Comprehensive Textbook of Psychiatry-Ⅱ

VOLUME 1  SECOND EDITION

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The Williams & Wilkins Company
BALTIMORE
In a classroom a professor attempts to explicate and form concepts, primarily by means of verbal examples and linguistic transactions that on a symbolic level may be analogous to groupings, sorting, inclusion, and exclusion. Thus, in a lecture on psychodynamics, he may refer to particular examples of behavior involved in denial, projection, and repression and try to distinguish among these mechanisms. In every case, he may cite examples of behaviors that do not qualify. He can then try to construct the more inclusive concept of defense mechanisms. The student, after leaving the classroom, may think of additional instances, positive or negative; he may puzzle over certain attributes such as the nature of unconscious mechanisms; and on the final examination the student finds out whether the rule he induced is adequate.

In principle, the creation of any category implies the existence of at least one other (a, not a); but in practice, concepts are often better learned, defined, and integrated with other concepts when positive instances are used (Bourne, 1966). This tendency may be partly cultural and partly logical. The total set of positive instances may be intuitively smaller than that of negative instances. In many circumstances, positive examples are more informative. Pork chops, salt crystals, and eggs do not themselves form a very useful subcategory of food; therefore, an alternative category is not easily coded. Similarly, it would be difficult to find the perfect case history to show non-denial behavior. Sometimes, however, when the entire situation is well outlined, negative instances can be effective. For example, in sorting tasks in which a number of attributes have to be assessed for their relevance and in which the rule is suspected of being a simple one, a sophisticated subject may select an example that combines several attributes at once. If, by trying that single example, he learns conclusively to eliminate several dimensions, he has greatly simplified the task (Bruner et al., 1956). Moreover, some fairly abstract concepts, such as moral goodness, are imparted primarily by citing negative instances. Some diagnostic procedures are illustrations of residual categories, reached by eliminating specific signs and symptoms.

The usual procedure in concept-learning experiments involves presenting the subject with exemplars one at a time in a predetermined or random order. In each trial the subject attempts to classify the stimulus—for example, as belonging to the positive class or not. Each time he can observe only the particular attribute values that are present on that trial. This procedure places a premium on the subject’s memory of information gained gradually over a number of trials.

A second procedure, due more recently to Bruner but familiar from sorting tests in the psychopathology literature, is the selection paradigm. Here the full set of stimuli is exposed all at once, and the subject freely selects instances for inspection and classification and for feedback as to correctness. This method more fully reveals the subject’s strategy, his hypotheses at various points, his initial tendencies—for example, to focus on color, rather than shape, which is a characteristic of young children—in other words, the way he goes about solving the problem. Cognitive psychologists who think of concept learning in terms of hypothesis testing or information processing find this paradigm rewarding. Those who emphasize hypothesis testing pay less attention to the control exerted by stimulus properties or even to the nature of the common elements themselves and more attention to the fact that subjects attack the problem with already learned habits and dispositions. Theoretically, when faced with a new problem, a subject decides to pay attention to one of all the possible attribute dimensions or to test one of the entire set of rules known to him. As the task proceeds, attentional or decisional shifts occur as needed. Those who emphasize information processing are especially interested in the way in which the series of trials unfolds and in assessing the power or efficiency of the subject’s cognitive behavior; how he learns from his mis-
subject, having learned the appropriate principle involving three jars, continues to do so when the task has changed, unbeknownst to him, so that using only two jars would yield an even simpler solution. Here is one of the paradoxes of this field of research. The ability to break one's set, to search far afield for new approaches, is taken to be a hallmark of highly intelligent behavior, and man is sometimes called the problem-solving animal. Yet adaptive behavior in general, whether by the individual or the species, often involves a different strategy. Where few or no costs are involved, successful behavior often means sticking with what works. This is important in the assessment of persons, for, after all, why should someone who expects to be able to solve a class of problems perfectly by using three jars recognize the problem in terms of only two? The seemingly rigid behavior of the mentally ill may often represent realistic caution in a stressful environment, rather than a lack of intelligence or creativity.

