapid efficiency of the brain in reviewing experience and generating behavior. Phenomenological research also prompts a questioning of this view. Remembered scenes, only partially apprehended, are not recalled like jigsaw puzzles with pieces missing. Furthermore, images often seem to have attributional properties that are inextricably wedded to their objective content. Pylyshyn (1973) notes that a chess player may have an image of two pieces that could be described as "being attacked by"; a nonchess player would not have this element in his image, although he might report imagining the same spatial relations between pieces on a chessboard. Or similarly, one can have a vivid image of two lovers embracing without any specific sense of who was on the left or who was on the right.

A partial solution to the storage problem might be to assume some kind of limited resolution representation. We could hypothesize a finite number of scan lines, as in a television picture, to be enhanced later by the brain for verbal report, as the computer enhances telemetered pictures of the near planets. A digital code might be even more efficient; however, we now stray even farther from the concept of a primary image. If a teleological statement may be risked, it seems unreasonable to suppose that the purpose of the brain is to provide primary images for human beings to comment on. As Sperry noted many years ago (1952), the purpose of the brain is not to generate perceptual experience but to organize and facilitate responding. If this is true we might expect the image code not to be independent of behavioral function, as are scan lines or digital notation, but to be relational and to incorporate the responding organism. Descriptions of images, particularly emotional images, inevitably contain many of the editorial comments (e.g., "attacking," "embracing") alluded to above. They also include the observer, his point of view, and often his active participation.

THE IMAGE AS A PROPOSITIONAL CONSTRUCT

What subjects report about images does not sound like limited-resolution photographs. The reports include both more and less detail than such a system would suggest, as well as the interpretive elements that are not part of raw observations. Any representation having such properties "is much closer to being a description of the scene than a picture of it. A description is propositional, it contains a finite amount of information, it may contain abstract as well as concrete aspects and, especially relevant to the present discussion, it contains terms (symbols for objects, attributes, and relations) which are the results of-not inputs to-perceptual processes" (Pylyshyn, 1973, p. 11).

It is proposed that emotional images, of the sort evoked in the therapeutic context, are best understood as propositional constructions. A proposition is essentially what a string of words assert, e.g.. "The book is on the desk.'' However, this does not mean that the propositions of an image are basically linguistic in form. Bower (1970) makes the distinction between an imagistic memory system and a contrasting verbal–propositional mode of thought and retention. The former is more active in processing concrete information whereas the latter is the common medium for abstract thought. These modes are identified with different hemispheres of the brain, and neurological evidence and studies of recognition memory offer support for the distinction (Sperry, 1968; Nebes, 1974). However, it is reasonable to assume that both of these storage modes have a common underlying code in the functional organization of the brain. We suggest that this deep structure of mentation must be propositional.

This is not meant to deny that so-called short-term memory could involve iconic forms in storage or that there may not be something like spatial schema which underly such phenomena as face recognition. However, when emotion-laden images are evoked in patients, it is long-term storage which is being tapped. "The hypothesis favored here is that the experience of an image itself arises out of 'constructive' processes (Neisser, 1967). The notion is that the units abstracted and interpreted during perception are stored in long-term memory in an abstract format and must be acted on by processes that serve to generate or to produce an experience of an image" (Kosslyn, 1975). Although some might question this view as

an explanation of simple visual images, it seems highly consonant with the nature of affective imagery in therapy. These latter images have the property of serial narratives, that obviously include much more than sensory impressions. It is for this reason that they cannot be held to simply "stand in" for objective stimuli. They are always processed with response elements as fundamental parts of the structure. In fact, the aim of therapy could be described as the reorganization of the image u nit in a way that modifies the affective character of its response elements.

It is proposed that the image we seek to manipulate in using desensitization, catharsis, or flooding techniques is best comprehended as a finite network of specific propositional units which have designating and action functions. The logic of this structure and of its underlying neurophysiology is presently unknown. In practice, propositions are often added serially to a diachronic structure. That is to say, the emotional image is not always processed as a complete unit, nor does it necessarily impact on behavior in the abrupt fashion of an external stimulus. Rather, the emotional image is recreated as it is evoked, and propositions may be added to or subtracted from this protean cognitive structure while it unfolds over time. We have noted that the emotional image involves behavior, and it is to be anticipated that this behavior will be measurable. In many practical contexts the emotional image is less usefully conceived of as an internal percept and more valuable when construed as a preparatory set to respond.

Emotional Imagery and Instructional Control

We have already been at some pain to emphasize the fundamental, nonlinguistic nature of the hypothesized propositional units. Furthermore, it is clear that emotional images may be evoked and elaborated by nonlinguistic external stimuli, such as models, pictures, or films. However, it is also true that propositional elements can be rendered as statements in a natural language. There is a long history of this enterprise in the written fiction, prose, and poetry of all civilized cultures, and an even more ancient oral tradition which the imagery therapist imitates.

