

# Clinical Uses of Mental Imagery: Experimental Foundations, Theoretical Misconceptions, and Research Issues

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The growing use of mental imagery in clinical settings has been hampered by major theoretical deficits, notably the virtual absence of interdisciplinary models not constrained by a specific therapeutic orientation. Information-processing data pertaining to the functional and structural properties of imagery are reviewed to illustrate that images may be but incomplete pictures that also convey non-pictorial, abstract information. It is proposed that the imagery and verbal/symbolic processing systems are functionally discrete but comparably influential in image generation, elaboration, and appraisal, a property suggesting that clinical images comprise multiple representational events of a visual, verbal, and affective nature. The popular notion of the image as a mental photograph is reviewed in the context of present knowledge and is argued to have only limited applicability. Methodological concerns associated with the study of clinical imagery are examined, pertinent literature is reviewed for each issue, and data are presented to demonstrate the significance of the problems confronting contemporary imagery researchers.

Use of mental imagery as a psychotherapeutic technique has escalated in recent years (cf. Singer, 1974). Imagery has been used within therapeutic frameworks ranging from symbolic techniques characteristic of the psychiatric approach (Hammer, 1967; Royer, 1963; Shorr, 1972, 1974) to focused and structured behavior modification strategies (Cautela, 1967; Wolpe, 1958). Such therapies are neither new nor did they originate in North America but were presaged by the guided imagery techniques of Desoille (1938), Fretigny and Virel (1968), and Luenner (1969), who contributed many of the basic technical procedures found in present-day approaches (e.g., concurrent relaxation, imagining fearful situations).

Behavior therapy has made extensive use of mental imagery to mediate therapeutic effects. This trend, unmatched in growth in any other therapeutic orientation, is re-

flected amply by a cursory review of imagery-based behavior therapies: implosive therapy (Stampfl & Levis, 1967), covert sensitization (Cautela, 1967), emotive imagery (Lazarus & Abramowitz, 1962), thought stopping (Wolpe & Lazarus, 1966), anxiety management training (Suinn & Richardson, 1971), self-control desensitization (Goldfried, 1971), graduated prolonged exposure (D'Zurilla, Wilson, & Nelson, 1974), and systematic rational restructuring (Goldfried, Decentecio, & Weisberg, 1974). Present trends indicate that imagery will continue to proliferate in the clinical setting, as is illustrated by Cautela's (Upper & Cautela, 1979) developing covert conditioning paradigm and the enormous growth of the cognitive behavior modification movement (Mahoney, 1974, 1977; Meichenbaum, 1977).

The clinical promise of imagery has been moderated by theoretical confusion with respect to the therapeutic significance of this complex and poorly understood phenomenon. Singer (1974) noted that for each new image therapy, the originator hypothesized a unique set of process substrates that encapsulate imagery within the specific theoretical framework. Conversely, therapeutic effects associated with the presence of im-

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agery as a distinct mode of cognition receive little empirical or theoretical attention. For example, imagery continues to be a popular psychiatric strategy (Hammer, 1967; Shorr, 1972, 1974), but little experimental effort has been devoted to verifying the pivotal process assumptions that underpin these approaches. In contrast, behavior therapy theorists have generally failed to develop a theoretical foundation of sufficient breadth to support the wealth of research data on the subjective impact of imagistic thought. Although investigators have reluctantly acknowledged the scientific "respectability" of mental imagery, the monism characteristic of radical behaviorism (Skinner, 1953; Watson, 1924) continues to limit the range of inferences drawn from present research results. To expedite scientific scrutiny, mental imagery is placed outside the individual by equating the principles governing covert behavior with those known to influence overt behavior (e.g., Cautela, 1976; Cautela & Baron, 1977). With a few notable exceptions (Lang, 1977; Mahoney, 1974; Meichenbaum, 1977), behaviorists have been slow to accept the constructive nature of mental imagery and the subsequent influence of subjective responses to therapeutic imagery. Our review of the substantial information-processing literature, we contend, is sufficient to form an account of imagery in psychotherapy that is not constrained theoretically within a single orientation. Persons do not abandon basic information-processing operations while performing clinical visualizations but use similar strategies that are adapted to higher order cognitive processing demands. Hence an examination of empirical data that have direct bearing on functional and structural characteristics of clinical imagery will prove useful. In addition, this review suggests that fundamental theoretical assumptions regarding clinical imagery are strongly qualified in light of present knowledge; we illuminate the manner in which these misconceptions have negatively influenced the adequacy of clinical research. Specifically, we examine the "functional equivalence" doctrine, a position that argues for a homogeneity of overt and covert events and attempt to show how it is analogically linked to the limiting influence of the pho-

tograph metaphor of imagery. Literature pertaining to individual differences in imagery ability is reviewed to illustrate how misconceptions regarding the nature of clinical imagery result in vague or oversimplified research hypotheses and consequently inadequate experimental design. Finally, we discuss key methodological considerations in the study of mental imagery that to date have received insufficient attention in clinical research.