Certain other tests of cognitive flexibility are similarly artificial or ill controlled and yet have interesting aspects. This is true, for example, of productive or open-ended tasks like the metaphor test, in which the subject must give as many meanings as possible to a simple stimulus word. Here it is not success or failure that interests the researcher as much as the evidence that may be gained of the subject's preoccupations, the ordering of his subjective lexicon, his definition and standard of meaning-equivalence.

Concepts versus conceptions. Since concepts refer to classes of stimuli, they always represent a certain level of abstraction. Concepts vary in their degree of abstractness; for example, one says that "rock" and "hardness" are concrete and abstract, respectively, but it is evident that "rock" represents a concept that is already considerably abstracted.

Is classification in this sense the predominant way in which one brings order to his experience? Philosophers and psychologists have been sporadically interested in other possible kinds of conceptions, defined here as single instances of abstract mental representation. These conceptions are of various kinds but share the quality of seeming to be to some extent sui generis, forming categories of one, or varying in their degree of category membership. For most people, "home" or "mother" has a special personal meaning; to decompose that meaning would violate one's sense of reality. Other conceptions, especially those based on images, are highly embedded in an associative network, from which it is difficult to disentangle them. If one's image of architectural beauty is the Parthenon, it is probably the Parthenon from a particular angle of vision or bathed in moonlight, as one first saw it. Other conceptions simply seem to be best examples. A turkey is somehow less of a bird than a robin. Some conceptions seem sui generis because they have hypothetical or nonanalyzable referents; unicorn, God. The natural color categories that all human beings possess are difficult to explain in terms of the usual characteristics of concept formation. Category boundaries shift markedly with context, and there seem to be focal colors, common across many or perhaps all cultures, that are better exemplars of particular color categories than are other values (Rosch, 1973).

Whether these conceptions are thought of as prototypes, prime exemplars, canonical forms, critical features, or best figures, they all share the quality of having a central value surrounded by a range of variation or a core meaning surrounded by examples of lesser degrees of membership. This quality makes them essentially analogue categories, as opposed to the digital categories of concept formation (attribute: relevant/irrelevant; value: present/absent). There is no question of the truly logical nature of much concept formation, as experimentally demonstrated, but a variety of non-Aristotelian cognitive representations seem to deserve study. Challenging ideas about natural categories have recently arisen from anthropological studies of folk classification of plants and animals, kinship, color, and disease terms and in taxonomical studies of evolutionary biology and evolutionary linguistics. The notion of critical features has long been common in the field of perception as the basis for perceived similarity and perceptual grouping, as has the notion of best figures in the Gestalt tradition. Recent work on human development and person-perception has re-emphasized the salience of certain facial features and expressions. And work in neuropsychology in the past decade or so has located an impressive number of fine-tuned feature detectors in the brain that respond directly to highly specific environmental stimuli—such as particular wavelengths, visual contours, pitch relationships, phonetic difference in speech—revealing not only that the nervous system is much more complex and elaborately wired than had been thought but also that many assumptions about the essentially arbitrary nature of higher interpretive functions need re-examination. In particular, research on prime exemplars and natural categories could be strategic in advancing knowledge of cognitive aspects of psychopathology. Schizophrenic thought, for example, seems to be not so much internally disordered or inefficient as unusually oriented relative to conventional assumptions or frames of reference.

The most interesting questions to be asked may concern a memory stage or the internal structure of memory—the way information is organized between input and use (Bartlett, 1932). Recent work on the genesis of abstract ideas (Posner and Keele, 1968) demonstrates that subjects who must classify or learn a set of visual patterns that are random computer-generated distortions of a central-tendency figure that is never shown do, in fact, generate a mental representation of the prototype. The prototype, on its first appearance in a test situation involving recall, is recognized better than are the examples of which it was the central tendency. What is not clear is when the abstraction is generated—gradually, during learning trials; in a dynamic memory stage; or in the test, when the subject could identify the prototype figure, shown for the first time, as a particularly good example and treat it on subsequent trials as equivalent to memorized instances. However, a small increase in reaction time to the first appearance of the prototype stimulus suggests that either the second or the third of these is involved, both of which involve memory processes.