It is therefore proposed as a methodological expedient that the emotional image be considered as a cognitive schema containing a finite set of propositional units, each of which can be represented as a verbal statement or instruction. It is not at all clear at the outset what the basic units of such a structure might be. However, for the purposes of experimental investigation, it is suggested that the emotional image contains at least two fundamental classes of statements: stimulus propositions and response propositions. To the extent that we think of the image as a percept, it is logical to assume that its structure will include descriptors, or assertions about stimuli, e.g., a black snake writhing on the path, and auditorium of staring faces. However, emotional images also invariably contain assertions about behavior, or response propositions; e.g., my palms are sweating, my heart is racing, I scream, I run away. The response components of the image are often more elaborate than the stimulus elements. They divide themselves naturally into the three response classes that we have come to associate with the empirical analysis of emotion [verbal responses, overt motor acts, and responses of the physiological organs, see Lang (1968, 1971, in press)], as well as propositions which define characteristics of the subject's thinking processes, and sense organ adjustments or postural responses that determine point of view. Response propositions representing each of these classes can be observed in the script presented below, created by Watson and Marks (1971, p. 277). It is an example of imagery instructions used in their flooding research on the phobia-reducing effects of exposure to relevant and irrelevant fear stimuli.

> Try and imagine yourself at home. You have to go out. You can't avoid it. You're uneasy at the thought. You have to go alone. Your boy is at school, you are on your own. You are already scared. You stumble as you leave your front door. You pull the door to with a bang. By the time you reach the pavement your heart is racing, your mouth is dry, you sweat. Just ten yards further on, past familiar landmarks, the panic starts. You dread losing control, and you shake like a leaf. You feel sick. You feel faint. You feel people are looking at you. You lose control of yourself. You lose control of your body. You vomit. You wet your underwear. You lose control of your mind. You cannot see things clearly. The world is unreal, unclear, seems unfriendly, a terrifying place. You cannot stop yourself from screaming. The noise attracts attention. You scream and scream and scream. Soon a crowd surrounds you. People are afraid to approach you, having hysterics as you are, and surrounded by your own vomit. You scream and shout and wave your arms and legs about like a child having a tantrum when it can't get its own way. Your thoughts are muddled, you are confused. You are lost, unable to control yourself, just a few yards away from your home. You continue screaming, crying, yelling, howling. The crowd grows. You go on making an exhibition of yourself. You feel ashamed. You no longer feel grown up and feel you are a baby. No one in the crowd dares to approach you. You make a grotesque spectacle. In a way, some of the crowd enjoy your being out of control. No one comes to help. No one is on your side. All the hysterics fail to make you feel better. In fact, the panic gets worse. The crowd laughs at you, shouts, jeers, and points. You feel exposed. You realize they are seeing you as you really are. The panic just goes on. Finally everything goes black.

Image Taxonomy

A tentative propositional catalog is presented in Table 1, which can be used in classifying imagery instructions for analysis or as a guide for creating balanced scripts for use in treatment and imagery experiments. It is interesting to note how few of the statements contained in the Watson and Marks (1971) script actually define stimulus propositions. Most of the flooding instructions assert the responses of the subject. It is clear that some of these statements are hard to classify. Feeling sick, for example, sounds like a stimulus proposition. However, the experience of sickness involves as much behavior as sensation. Thus, our pulse may race muscles tense, and stomach contract, we have difficulty maintaining a steady hand, and we feel sick. What are usually called feelings may fall into one or several different propositional classes, e.g., stimulus elements, self-referent statements, visceral events, and processor characteristics. Very few details of the internal stimulus configuration actually contribute to the propositional net. Consonant with the view of the emotional image as a response set, its potency is often instructionally augmented more by the elaboration of response propositions than by the refinement of stimulus elements.

It is suggested that the emotional image in the brain of a cooperative patient is more or less consonant with the propositional structure of the administered instructional set. Furthermore, if the image is indeed a preparatory set, we should observe partial responses in imagining subjects which are consistent with the response elements of the script. In point of fact, in many experimental situations, no methodological distinction need be made between the imagery instructions and the hypothesized image in the brain. While this may not

Table 1
Propositional units of the emotional image

I. Stimulus propositions (auditory, visual, tactile, cutaneous, olfactory, vestibular, kinesthetic)
  A. Physical details of the object or situation
  B. Changes in object configuration
  C. Object movement (approach or withdrawal)
  D. Physical place or general location
  E. Presence or absence of others as observers or participants
  F. Comments made by others
  G. Pain, location on the body: sharp, dull, etc.