### Preliminary Definitions

Our clinical approach emphasizes that therapies as seemingly diverse as implosive therapy (Stampfl & Levis, 1967) and systematic desensitization (Wolpe, 1958) possess common substrates that can be attributed to properties of the image generation, elaboration, and appraisal process. Further, the strength of nonspecific imagery effects may supersede those that are posited to reside within a given therapeutic rationale. Clinical imagery is defined as a sequence, progressing toward resolution, that uses associative information but also exhibits emergent properties that transsumatively are related to more basic information-processing operations. Thus the abilities required during image construction are not necessarily preeminent during image appraisal. Image construction is underpinned by molecular imagery, whereas image appraisal is functionally tied to molar imagery processes. Molecular imagery comprises analogue representations that are constructed and juxtaposed to formulate a meaningful reproduction (Anderson, 1978; Kosslyn & Swartz, 1977). Molecular processes are endowed with irreducible sensory modality and affective properties that are carried by analogue structures. Minimal subjective awareness is required to consummate basic image construction because nonverbal processes are habitually used to complete numerous common processing tasks. The term *subjective transformation* identifies a protopoint in the imagery sequence at which subjective awareness of an image is experienced. Subjective transformation implies a discontinuous break with molecular imagery processes in that the

complete image possesses a variety of higher order cognitive and affective valences. Molar imagery, regarded as a relatively unique stage of information processing, incorporates conscious operations such as elaborative imagery, emotive arousal, and mental rehearsal. Thus our position is that multiple representational/processing events of a cognitive and affective nature transpire within any one visualization sequence. Our research supports the veracity of the molecular/molar ability division and further suggests that the spectrum of imagery abilities is arranged hierarchically so that higher order operations subsume lower order ones (Strosahl & Ascough, Note 1).

### Functional and Structural Properties of Images

Experimental interest in the functional and structural properties of imagery has surged in recent years, as is indicated by the many contemporary texts devoted to the subject (e.g., Paivio, 1971; Richardson, 1969; Segal, 1971; Sheehan, 1972). Much of this literature pertains to events that in all probability occur in therapy, specifically with respect to functional and structural properties of imagery and their relation to the notion of the image as a mental photograph.

The functional significance of imagery, as well as the photograph metaphor, has been the subject of heated controversy since Pylyshyn's (1973) critique. An opposing orientation, propositional network theory, holds that verbal and visual representational processes are epiphenomena of a more complex "interlingua" or underlying code that is abstract but not explicitly verbal in nature (Anderson, 1976; Anderson & Bower, 1973; Pylyshyn, 1973). Indeed, the most thoroughly explicated model of clinical imagery to date is derived largely from propositional network theory (Lang, 1977). (See Kosslyn & Pomerantz, 1977, for a general discussion of the theoretical and empirical limitations of propositional network theory.) Anderson (1978) argued that dual coding and propositional positions have not surmounted the problem of "nonidentifiability" or the capacity of competing theories to mimic performance effects that Anderson

argued to be unique to a specific approach. Thus, we direct attention only to evidence about the functional and structural properties of imagery and not to the intricacies of this controversy. Our assumption is that a reasonable degree of functional independence exists between the visual and verbal processing systems, and many of the points advanced in this article are products of the dual-systems orientation.

Mental rotation studies provide evidence that images use spatial information to complete processing responsibilities. Essentially, mental rotation experiments consist of simultaneously presenting two visual test stimuli that are identical in form but that differ in angular orientation relative to one another. One form is regarded as the test stimulus against which a same-different orientation judgment is to be made. Shepard and Metzler (1971) observed that the reaction time (RT) required to make the same-different decision increased as a monotonic function of the angle of departure between the two test stimuli. These investigators proposed that subjects had mentally rotated one stimulus figure into congruence with the other and then made the same-different determination. Cooper and Shepard (1973a, 1973b) found a similar effect when backward versions of alphanumeric letters were used as the test stimuli, decreasing confidence in the rival hypothesis that verbal associative strategies were responsible for the observed RT effect. Cooper (1975) demonstrated that the RT effect could be eliminated by providing preparatory visual information about the angular orientation of the upcoming test stimulus, although preparation time matched the temporal duration of previously observed RT effects. Thus the mental rotation literature supports the idea that imagery permits visual and spatial information to be stored and accessed for information processing.

The results of perceptual comparison studies demonstrate that images are not confined solely to spatial-reproductive functions but may in fact be responsible for conveying abstract information. Moyer (1973) asked subjects to name from memory the larger of two animals whose names were presented verbally. Analysis of data revealed that the

time required to make the decision resembled the RT observed when actual visual comparisons are made. Specifically, RT increased as the subjective magnitude difference became smaller. Moyer (Moyer & Bayer, 1976) postulated that the "symbolic distance effect" occurred because subjects had converted each animal name into an internal analogue that retained essential size information and then made the psychophysical comparison. Paivio (1975) replicated these results and demonstrated that the verbal and imaginal representational systems enacted functionally distinct roles in the comparison process: Size comparisons were effected faster for pictures of objects than for the words naming them; a reverse effect was noted when subjects were asked to judge the pronounceability of words or the pictures representing them. Kosslyn (1976) found that the smaller test properties of imaged animals were verified more slowly despite their high association value to the animal (e.g., cat-claw). However, when subjects were instructed not to use imagery as a mediation strategy, association value of the test stimuli was most predictive of RT. Several other investigations demonstrated that such mediation set influences whether visual or verbal processing preeminence was revealed in performance data (e.g., Holyoak, 1977; Kerst & Howard, 1977). Recent indications of a symbolic distance effect with abstract test stimuli (Holyoak & Walker, 1976; Kerst & Howard, 1977) led Paivio (1978) to propose that the imagery system is capable of representing the abstract or affective properties of *things* but not the language that describes them. Apparently, images provide a format for effective processing of pictorial and abstract information, suggesting that minimal spatial information may be required for efficient imagery (Kosslyn, 1975, 1976). Consonant with this position, Shepard (1978), Kosslyn (1976), and Anderson (1978) argued that images may be only incomplete pictures, or analogues, that convey essential types of information. Information is conveyed in the surface image rather than primarily through an underlying associational response network (Kosslyn, 1975, 1976). Presentation in this manner provides the basis for parallel processing, or the ca-

capacity of the imagery system to act on diverse information structures concurrently (Paivio, 1971). Parallel processing may be instrumental to the therapeutic impact of imagery, since verbally based sequential and stereotyped self-defeating thought patterns are circumvented, with distressing information presented in an uncharacteristic fashion (cf. Horowitz, 1978; Singer, 1974).