II. Response propositions
  A. Verbal responses
    1. Overt vocalization, out loud comments or expressive cries
    2. Covert verbalizations
      a. Emotional labeling
      b. Self-evaluative statements, e.g., feelings of inferiority
      c. Attribution of attitudes to others
  B. Somatomotor events
    1. Muscle tension
    2. Uncontrolled gross motor behavior
    3. Organized motor acts, freezing, approach, avoidance
  C. Visceral events
    1. Heart rate and pulse
    2. Body or palmar sweat
    3. Vascular changes, blanching or flushing
    4. Pilomotor response
    5. Salivary response, mouth dry
    6. Respiratory change
    7. Intestinal upset
      a. Vomiting
      b. Incontinence
    8. Urinary dysfunction
  D. Processor characteristics
    1. Perception unclear or unusually vivid or distorted
    2. Loss of control over thoughts, cannot think clearly
    3. Disoriented in time or space
  E. Sense organ adjustments
    1. General postural changes
    2. Eye and head movements

be expedient for individuals, who idiosyncratically add or subtract from the suggested propositional structure, the instructions will be very close to the image for groups of subjects, whose numbers improve the signal-to-noise ratio. Thus, if elaborate response propositions are part of the instructional set given to one group of subjects and not to another, then the premotor, verbal, and visceral responses during imaging will be relatively augmented for the group so instructed. To modify McLuhan's statement, "the media is the message," the proposed research strategy affirms that the message is the image.

THE SOMATOVISCERAL IMAGE

In a recent experiment (Kozak & Lang, Note 3), we tested the hypothesis that the propositional organization of instructions can be shown to control somatovisceral responses during imagery. All subjects practiced visualizing fearful and neutral materials and were interviewed following each scene. In this context, subgroups were trained in vivid imagination, according to one of two procedures. Group one was instructed to focus on the perceptual content of the scene, to capture it vividly in the "mind's eye." Furthermore, they were verbally reinforced by the experimenter during the interview for describing stimulus detail and elaborating the perceptual content of the reported image. Thus, if a subject imagined that he was outside flying a kite, he was complimented if his postscene description included a mention of such specific elements as "the blue sky," "the sun glistening on the clouds," "the tail of rags, dancing below a bright orange kite."

A second group received instructions which emphasized their somatomotor and visceral responses to the scene. They were told to experience the scene "as if" it were happening, and "to do in the image what you would do in the real situation." Subjects in this group were reinforced during training for reporting response elements, e.g., eyes moving with the spiraling kite, breathing deeply and rapidly as you run through the field, your forehead tense and eyes squinting into the sun. At a final test session, the groups were each given instructions to imagine the same scenes, but with training-related differences in propositional structure. Some of the test scenes involved activities or situations which were not fearful, and others represented emotional confrontations with fear objects. Heart rate, skin conductance, two electromyographic channels, and respiration activity were recorded continuously during the session.

The primary hypothesis of the experiment was strongly supported. For nearly all measures, the groups trained in (and test-instructed with) response propositions generated the largest and most consistent physiological response. Furthermore, individual scenes generated patterns of physiological response which were specific to the propositional structure of the scene. For example, among response-trained subjects, scene scripts which included specific respiratory, heart rate, or muscle tension propositions elicited more activity in these specific response systems than scenes which did not contain these elements. Data on verbal report of scene vividness and feelings of fear were complex, with sex of subject proving to be a highly significant variable. However, response-trained subjects tended to rate their anxiety during fear scenes to be greater than stimulus-trained subjects, relative to each group's verbal response to nonfear material.

In brief, with proper training and instructions, subjects can learn to increase their psychophysiological response in the image context, and this can influence other response systems. In future research, we plan to determine if this training-augmented somatovisceral activity mediates a broad fear behavior change, as was observed for spontaneous scene arousal by Lang et al. (1970). We also plan to manipulate specific verbal and motor act propositions instructionally to determine their specific and general impact on the three systems of affective behavior (Lang, 1971, in press).

Emotional Imagery and Behavior Change

The propositional conception of emotional imagery provides a strategy for the analysis of emotional change which could clarify a variety of unresolved issues in behavior modification research. Specifically, it is suggested that uncontrolled variation in the content of fear imagery accounts for many differences observed by researchers between desensitization and flooding, among *in vivo,* slide or film exposure, and imaginal techniques of fear reduction, as well as between desensitization and modeling.

Despite the many studies of desensitization, little attention has been directed to the effectiveness of image processing during therapy. This is particularly surprising, as the success of therapy (assuming the stimulus substitution theory) must depend at least on the vividness, and perhaps on the affective intensity, of the generated images. Nevertheless, it is a rare experimenter who provides even verbal report data relevant to either quality.

From the perspective presented here, vividness is determined by the completeness of the evoked propositional structure. Thus, subjects reporting vivid images can generally describe them in exquisite detail, providing a large catalog of discriminable

stimulus elements. Vividness is also determined by the pattern of response propositions, many of which are measurable during the image experience. For example, a vivid image of a tennis match might include regular, lateral movements of the eyes that are observable in the electro-oculogram.

Affective intensity is defined by the *amplitude* of visceral, verbal, and somatic muscle responses which are associated with the overt emotional state. Thus, an increase in autonomic arousal (e.g., increased heart rate and skin conductance) is expected when subjects visualize more fearful scenes. However, vividness and affective intensity may interact. A change in stimulus propositions (e.g., an increase in proximity to the feared object) presumably involves an augmented visceral response, if vividness is to be maintained. Nevertheless, large autonomic responses can be aversive and may be harder for subjects to generate. Discontinuities in the organization of stimulus and response propositions can then occur.

Verbal reports of vividness and affective intensity are, of course, only loosely coupled to the physiological structure of the image. Individuals who produce vivid images will probably also be able to generate more intense affect. Thus, among sophisticated subjects, moderately high group correlations between reported vividness and affect are to be anticipated (Lang et al., 1970). However, within-subject patterns are predicted less readily. It is easy to confound meanings of affective intensity and vividness, and more arousing images can "seem" more vivid, even when the discriminated details are fewer. On the other hand, the subjects of Lang et al. (1970) reported neutral material to be more vivid than images taken from the top of their anxiety hierarchies. It may be that the reported image properties of arousal and clarity parallel the perception of external stimuli, i.e., while moderate arousal improves attention, higher levels of activation prompt response disorganization and a reduction in sensory discrimination.

It is argued here that the therapeutic effect of an image is determined by its propositional structure, the balance between stimulus and response elements, and the interrelated characteristics of vividness and affective intensity. With this general hypothesis in mind, we will now consider the visualization instructions (to the extent they are available) that have been employed in imagery therapy research.

Desensitization and Flooding

The basic structures of the evoked images used in desensitization and used in flooding or "implosive" therapy appear to diverge significantly. In desensitization, the therapist's imagery instructions are brief and include primarily what we have called stimulus propositions. A typical scene administered to a socially anxious patient would be: "Imagine that you are standing before a group of twenty spectators just prior to the presentation of an extemporaneous speech." There is no mention of emotional response. The subject would have been previously trained in relaxation and would have been told to relax prior to the scene presentation. However, neither a description of the relaxed posture nor fear arousal is a normal part of the imagery instruction.

From the present perspective, the imagery instructions most often used in desensitization are incomplete. It is the conjunction of stimulus and response propositions which produces a vivid emotional image and, in desensitization, the patient may have to rely wholly on his own resources to generate the important response elements. He may even construe the context as a perplexing and inconsistent response set, i.e., he is told to imagine an emotional context vividly *and* to relax. It is not surprising that subjects resolve this paradox in idiosyncratic ways, some of which can attenuate image vividness and therapeutic effectiveness.

As may be readily observed in the scripts provided by Marks and his co-workers (e.g., Watson & Marks, 1971), imagery instructions in flooding are primarily made up of response propositions, but with enough descriptor statements to tag the context. If we are correct in our assumption that emotional imagery depends on the joint evocation of both propositional classes, then images evoked in flooding could be not only more affectively intense than those prompted in desensitization, but in some cases might be more complete cognitive units and, thus, potentially more vivid. To state the issue more pragmatically, some research has suggested that flooding is more effective than desensitization (e.g., Boulougouris, Marks, & Marset, 1971). It is possible that the response elements of the emotional event were simply more available for processing in flooding than they were during laboratory desensitization, and this accounts for the findings.

It should not be inferred that the induction of intense affective states ensures or facilitates fear change; research suggests that significant emotional change in flooding can occur under drug-induced low arousal (Johnston & Gath, 1973; Marks, Viswanathan, & Lipsedge, 1972). In this context, flooding is tactically very close to desensitization. We hold that the critical requirement for both therapies is that at least partial response components of the affective state must be present if an

emotional image is to be modified. Such response components are present in desensitization, if the procedure is not overly asceptic. In the experiment referred to at the outset (Lang et al., 1970), the heart rate responses during fearful images of successful subjects were several beats per minute faster than those of subjects who failed to profit from treatment. Although small, the differences were reliable, indicating that visceral response propositions were indeed being processed in the positive cases.

The most important difference between desensitization and flooding may be the differential emphasis given in these two treatments to stimulus and response components of the image. In desensitization, the stimulus propositions of the images are emphasized. Furthermore, this treatment is undertaken with the patient in a more moderate state of arousal, when discrimination may be best. Using a sensory decision theory analysis, Chapman and Feather (1971) examined the discriminability of reported fear between images evoked at various levels of the anxiety hierarchy. They found greater differential sensitivity in subjects trained in relaxation than in those who were not, and concluded that "the role of relaxation in the therapeutic process is . . . the enhancement of discrimination learning." This view suggests that desensitization is ideally suited to the treatment of focused fears, i.e., the therapist wishes to alter responses to a specific stimulus, but not necessarily to modify more general aspects of the patient's stress response. Consistent with this position, few researchers have questioned the effectiveness of desensitization in the treatment of focal phobia. Furthermore, our own early research (Lang, 1969) supported this idea of specificity. While we found considerable generalization of fear reduction after desensitization, as did Paul (1966), we also observed that the degree of effect closely followed the degree of stimulus association. [1]

We have already noted that the scripts used in flooding and implosive therapies emphasize response propositions. Furthermore, these treatments often generate strong affective images, where discrimination may be poor but visceral responses are numerous and intense. For example, in the Stampfl and Levis (1967) procedure an emphasis is placed on maintaining a persistent affective state, and stimulus elements quite remote from the primary fear are often employed. It is interesting to note here that Marks' group has also found that, in flooding, a considerable reduction in specific phobic behavior is prompted by the use of phobia-irrelevant fear images (Watson & Marks, 1971). Furthermore, some investigators (Boulougouris et al., 1971) argue that flooding is more successful than desensitization with the diffuse fear of agoraphobics. It could be that treatment of the latter complaint with its characteristic of ubiquitous anxiety, is not very dependent on the patient learning discriminations and that the important element in therapy is the processing of general response components. These facts support the thesis that flooding is less specific in effect than desensitization, and that results are achieved primarily through processing of response elements in the image, which mediate broad changes in the emotional response set.