As it pertains to information processing, dual coding describes the propensity of the visual and verbal systems to corepresent and share processing responsibility for incoming information. We contend that visual and verbal interchange is an integral aspect of therapeutic imagery as well. It will be beneficial to examine two areas that provide support for the dual coding hypothesis. The rationale underlying selective interference designs is that one can determine the format or structure of a representational system by determining which events interfere with it. Selective interference studies have used short-term information-processing tasks in which stimulus presentation and task performance are separated by an "interpolated task" that is assumed to interfere with a specific representational system. In general, results imply that dual representational systems exist and that incoming information is attached to the system that is best suited for processing it. Numerous investigations have demonstrated interference effects in visual (Allen, Marcell, & Anderson, 1978; Brooks, 1968; Segal & Fusella, 1970; Warren, 1977) and verbal (Salthouse, 1975) modalities. Two studies (Allen et al., 1978; Den Heyer & Barrett, 1971) revealed that different properties of a unitary stimulus may receive visual or verbal encoding, suggesting that the "non-verbal and verbal symbolic systems represent and process information derived from any of the sensory modalities individually, and possibly, in parallel" (Paivio, 1978, p. 207).

The most elegant laboratory tests of the dual coding hypothesis are the speed and letter-matching experiments of Posner and Keele (1967), Posner, Boies, Eichelman, and Taylor (1969), and Tversky (1969). Although the complexity of their design factors prohibits a detailed explanation, results demonstrate that visual information can be

transformed and corepresented by the verbal processing system, and vice versa. There is significant voluntary control over the selection of which system is prepared for functional preeminence with an anticipated task, and the congruency of the actual task with preparatory set is a significant determinant of processing efficiency (Tversky, 1969). Similar functional sets may occur in the clinical setting (i.e., visualize a scene as clearly as possible), and the effects of incongruent task material, such as a list of highly abstract scene descriptors, may create difficulties because abstract words do not readily elicit vivid visual images (Paivio, 1971).

The most influential study of image structures addressed the question of the mental photograph metaphor, which is a predominant way of describing the imagery experience (Neisser & Kerr, 1973). Subjects were asked to read sentences with two major concrete objects represented in one of three ways: The two test objects were portrayed as interacting in some sense, the two objects were described as separate and not spatially proximate, or one of the objects was somehow concealed by the other object. After reading the test sentences, subjects rated sentence vividness and were then administered an unexpected free-recall test. Test objects were recalled with equal facility, regardless of whether they would be visible in a snapshot, whereas recall was best when the objects were portrayed as interacting. Interestingly, spatially remote objects were recalled with the least accuracy, suggesting that visual memory was not exclusively based on spatial information. In addition, rated vividness of test sequences did not correlate with recall accuracy, a result that is difficult to reconcile with the photograph metaphor. Data reported by Keenan and Moore (1979) indicated that the Neisser and Kerr results may have been more a product of noncompliance with the experimental mediating instructions than an imagery effect per se. Yet, incidence of recall for concealed objects observed in that study continues to support the premise that images have spatial and nonspatial properties.

Jonides, Kahn, and Rozin (1975) also reported results incongruous with the mental

photograph metaphor in a study comparing blind and normal college students on a recall task that manipulated word concreteness and abstractness as well as the type of mediating instructions offered to subjects. Based on Paivio (1971), this study hypothesized that the concreteness of stimulus words would interact with mediational strategy (e.g., imagery or verbal association) to differentially influence the recall of subjects with and without previous visual experience. The performance of blind subjects showed that imagery mediation continued to improve recall for concrete words, however, indicating that they had used an effective visual processing strategy despite the absence of previous visual perceptual experience. Thus the validity of the photograph metaphor is qualified by data showing that, under certain circumstances, imagery is capable of performing more abstract mnemonic functions.

Common sense dictates that images can exhibit spatial/reproductive properties that are at least analogous to visual perception, a position advocated by Shepard (1978) and Kosslyn (1975, 1976). Kosslyn (1976) tested the hypothesis that images possess spatial properties that allow them to be "scanned" by some internal process. Subjects were asked to memorize a set of drawings and were required to verify whether a property was present or absent in the image. Three experimental groups were used. One group was instructed to focus attention on one end of the imagined drawing, the second group was asked to keep the whole image in mind, and the third group was instructed not to use imagery as a mediational strategy. For the first condition, the RT required to verify a test property varied as a function of that property's distance from the focal point on the image; no such effect was noted in subjects who kept the entire image in mind. When not instructed in the visual mediation strategy, subjects verified test properties on the basis of associative value to the object in question.

Kosslyn (1975) illustrated several structural properties of imagery that are relevant to the technical procedures used in many imagery-based psychotherapies. This inves-

tigation showed that images have a limited storage capacity that is degraded when too much irrelevant material is injected or when image complexity exceeds certain limitations. When limitations are exceeded, the time needed to effectively process an image increases significantly, encouraging the use of the pretreatment imagery training that is prescribed for many imagery therapies. Furthermore, smaller images were more difficult for subjects to construct and required additional time for efficient processing. The presence and impact of such representational limitations remains unexplored as a clinical hypothesis and suggests an intriguing series of experiments for innovative researchers.

Finally, Kosslyn (1978) examined characteristics of the imagery field and developed a fascinating structural account of the "mind's eye." Subjects in these experiments reported an overflow effect or a point at which the subjective size of an image became too great to maintain the whole image within the imagery field. Interestingly, the point at which overflow occurred was not influenced solely by the subjective size of the imaged object but by image content as well. Spontaneously generated images were constructed at near maximum size, and the point of overflow was subjectively more distant from the imagined object when verbal descriptions were the basis for image formation. An interesting hypothesis is whether the overflow effect can occur as a function of negative arousal produced by unpleasant images and the extent to which therapist and self-generated scene descriptions produce qualitatively distinct image structures.