The above generalizations about desensitization and flooding are made with great hesitation. Recent studies have produced complex results which are difficult to interpret (e.g., Gelder, Bancroft, Gath, Johnston, Mathews, & Shaw, 1973). From the perspective presented here, the critical issue is not whether the therapy is called "flooding" or "desensitization." The important fact is that any evaluation of imagery variables, e.g., duration of the image, frequency and rate of exposure, relevancy of content, or the pertinence of relaxation training, depends on the propositional structure, affective intensity, and vividness of the processed images. This information is available in crude form in the verbal judgments of clients and in the verbal report of stimulus and response propositions which may be systematically gathered at debriefing. More important, we must determine that the measurable physiological events occur during imagination, consonant with the image structure and its arousing properties.

To summarize, our view could be construed as an elaboration of the position taken by Wolpe in 1958: The therapeutic use of imagery depends on the modification of an associated psychophysiological state of fear. This state can be defined in terms of three response systems, verbal report, behavioral acts, and somatovisceral events (Lang, 1971, in press). If extratherapeutic change is to be effected, then irrespective of the treatment's formal structure, components of these responses must be represented in the images processed in therapy. Furthermore, it is incumbent on the researcher, and wise for the journeyman therapist, to confirm their presence during treatment.

Fear Object and Fear Image

The present analysis also raises questions about research comparing imaginal, media, and *in vivo* methods of flooding or desensitization. Such experiments are predicated on the assumption

[1] It is possible, of course, to structure desensitization so that relaxation is perceived as a generalized coping response and to treat the desensitization of a specific fear as a prototype for self-treatment (Goldfried, 1971).

that these methods are different modes of presenting stimuli. However, as we have taken pains to elucidate, the emotional image is not simply a stimulus or a representative of a stimulus. It is both stimulus and response, organized into a processing unit which is as much a behavioral set as an internal percept. Media presentations are to be similarly understood. Indeed, the function of a slide or film is not to present images but to evoke them.

Frightened subjects do not equally avoid all stimulus members of the class of feared objects. The subject's most potent feared object exists as a functional model in the long-term storage of the brain. The external stimulus offered by the experimenter will conform more or less well to this model and, with no other instruction, a bad match may evoke few response propositions of the fear state and little relevant overt behavior. In other words, the objective stimulus defines the descriptors of the image which mediates behavior. However, if a specific test stimulus is poorly chosen, and the subject cannot match it to his fear model, then treatment may be ineffective.

The effect of a media presentation, like a scripted image, depends on the response propositions which are processed with it. Furthermore, while a good external stimulus match may facilitate their occurrence, the probability that a complete image unit will be processed is also determined by context, physiological state, and instructions. Thus, Lazarus and his colleagues (Lazarus, Speisman, Mordkoff, & Davison, 1962) studied reactivity to fear films and found that certain instructions, which encouraged an "intellectualization" set or "denial," reduced both autonomic responding and verbal report of fear. Melamed (1969) confirmed this effect of instructions, but showed that it could also be used to increase arousal. In her experiment, the impact of the fear films on visceral reactivity was *augmented* by instructing subjects to become personally involved in the material and to experience the context "as if" it were real.

It is also possible for high tonic levels of sympathetic arousal to render subjects emotionally responsive to a film presentation that might otherwise be less provocative. Schachter (1964) demonstrated this effect for a humorous film, in which subjects who had received injections of epinephrine tended to laugh more while viewing the comedy than undrugged subjects. Furthermore, subjects who had been administered chloropromazine were observed to be significantly less amused than controls. In the same way that instructions can instigate appropriate language response propositions and thus facilitate autonomic responding to media stimuli, the verbal and behavioral components of the emotional image appear to be more readily evoked when subjects are making consonant visceral responses, even though this physiology is generated by emotion–irrelevant factors.

The presentation of fear stimuli in the context of independently generated low arousal is, of course, the treatment method proposed by Wolpe (1958), and the clinical and experimental data indicate that relaxed subjects do report less strong emotional reactions. However, the effects of tonic physiologic state on a subject's response to a film may be complex and difficult to interpret. A moderate increase in arousal facilitates attentiveness (Mackworth, 1969); a very low activation level may be inadequate for image processing. We have already suggested that high levels of sympathetic activity can be distracting and disrupt the integrity of an image. Furthermore, Schachter (1964) has shown that an instructional set that is not consonant with an emotional response can undermine arousal manipulations. Such deflating instructions are sometimes inadvertently communicated by the experimental or clinical context.

It is important to see that pictures and films are not "objective stimuli," but each is a kind of image or thesis. Whether they will actually facilitate imagination and aid the therapeutic task depends on the specifics of their application in the individual case. Furthermore, it is clear that simple instructions can by themselves evoke powerful images, in some cases just because exact details are left to the subject (as in Marks' method of guided fantasy), and the descriptors and response components thus conform most closely to the primary fear model.

Individual Differences

The vividness of the image and, thus, the potential for behavior change depend on the subject's ability to supply the visceral, verbal, and postural responses of emotions. In brief, the effectiveness of imaginal techniques is dependent first on the skill of the therapist in composing and delivering instructions and second on the ability of the patient to self-generate an emotional response. The problem is at least metaphorically parallel to the burden of artistic communication, which is shouldered equally by the creativity of the artist and the aesthetic sensitivity of the viewer.

In part, then, the prognosis of imaginal treatments relative to *in vivo* manipulations will depend on the patients' language control over the visceral and motoric components of emotional responding. Our research on cardiovascular control (Lang, 1975) suggests that the ability to initiate visceral change on instruction is a normally distributed human skill. Thus, some subjects can with a simple

command increase heart rate 20 or 30 beats/min or as much as 70 beats/min if provided with proper information and incentives. However, other subjects lack this capacity and do not achieve such instructional control despite extended training.

Imagery instructions can be viewed as another example of verbal control over the somatovisceral system. It is also clear that an imagery control deficit characterizes many patients. Nevertheless, these same patients may show visceral arousal in the context of objective stress. They are autonomically responsive to the presence of fear objects but lack the intentional control over the visceral responses of emotion that we feel is essential to emotional imagery generation. We hypothesize that this group is less capable than the good controllers of processing emotional experience "off-line." It is this group that specifically needs to work with fear stimuli *in vivo*. On the other hand, the subject with language control over arousal can learn prototypic fear-reducing behavior in therapy which he can readily apply in the objective context outside the treatment hour. For this group *in vivo* presentation may well be superfluous.

Image Control and Response Specificity

For nearly all subjects, presentation or the threat of presenting primary fear objects is the surest way to evoke the broadest fear response. However, it is clear from the perspective presented here that the external stimulus is not necessary to all subjects for fear generation. This conforms to clinical experience with patients, many of whom are distressingly capable of frightening themselves with little objective prompting.

The ability to become absorbed in a representation of reality "as if" it were an objective experience was described by the poet Coleridge (1884) as the "willing suspension of disbelief." There are presently very limited data based on the formal assessment of this process in patients. Most experiments have been retrospective, dependent on the vagaries of verbal report, and only a few studies involve the systematic assessment of the evoked image as it is occurring. A potentially useful paradigm was developed by Geer (Note 2), who examined attentional factors in the processing of sexual images. He found that erotic scripts, which reliably evoked arousal when presented alone, yielded attenuated erectile response when distracting tasks were introduced. These data suggest that competing stimuli of varying strength could be used to measure the saliency of emotional images. Resistance to distraction could become a method for objectively assessing the demand or intensity of emotional response (Geer, 1977). Another method might involve testing the patient's ability to instructionally suppress the visceral propositions of the emotional image in the context of prompting stimuli. Again, the sex researchers provide interesting preliminary data. Barlow (1977) reports that subjects have difficulty suppressing erections instigated by erotic audiotapes relative to erotic visual material, even though the latter yield greater responses. These same questions are relevant to our understanding of fear images, where optimal media impact and set factors must be determined if effective therapeutic processing is to be achieved.

Researchers studying human sexuality have also explored individual differences in image content, and this strategy could be adapted to the study of specific anxieties or phobia. A method has evolved for adjusting the propositional content of the erotic image so as to maximize the concurrent autonomic response. Tapes are presented to subjects repeatedly, progressively eliminating material which does not prompt erection and augmenting those statements which are reliably followed by an increase in penile blood volume. In this manner, specific language controlling the response components of the image are uncovered, and powerful fantasies are tailored to individual subjects. Barlow (1977) reports using this method to explore image contents related to sexual pathology or dysfunction. He notes that patients' verbal reports at interview often poorly label or misidentify the stimuli which prompt their own sexual response. The refining of the emotional image over trials uncovers the truly relevant stimulus contexts which can then become the focus of therapy. A similar procedure could be used to explore patterns of physiological response other than sexual arousal. Weerts and Roberts (Note 4) recently studied physiological changes occasioned by instructions to image fearful and anger-i nvoking scenes. Using selected subjects, they found differing autonomic patterns for the two emotions, similar to those originally reported by Ax (1953). The method of successive audiotapes might have further refined this distinction for individual subjects. Over a decade ago, Graham and his colleagues proposed that specific psychological sets or "attitudes" controlled patterns of physiological responding, and that their repeated instigation underlay much physical disease (Graham, Kabler, & Graham, 1962; Graham, Stern, & Winokur, 1960). For example, they suggested that hypertension involved a feeling of threatened harm and a need to be "ready for anything." Furthermore, they demonstrated that the hypnotic evocation of this "attitude" prompted a predicted blood pressure response. Other attitudes were held to control different physiological response patterns. There has