Clearly, this review of information-processing research implies that imagery may be a more complex event than is presupposed in the notion of the image as a mental photograph. Not only do images convey information that would not be visible in a photograph, but it is likely that the visual and verbal processing systems are active contributors to the imagery sequence. Consequently, we think that theoretical models of imagery in therapy should be modified so as to dispell misconceptions attributable to the lingering influence of the photograph metaphor.

### Clinical Misconceptions

Sarbin (1972) argued that metaphors may supplant the phenomena they are designed to describe. Such has been the case with the photograph metaphor of mental imagery, a metaphor on which much theory and research about the role of imagery in psychotherapy has been based. For example, Lazarus (1964) and Wolpe (1969) stated that an essential prerequisite for successful desensitization is the client's ability to vividly and realistically imagine scenes. Moreover, pretreatment imagery training is routinely prescribed in imagery therapies to enhance the development of vivid images. In addition, an influential contemporary model of clinical imagery, Cautela's (Cautela & Baron, 1977) covert conditioning paradigm, is grounded in assumptions that are explicitly related to the photograph metaphor.

### *Functional Equivalence Doctrine*

Conceptually, the functional equivalence assumption has dominated process models of imagery-based behavior therapy, although the key tenets of this position were not formally advanced until Cautela (1976; Cautela & Baron, 1977; Upper & Cautela, 1979) introduced the covert conditioning paradigm. The characterization of imagery advanced in this position is so widely accepted by behavioral researchers that it constitutes a major influence on contemporary clinical research. The functional equivalence doctrine argues for a homogeneity between covert and overt behaviors, each realm being influenced and modified by the same laws of learning (Bandura, 1969; Cautela & Baron, 1977; Ullmann, 1970). We believe that the homogeneity assumption reflects a desire to ease the scientific difficulties associated with the study of covert events by reconceptualizing such processes as analogues of observable behavior. The photograph metaphor has been used extensively because mental imagery can thus be equated with a stimulus comprising observable structural and functional properties (e.g., a snapshot). To illustrate, imagery variously has been defined as a "coverant" (Day, 1969),

or covert operant, and as a set of responses made to particular stimuli when those stimuli are not present (Cautela & Baron, 1977).

Evidence for the homogeneity assumption is argued to reside in a number of studies which demonstrated that similar patterns of physiological arousal are elicited by physical stimuli and their imagined counterparts (e.g., Haney & Euse, 1976; Rimm & Litvak, 1969; Swartz & Higgins, 1971; Waters & McDonald, 1973). Two additional lines of supporting evidence involve the application of overt learning laws to modify internal processes (Mahoney, Thoresen, & Danaher, 1972) and the successful adaptation of overt therapy procedures to a covert format (Cautela, Flannery, & Hanley, 1974). Within the later research paradigm, support for the homogeneity assumption was generated by illustrating the significance of identified overt therapy process variables for adapted covert therapies (e.g., Kazdin, 1974a, 1974b, 1974c). Although it is not feasible to provide an exhaustive account of the substantial literature in this area, data indicate that, in some areas of covert functioning, this hypothesis appears to be tenable (cf. Shepard, 1978).

We do not maintain that reproductive/photographic imagery is an insignificant aspect of psychotherapeutic imagery. But there is a need to determine how much of the clinical imagery sequence can be characterized in this way and the relative contribution reproductive imagery makes to eventual therapeutic success. A difficulty in resolving this dilemma is posed by the data cited in support of the functional equivalence model. In each case, the acceptability of evidence cited depends on the logical fallacy that similar outcomes imply similar processes (Mahoney, 1974). Thus properties of covert events are inferred by linking them to overt events with known properties. Informal assumptions about the automaticity of treatment effects and continuity of overt and covert learning processes provide the foundation for this belief; yet a recent review suggested that these tenets are not grounded on a firm empirical basis (Little & Curran, 1978). The functional equivalence model offers an account of mental imagery that does not coincide with data showing that subjects use mental

imagery in idiosyncratic ways that are resistant to external control (e.g., Kazdin, 1975, 1976; Weitzman, 1967; Wolpin & Raines, 1966). Moreover, research has not demonstrated that the predictions derived from the functional equivalence hypothesis are influential determinants of therapeutic outcome.

Wilkins (1971, 1972) reviewed data which indicate that the presence or absence of imagery, not reciprocal inhibition, is the key process variable in systematic desensitization; Kazdin and Wilcoxon (1976) cited data which suggest that there may be no essential requisite for successful desensitization. Indeed, it has been argued that the covert therapies have been validated inadequately with respect to key outcome and process predictions (Little & Curran, 1978; Mahoney, 1977). Finally, clinical techniques that appear to violate sound covert learning principles have been shown to produce strong therapeutic effects (Goldfried, 1971; Goldfried & Goldfried, 1977). Although affirmations of the functional equivalence hypothesis exist (e.g., Kazdin, 1974a, 1974b, 1974c), we have proposed (Strosahl, Chaffee, & Ascoug, Note 2) that such results can also be explained as products of molar processes that are minimally related to the laws governing overt behavior. Thus immediate research efforts should attempt to evaluate the identifiable predictions derived from competing theoretical orientations.

### *Individual Differences*

A common point of interest for experimental and clinical psychologists is the topic of individual differences in imagery ability, as considerable effort has been expended in both areas to identify performance differences that can be linked to the presence of vivid as opposed to dim mental imagery. The controversial aspect of the individual differences question resides in the premise that on selected tasks vivid imagery can be linked empirically to more efficient performance than would be possible with dim imagery. An examination of the individual differences literature highlights not only a chief limitation of the functional equivalence doctrine but also many of the methodological con-

cerns associated with the study of imagery in psychotherapy.