been little effort to replicate this work, although it inevitably finds a place in treatises on psychosomatic medicine. The failure to exploit these insights may stem in part from a methodological failure to focus on the specific elements of the image, i.e., the covariation between a specific instructional set and the physiological response. A propositional analysis of specific fear and anger material, refined over successively presented audiotapes, could very well generate just the kind of psychophysiological patterns Graham hypothesized. They may indeed prove to be reliable and stable for individuals and, once such relationships are established idiosyncratically, communality of content elements could be explored. Thus, it is possible that specific disease entities could sort out in terms of the psychophysiology of specific images. However, the evaluation of this hypothesis depends on the establishment of a more explicit relationship between imagery instructions and physiological response than has previously been sought. In brief, it is not sufficient to say that urticaria is related to "helplessness," ulcer to "deprivation," or tachycardia to "fear." The specific instructional material controlling skin temperature, stomach motility, and heart rate must be isolated before any useful catalog can be generated. In this enterprise, the clinical interview is only a first step. The specific image content must become the independent variable which is tested and refined against the relevant physiological responses.

Modeling and Imagery

The present conception also provides a perspective for the analysis of modeling techniques in fear reduction and suggests what differences would be found between simple exposure to frightening stimuli and observations of others interacting with a feared object. It is clear that the way to alter the fear state is to change the response propositions of the fear image, which we view as a kind of behavioral prototype stored in the brain. The primary response classes of this fear unit are visceral, verbal, and overt acts.

In observing an external model, the subject is provided with a vivid instruction which defines an alternative overt act. If the alternative response is not in the subject's repertoire, e.g., it was a complex social skill that he needs to observe, rehearse, or practice, then the main function of the modeled act would be to demonstrate the skill. The model is a more explicit alternative to verbal instruction for communicating essentially academic information. However, if the desired overt behavior is in the repertoire, but the patient has not been willing to use it in this context (e.g., approaching an object rather than avoiding it), then the effectiveness of the treatment is more likely to depend on changing other components of the emotional response in addition to overt actions. Assuming the topography of the patient's fear includes visceral arousal and somatic muscle tension, we suggest that a filmed model would have to evoke elements of these responses, at least on initial trials, in order to be broadly therapeutic. Furthermore, differences in fear change produced by modeling vs. imagery instructions would then depend on the extent to which these physiological elements were instigated and processed in the two procedures. Such competitions between therapy methods can turn out either way, depending on the image potency of the alternative media. Everything depends on the artist-therapist. Is the modeling film successfully realized? Are the imagery instructions well composed and delivered? To some extent psychophysiological analysis will be able to predict the outcome. However, such experiments are really analogous to comparing a novel to a play or film. I believe researchers have many times deceived themselves about the outcome of such contests, simply because they were more creative and/or skilled at developing one set of materials than another. Despite the above considerations, there may be good practical reasons for choosing modeling instead of instructed imagery for specific treatment situations. For example, modeling may be more effective if the patient's instructional control over the visceral components of emotion is poor. A well made film may have more capacity to evoke the relevant response propositions in such subjects. For this reason, we might expect children to profit less from instructed imagery, on the assumption that their capacity to self-generate emotion is less than that of adults. However, we do not yet have the necessary research to tell us about the development of this capacity. Children are very good at the game of "let's pretend," and at certain ages they may prove superior to adults in generating visceral arousal, whether mediated by verbal or pictorial stimuli.

Covert Modeling

The view taken here is that the fundamental strategy of treatment should be to process the emotional image; the media are a tactical consideration. This fact is highlighted by Kazdin's research (1973, 1974). In his experiments, subjects are asked to imagine models, themselves or others, interacting positively with fear objects. This procedure was dubbed "covert modeling" by Cautela

(Note I); however, the word modeling seems wholly gratuitous. Kazdin's instructions and those used in flooding or desensitization are the same in that subjects are asked to generate an image unit containing stimulus propositions tagging the fear object. Kazdin' s instructions are different because phobic stimuli are combined with verbal and overt response propositions inconsistent with the emotional response. The scene actually involves the covert practice or rehearsal of new, nonphobic behavior.