Griffitts (1927) is credited with coining the terms *visualizer* and *verbalizer*. Visualizers are posited to process incoming information with visual-concrete imagery, whereas verbalizers make extensive use of verbal-auditory information-processing strategies. This distinction is not a dead theoretical issue, as several contemporary theorists have proposed that visual or verbal styles of information processing exist (e.g., Hiscock, 1978; Paivio, 1978; Richardson, 1969). Disagreement surrounding the precise nature of the visualizer-verbalizer continuum stems from the tendency to equate the distinction with individual differences in image vividness. In all probability, the two are separate issues, since it is tenuous to equate a vivid imager with a visualizer and vice versa. Nevertheless, the individual differences assumption exhibits conceptual links with the visualizer-verbalizer distinction in that persons are postulated to have habitual processing styles that produce a vulnerability to specific tasks. We propose that this vulnerability is much more likely to be observed in the experimental setting because of the sophisticated artificial constraints that can be placed on the activities of compensating information-processing mechanisms (e.g., selective interference methods). In contrast, no such limitations are extant in the clinical context, and consequently deficiencies in imagery ability may be minimized through increased verbal elaborative activity, to cite but one example.

One research tradition in the individual differences area that has directly influenced clinical research efforts involved the evaluation of performance differences on cognitive tasks that could be attributed to the presence or absence of vivid imagery (cf. Ernest & Paivio, 1969; Marks, 1972, 1973; Paivio, 1978; Sheehan, 1966b; Sheehan & Neisser, 1969). Attraction of clinical investigators to the performance paradigm undoubtedly arises from a desire to operationalize the imagery construct so that the individual differences hypothesis can be adequately tested. As summarized in several recent reviews (Marks, 1972; Paivio, 1978; Richardson, 1969), results of laboratory ex-

periments have been intriguing but equivocal, and as many studies can be cited in support of the hypothesis as against it. Clinical research in this area has been more disappointing (Danaher & Thoresen, 1972; Rehm, 1973; Rimm & Bottrell, 1969). Relations have been observed among the various performance tasks used in these studies (e.g., block test, picture memory test) but self-reported image vividness is not reliably correlated with objective performance measures. As Neisser (1970) suggested, individual differences studies raise the possibility that the subjective experience of imagery is fundamentally distinct from the way imagery is used as an information-processing strategy.

A second clinical research tradition attempted to establish an empirical association between behavior therapy outcome and individual differences in imagery ability (Beere, 1972; David, McLemore, & London, 1970; Dyckman & Cowan, 1978; Kazdin, 1975; McLemore, 1972; McSweeney, 1976). The majority of these studies indicated that, with pretreatment imagery ability assessed by self-report as the independent variable, few meaningful relations with treatment outcome were observed. In vivo imagery assessment has fared better in two investigations (Dyckman & Cowan, 1978; Strosahl et al., Note 2) but did not receive support in an earlier study (Kazdin, 1975). Although negative results may dispose one to reject the significance of imagery ability in therapy, clinical investigations to date have exhibited fatal theoretical flaws that can be attributed to the restrictive influence of the photograph metaphor and its clinical counterpart, the functional equivalence doctrine. Despite a limited empirical base, clinical research rationales assume that the photographic quality of covert representations is critical to the success of behavior therapy. Hence more vivid images produce more effective therapy, a premise that also implicitly requires an automaticity of treatment effects. We argue that a principal deficiency of the functional equivalence position is that it artificially restricts nonverbal operations to the visual/reproductive realm rather than conceptualizing the image as a multifaceted event. In effect, research designs have failed to dif-



ferentiate which imagery abilities are clinically, as opposed to experimentally, relevant. A specific subclass of abilities (e.g., sensory modality imagery, image control) has been selected for study to the exclusion of other imagery operations, usually molar in nature, that may be fundamental to effective imagery. An alternative hypothesis consistent with information-processing research is that molar and molecular representational systems interact to influence *image integrity*, a term used to describe the quality of image construction, elaboration, and appraisal. Although these abilities may be varied and complex, it is reasonable to assume that they reflect the interaction of visual and verbal processing products (e.g., imagery vividness, image controllability, abstract imagery capacity, internal dialogue) associated emotive factors, and processes integral to self-appraisal such as image elaboration, mental rehearsal, and self-control imagery.

When constructing a research design to test the individual differences hypothesis, it is important to assess the specific predictions generated by this hypothesis; for example, examining the clinical success of visualizers and verbalizers is distinct from the question of simple interval differences in imagery ability. It is likely that the true verbalizer is exceedingly rare in the general population; McKellar (1965) found that the occurrence of visual imagery was common in 97% of 500 subjects studied, whereas auditory imagery was also reported by the vast majority of individuals (93%). The visualizer-verbalizer issue may thus be more suitable to an ideographic design strategy; interval ability differences may be more fruitfully approached through nomothetic designs. Indeed, our experience suggests that few subjects can even be classified as poor imagers when measured by existing self-report inventories. Subjects generally report moderate to excellent imagery abilities, mandating that future investigations list mean ability scores for the subject sample and the cutoff points used to differentiate good and poor imagers.

#### Methodological Issues and Research Needs

The remainder of this review is devoted to an exploration of pivotal methodological

concerns that have hampered research on imagery in therapy. Tenuous theoretical assumptions about the function and nature of such imagery have been converted into design rationales that assure negative or inconsistent results. Several intriguing but unexamined theoretical and empirical concerns associated with psychotherapeutic imagery are also discussed to highlight the need for organized and systematic programs of research into the significance of imagery in the behavior and attitude change process. In general, these issues question the adequacy of current methods for assessing psychotherapeutic imagery and the intrapersonal factors that may mediate the format or content of covert representations.