It is instructive to compare Kazdin's covert coping model and covert mastery model. For coping, "within each scene, the model eventually coped with his anxiety and performed the task calmly. Across all 14 scenes the model became less anxious and more confident so that by the last two scenes there were only confident approach responses" (Kazdin, 1973). In other words, an effort was made to generate emotional imagery in early scenes, and then nonfear responses were gradually substituted. In the mastery condition, the imagined model showed no initial anxiety, he simply interacted with the fear object in a straightforward, fearless manner. "Descriptive phrases in the scenes included performing the tasks without hesitation, while smiling, remaining calm, looking confident, and appearing relaxed" (Kazdin, 1973). There are not enough details provided to permit a detailed propositional analysis of the image scripts and a psychophysiological analysis of the scenes was not undertaken. However, from the material available we might infer some important differences in the response propositions of the images generated, with specific implications for behavioral change. First, there was no specific evocation of visceral arousal. However, to the extent it was present at all, autonomic activation was probably prompted more by the coping than by the mastery scripts. If we are correct in the assumption that evocation of an emotional image depends on the generation of response as well as stimulus propositions, and if this image is indeed critical to behavioral change, then we must presume that greater change would be found after coping instructions. The data did indeed show somewhat more behavior test change for the coping condition. Second, it was the mastery condition that involved extended rehearsal of new, positive self-referent statements, e.g., calm, confident, and relaxed. It is perhaps not surprising to note that the mastery condition yielded slightly more improvement than coping on verbal report measures of reduced anxiety and positive attitudes towards the feared object. In brief, the investigator got out of the experiment more or less what he put into the instructions.

Conclusions: an image for the future

The purpose of this paper is not to offer a conclusion about the relative effectiveness of different behavior therapies. We do not propose to decide here whether the training of a competing physiological state, the development of new overt coping responses, the encouragement of positive self-referent statements or mere exposure to fear materials is the best vehicle of change. What we have tried to do is define a conceptual context in which we believe such questions would be meaningfully answered.

We have suggested that the narrow definition of the image, as an internal stimulus, is theoretically inadequate and of limited practical utility. We proposed alternatively that the emotional image in the brain is a propositional construct, a finite structure made up of stimulus and response elements which are under limited instructional control. We have tried to show that many components of the image are measurable through concurrent physiological recording and that this provides both a window through which the image can be observed and another vehicle through which it can be modified. Furthermore, we have offered reasoned speculation on the relationship of fear imagery to fear behavior and explored the conditions which increase or decrease the probability of an emotional response.

It is held that fundamental to the emotional response of fear is the prototype fear image contained in long-term storage. This template can be evoked for processing in a variety of ways, through instructions, through pictorial representations, or by objective stimuli. The stored descriptor propositions constitute a model against which external events are tested. If the stimulus does not closely match the prototype, fear is not evoked. However, instructions which provide more information (e.g., "imagine that it is real") can override a mismatch and prompt emotional processing. The processed image is a response set. Thus, an external stimulus which elicits descriptor elements and interpretive propositions will activate the total information unit, including the designated overt behaviors.

It is possible to define the specific conditions which will encourage such processing. Clearly, large parts of the unit can be generated by telling subjects to imagine they are interacting with real stimuli. It should come as no surprise that this is so, as the objective stimulus configuration of most fear stimuli has no fundamental nociceptive property. More intense fear stimuli will not burn the skin or destroy the retina or basilar membrane. Whether a

stimulus is present or absent becomes wholly academic, for example, under conditions of attenuated ambient light, when the crucial issue is whether the subject "believes" the stimulus is present. On the one hand, a useful avoidance response is not to "believe" in the fear object and thus not to evoke the image unit with its disruptive response components. However, the conditions prompt equivocation. Whether belief and the fear will be absent or, alternatively, fear will be augmented by the uncertainty, is here a function of idiosyncratic learning. The important consideration is that the objective stimulus is clearly not fundamental to the evocation of either the stimulus or response propositions of the image. We have already noted that despite the apparent importance of a reality set to the effectiveness of imagery therapy, there is limited objective data on the specific effect of such instructions. Furthermore, we do not routinely determine how well patients will respond to an "as if" set before we proceed to treatment.[2] The large individual differences in the imagery ability of patients needs to be investigated, and methods developed to increase patient responsivity to instructional control.

Clearly, there is much to be learned about fear images and their antecedent relationship to the overt verbal, motoric, and visceral responding in emotion. The methodological assumption of media identity with the image permits us to explore the effects of adding or subtracting information from the image unit. Thus, we can examine the effects on the viscera of the presence or absence of visceral response propositions in the imagery instructions. Similar investigations can be made of self-referent statements and imaginal overt acts. Furthermore, we can explore more explicitly the effects on the image of incongruous or competing propositional units. For example, what are the consequences of instructing subjects to imagine a coping response in the fear context, for the contingent visceral responses of the image, as well as for subsequent overt behavior? Does imagery processing lay down a new response prototype which then becomes the basis for overt behavior change? Can other emotional states (e.g., anger, sexual arousal) be analyzed from a similar conceptual framework, and will this provide a method for examining the interaction of emotional states? We believe the proposed approach opens the way to a serious, systematic exploration of these issues, which will in the next decade greatly increase our understanding of fear processing and perhaps other emotions as well.

[2] Goldsmith and McFall (1975) utilized a coaching or rehearsal technique which did consider an aspect of this issue. Subjects were checked repeatedly to see that requested behaviors "fit" their concept of their own behavioral repertoire, i.e., that they could "see themselves" engaging in the response. Modifications were made in the instructed behavior when it was not readily consonant with the prototype image.

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Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

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