#### *Imagery Assessment*

The difficulties associated with imagery assessment pose a significant obstacle to clinical research, particularly with respect to the relevance of questionnaires, state and trait aspects of imagery, imagery as a learned ability, confirming therapeutic manipulations of imagery, and differences in image clarity that occur as a function of emotional arousal.

Empirical efforts directed toward resolving the problems associated with imagery assessment by self-report involve three interrelated issues. First, the question of comparability implies that there is no way to know whether one person's definition of vivid or dim imagery corresponds to that of a second person (McLemore, 1976). Since this concern emerges in the context of the individual differences hypothesis, it represents a methodological restraint that can be resolved only when the objective performance correlates of vivid imagery are isolated.

The second aspect of this assessment issue is the failure of previous investigations to identify a performance measure of imagery ability (Danaher & Thoresen, 1972; McLemore, 1976; Rehm, 1973; Rimm & Bortrell, 1969). With the exception of one investigation (Rehm, 1973), little has been done to examine an equally significant question. What is the relation among clinical imagery, laboratory performance tasks, and various self-report measures of visual imagery? Rehm found a modestly significant

relation between self-reported imagery ability, as measured by the Betts Questionnaire Upon Mental Imagery (Sheehan, 1967) and performance on an analogue clinical imaging task. Interestingly, clinical scene vividness ratings and self-report did not correlate with laboratory performance measures. However, the clinical utility of measures such as the Betts Questionnaire cannot be justified on the basis of a single study, and replications of this investigation are urgently needed.

A final aspect of the questionnaire problem is the psychometric acceptability of existing imagery inventories. Research (McLemore, 1972, 1976) revealed that the Betts Questionnaire withstands psychometric scrutiny better than might be expected, even though earlier results indicated that this measure might be moderated by a social desirability bias (DiVesta, Ingersoll, & Sunshine, 1971). Evidence also supports Richardson's (1969) hypothesis that image vividness and image controllability are factorially separate dimensions (Hiscock, 1978; McLemore, 1976). Unfortunately, the Gordon Imagery Control Scale, the only existing measure of this ability, consistently exhibits a number of undesirable psychometric properties, such as unstable relations to other self-report imagery measures, sex differences, and a social desirability response bias (Hiscock, 1978; McLemore, 1976). These shortcomings may be linked to the yes-no-uncertain scaling format that is currently used to assess image controllability. We believe that the Gordon Scale would be more acceptable psychometrically if the present scaling format were revised, a project currently under way.

An issue not yet addressed by clinical investigators is whether existing self-report measures of imagery ability assess clinically relevant (molar) dimensions of imagery capacity. One also may question whether laboratory performance measures of vivid imagery would reflect the same capabilities required for effective clinical functioning. For example, Danaher and Thoresen (1972) attempted to relate scores on the Betts Questionnaire to performance on the "block test" (Sheehan, 1966a), a low-level cognitive task that primarily requires spatial/reproductive memory imagery. As has been stressed re-

peatedly, there is little empirical justification for positing that laboratory and therapeutic imagery involve identical cognitive processes, although some overlap can be expected. Paradoxically, the self-report measures used in clinical investigations of imagery in therapy were developed primarily for laboratory research and only for the assessment of molecular abilities (Gordon, 1949; Marks, 1973; Sheehan, 1967). The present state of imagery assessment suggests that attempts should be made to construct measures that are specifically designed to assess the imagery abilities required during therapy. Investigators are advised to focus assessment efforts on molar imaging operations because of their proximity to the subjective operations underpinning the behavior change process.

A developing issue in the clinical literature pertains to differences between maximal and typical levels of imagery functioning (McLemore, 1976). In general, existing self-report instruments encourage optimal performance, but it is not at all certain that similar performance levels are maintained over or even within treatment sessions. Hence, assessing imagery as it occurs appears to be an essential research strategy, and because of its proximity to events that initiate the therapeutic change process, it should provide additional information about the clinical impact of imagery. The initial evidence generated by state assessment techniques has been equivocal, as both significant (Dyckman & Cowan, 1978; Strosahl et al., Note 2) and insignificant (Kazdin, 1975) relations to treatment outcome have been reported. The nature of state assessment procedures also introduces thorny methodological problems for clinical researchers. For example, Kazdin's research (1975, 1976) indicated that image content may be as important as image quality in therapy, suggesting that the goal of assessment (i.e., how vividly versus how well one can image the scene) and the methods used to elicit subject response are important considerations. The verbal narrative method used by Kazdin seems well suited for strategies that do not use relaxation training, but this method may be intrusive when relaxation is used concurrently with imagery. Empirical efforts are needed to delineate as-

assessment strategies that are appropriate for a specific subclass of therapies.

Curiously, we have been unable to locate research examining the possibility of learning effects in imagery ability. This is not surprising in laboratory research, since performance studies tend to be one-shot designs, but again some clinical research designs incorporate laboratory assumptions of questionable relevance. Obviously, the issue of imagery as a learned ability is a crucial clinical question, since pretreatment assessment of imagery has been the predominant strategy in investigations to date. In an empirical evaluation of the learning effects hypothesis (Strosahl, Ascoug, & Mariotto, Note 3), we examined changes in the imagery ability of test-anxious subjects undergoing two imagery-based behavior therapies: systematic desensitization and covert modeling. On the basis of scores on the Betts Questionnaire, subjects in these two conditions were partitioned into two groups, good (Hi) and poor (Lo) imagers. Waiting-list-control and relaxation-training-only subjects were grouped to form a control condition (WL). Analysis of pre- and posttreatment Betts Questionnaire scores provided considerable evidence for the presence of a learning effect: Lo subjects improved significantly on four of the seven Betts modality subscales, and the overall result was a highly significant main effect for the total Betts scores within this group ( $p < .01$ ). Hi and WL subjects showed no gain in imagery ability. Although the rival hypothesis that verbal response set simply influenced scoring on all self-report measures at posttreatment cannot be ruled out entirely, two factors mitigate against this position. First, no change in ability was noted in the Hi group, although anxiety reductions were comparable for Hi and Lo subjects. Second, Hi subjects whose pretreatment scores approached the floor of the Betts scale were excluded from this analysis to remove artificial constraints on change variance. Thus it is unlikely that this group failed to change because of a floor effect.

The presence of learning effects qualifies research data pertaining to the individual difference hypothesis. A fundamental assumption of pretreatment imagery assessment is that the ability levels of subjects re-

main stable during treatment, although imagery treatments provide de facto training over the course of therapy. A more efficacious strategy may be the use of statistical models that can illuminate the concurrent contributions of several facets of imagery ability assessed both at pre- and posttreatment. Moreover, the question of imagery ability as a pretreatment predictor of outcome must be distinguished from the issue of changing imagery ability as a process variable during therapy. The former argues for a stable contribution of imagery ability across treatment; the latter suggests that changes in imagery style and content may be related to the degree of therapeutic change.

What are the implications of data which show that persons spontaneously elaborate clinical images and benefit from this mode of cognition in ways that are quite individualized (Kazdin, 1975, 1976; Weitzman, 1967)? To illustrate, Kazdin (1976) found that roughly 50% of subjects undergoing two covert modeling treatment variations invoked elaborative imagery during scene visualization. Interestingly, 10% of the subjects in a nonassertive covert modeling condition were introducing material that made the covert model *assertive* in nature! Alternatively, we found that subjects may use various defensive maneuvers (i.e., wandering to irrelevant scene details, premature erasure) to keep scene-associated anxiety within tolerable ranges (Strosahl et al., Note 2). The presence of image defense strategies indicates that subjects also may simply refuse to comply with therapist instructions via conscious avoidance behavior (Horowitz, 1978). Thus evidence to date suggests that clinical procedures for eliciting imagery are naive and embarrassingly uncontrolled (Mahoney, 1974), a factor that qualifies the vast majority of empirical literature pertaining to process and outcome variables in imagery-based therapies. Without tangible documentation that presumed manipulations of imagery have actually occurred, the argument that a specific therapeutic approach has been successfully instituted is tenuous.

Rather than hampering clinical research, the issue of external control over imagery can be used to generate evidence for the va-

lidity of key process assumptions for many imagery-based techniques. For instance, one could address the importance of elaborative imagery as a determinant of therapeutic outcome. Theoretical models could be examined by comparing the therapeutic success of subjects who conform to imagery instructions with subjects who deviate in the structure and content of imagery. Our position is that scene elaboration is an essential facet of therapeutic imagery, and therefore persons who do not use multiple representational strategies may not benefit optimally in therapy. Data reported by Kazdin (1979) provide support for the importance of elaborative imagery in successful therapy.

The image disparity effect refers to degradations in image clarity that occur as a function of negative arousal linked to a visualized scene, an effect observed in recent studies (Haney & Euse, 1976; Strosahl, Note 4). Image disparity may be a defensive operation that is related both to the emotive valence of scene content and to personality variables such as anxiety, extraversion-introversion, and neuroticism (Euse & Haney, 1975). The presence of image degradation not specifically attributable to a general imagery ability leads to two important research questions. Framed within the individual differences tradition, the degree to which image integrity is degraded or upheld under conditions of negative arousal may be a meaningful predictor of therapeutic outcome. From the perspective of imagery assessment, image clarity differences mandate that some form of state imagery assessment procedure be used in research designs. Moreover, image clarity differences highlight the inadequacy of existing self-report imagery measures, since these instruments do not assess imagery ability under conditions of emotive arousal. The image disparity effect also suggests that state influences may be related to outcome variability within various dimensions of a single target complaint because a subset of scenes imagined with insufficient integrity may not facilitate effective molar imagery for those scenes.

Technical recommendations for pretreatment imagery training may evolve from empirical examination of image disparity characteristics. For example, Kosslyn (1978)

reported that spontaneously generated images seem to be constructed at near maximal size with respect to the limitations of the imagery field. Threatening scene descriptions may elicit images that are too large for concentrated internal focus. Thus training could refine a person's ability to generate small images that could be maintained within the central focus of the imagery field. In general, the structural aspects of clinical imagery remain poorly delineated, and consequently the contributions and necessity of pretreatment imagery training in imagery therapy remain empirical issues.

### *Intrapersonal Factors*

Intrapersonal factors can be distinguished from assessment issues in that, given reliable and valid assessment techniques, one might still observe individual variations in the content or format of imagery as a function of cognitive style, sex, or age. Hiscock (1978) proposed that individuals can be differentiated with respect to the higher order information-processing styles that they habitually use to perform routine cognitive tasks. Briefly, certain persons rely on visual/spatial representational strategies, whereas others use verbal/abstract processing strategies, a hypothesis similar to the traditional visualizer-verbalizer distinction. The clinical significance of this proposal is not clearly discussed by the author, but the construct validity data presented for the Individual Differences Questionnaire (IDQ) reveal a discontinuity in the abilities defined by this measure of cognitive style and the Betts Questionnaire. Of particular importance is the absence of a relation between the Betts Questionnaire visual modality subscale and the visual scale of the IDQ, a finding consonant with the molecular molar imagery distinction. An intriguing empirical question is the degree to which the visual and verbal subscales of the IDQ reflect clinically relevant processes and, further, their relationship to success in therapy.

Some preliminary data relating to the first question was obtained by Ruffett (1980). Subjects were instructed to perform a clinical imagery task that involved visualizing, respectively, negative, negative, neutral, and negative

scenes. Intertrial periods allowed physiological indices to return to baseline levels. Prior to this task, subjects were administered the Betts Questionnaire, the IDQ, and social desirability and trait anxiety measures. Correlations of interest involved the self-report indices and state vividness ratings obtained from each subject immediately after a visualization period. The Betts Questionnaire correlated modestly with each of the three scene vividness ratings, a finding that replicates results reported by Rehm (1973). Conversely, the visual and verbal IDQ subscales correlated with the first scene vividness rating but not with ratings for the second and third scenes. Unfortunately, the visual subscale of the IDQ correlated with the social desirability measure, whereas *both* the Betts Questionnaire and the IDQ were moderated by trait anxiety levels. Thus examination of the IDQ as a clinical measure produced disappointing results, and the question of response biases in imagery self-report is once again raised. Although the IDQ has not been related to therapeutic outcome, we hold that visual and verbal cognitive styles are equally important and mutually compensatory during clinical imagery, provided that severe limitations are not placed on the activation of either representational system. Thus cognitive style should be only one of several imagery abilities that act as determinants of therapeutic outcome.

An unexplored question in clinical research is the influence of sex factors in the image construction, elaboration, and appraisal process. There are indications in the information-processing literature that sex differences in imagery ability predict performance differences on selected tasks (Ernest & Paivio, 1969, 1971; Marks, 1972), although negative results also have been presented (Ernest & Paivio, 1969). In addition, Hiscock (1978) reported that sex differences were observed on the Betts Questionnaire, with females reporting more vivid sensory modality imagery than their male counterparts. With one exception (Kozak & Lang, Note 5), the clinical literature is devoid of empirical efforts in this area.

We examined the possibility that different imagery abilities might predict the therapeutic success of male and female subjects

(Strosahl et al., Note 3). Residual gain scores of male ( $n = 14$ ) and female ( $n = 15$ ) subjects were correlated with scores on the Betts and Gordon scales administered before and after treatment and three experimental questionnaires that we constructed to assess specific aspects of molar imagery ability. The new measures were administered at pretest only. The Abstract Image Inventory (AI) evaluates the ability of respondents to formulate abstract relations between imaged objects, a task that we assumed would reflect verbal/elaborative imagery ability. The Emotive Image Inventory (EI) measures the capacity of subjects to experience emotional reactions in response to imagining a written scene. The Positive-Negative Image Differential Scale examines image vividness for a series of highly negative and positive scenes. Psychometric data related to these measures are now being analyzed.

Surprisingly, different imagery abilities were implicated as determinants of treatment outcome. Females showed a preference for the concrete modality imagery assessed by the Betts Questionnaire. In contrast, the AI score correlated significantly with the outcome of male subjects, suggesting that verbal-elaborative imagery was important for these individuals. The Gordon scale was also related to the therapeutic success of male subjects, and we cautiously speculate (in light of psychometric limitations) that image control might be a requirement for the generation and maintenance of abstract imagery. Comparisons of male and female prime order correlation matrices indicated that the AI discrepancy was a marginally significant sex difference ( $p < .06$ ), whereas comparisons involving several Betts subscales and the Gordon scale could be classified as showing a nonsignificant trend ( $p < .12$ ). Thus sex differences were not convincingly demonstrated in terms of prime order correlations. An interesting result from the point of view of our model, however, was that the EI correlated comparably highly for males and females, generating the hypothesis that emotive arousal may have been the subjective end product of distinguishable image construction and processing operations. It must be stressed that these results are only suggestive, since the limited sample size and

inconsistent results necessitate a replication of these findings.

Developmental theorists hold that childhood development consists of a steady transition from concrete to more abstract representational processes (e.g., Piaget, 1932). In part, evolution of abstract reasoning is attributed to increased language capacity, which allows verbal information to be efficiently stored and processed. Effort has been directed toward illuminating performance differences in children of varying ages to comprehend how the verbal representational system evolves (Paivio, 1971). Evidence reveals that age is a factor in determining the functional significance of visual processing strategies, and the increasing application of imagery-based behavioral techniques to childhood clinical complaints (e.g., Kornbacher & Schroeder, 1975; Meichenbaum, 1977; Tasto, 1969) leads one to wonder whether children respond differently to imagery-based treatments as a function of age. Examination of the clinical imagery characteristics of young children could provide clinicians with valuable treatment prescriptions and illustrate the progressive contribution with age of verbal elaborative processes to the outcome of image therapies.

### Discussion

We have argued for an approach to the topic of imagery in psychotherapy that is consistent with experimental and clinical research data. A substantial information-processing literature indicates that more information is conveyed in a mental image than would be possible in a simple photographic reproduction. Specifically, images may convey the abstract or affective properties of persons and objects, and it appears that the visual and verbal processing systems may work concurrently to process the information generated in an image. This suggests that it may be necessary to revise the photograph model in the direction of one that envisions imagery as a multiple representational process. This model retains simple reproductive imagery as a facet of the imagery sequence, but it is how the individual transforms and reevaluates the image that is the central determinant of therapeutic outcome. In turn,

a greater range of cognitive operations is required for effective imagery than is acknowledged in the majority of existing theories.

A sound technique for imagery assessment should be developed. Researchers should attempt to identify what relation, if any, exists between imagery ability as defined by self-report and the imagery performance characteristics observed in vivo in the therapy setting. In general, our understanding of the functional and structural properties of clinical imagery is woefully deficient, to the extent that investigators may have put the cart before the horse by attempting to study imagery in therapy without a firm conception of its properties or adequate assessment techniques. It is hoped that presentation of these issues will stimulate both conceptual and empirical advances in the field of imagery in psychotherapy.

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