Renewed attention has also been paid recently to experimental work on imagery, which for many years had been neglected in scientific psychology as an improper vestige of introspectionism. This renewed emphasis is on the function of mental images—in what circumstances they are formed, in what time span, how they aid in problem solving and recall (Paivio, 1971). Images are currently seen to be important in their role as the equivalents of verbal mediators—that is, as modes of symbolic representation that permit association, recombination, and generative processes in cognition. The crucial problem with such formulations—in fact, with all mediation formulations—is how the mediator takes on or leads to the correct meaning in the particular instance.

Developmental approaches. Developmental work on cognitive processes, although extremely diverse and difficult to interrelate, is inherently of great importance. Since at its best it can partially lay bare mental processes and structures in the course of formation, it militates against the quality of self-evidentness that makes the examination of mature thought difficult. Because such research tends to be both normative and accretional—that is, revealing patterned sequences and stages of
ment of a child's mental development than does Piaget's and is more solidly empirical. Probably because of this fact Bruner, who is keenly interested in general formal abilities, such as rule-governed behavior, has by no means ignored specific contents and context in investigating children's actual attainments. Furthermore, for Bruner, cognitive stages succeed each other—that is, appear in an orderly sequence in development—but do not replace each other. Adults have access to all three modes, and the full richness and productivity of adult thinking are due to the interplay and simultaneous processing among these modes. And Bruner attaches far more importance to language than does Piaget. For Bruner, the basic structure of thought is linguistic, involving fundamental experiential relations, such as agent/object, transitive/intransitive, active/passive, discrete/continuous. In his view, language develops in advance of other forms of cognitive behavior and acts as a catalyst for their development; in adulthood, language is the primary form in which thought is conducted, so that it guides and amplifies thought. Bruner probably would not find the question, "How do I know what I think until I hear what I say?" a trivial or unrealistic one. Although Bruner does not claim that all thought is conducted linguistically, he points out that much information is imparted and acted on entirely by linguistic means, especially but not exclusively in adulthood. Consider story telling and its part in the cognitive development of the child, as well as the prevalent character of instruction in higher education. He holds that the conflict between description of reality and perceived reality causes cognition to alter or to advance—to be restructured or for subsuming principles to be found—and that often it is only by verbalizing the problem that many problems are conceptualized, let alone solved. With the former claim, at least, Piaget would, no doubt, diametrically disagree.

Language and cognition. The presumptively intimate relation between linguistic behavior and cognitive behavior is a topic that has deeply concerned philosophers, especially those epistemologists—Aristotle, Descartes, Locke, Kant, et al.—regarded as being in the main line of thought leading to scientific psychology. Psychopathologists, too, know that the pathological thought processes of schizophrenics, for example, are often or usually inferred from bizarre or disordered language behavior.

In the past two decades, the development of psycholinguistics as an experimental subdiscipline concerned with linguistic behavior of the individual, together with influential forms of linguistic theory that put special emphasis on the linguistic knowledge of the native speaker and on the acquisition of language, have meant that more detailed attention has been given to various questions about language and cognition than perhaps ever before. One result has been a sophisticated approach to describing the underlying intuitive linguistic knowledge that enables the speakers of a language to communicate with each other. Linguists refer to this knowledge as the grammar of a language.

The implicit controversy between developmental stage theories, like Piaget's and Bruner's, over the relative rate of advance of linguistic and cognitive development has been mentioned. Few theorists hold that linguistic and cognitive processes are essentially the same thing. It is reasonably clear (Furth, 1971) that congenitally deaf persons, who never fully master the grammar of the language of their society, nevertheless master the essentials of thinking, reasoning, and the like, which may be evidence against Bruner's position, although much depends on definitions of terms and the specific...
Generative semantics involves a fundamentally different set of assumptions but retains the idea of deep versus surface interpretations and the idea of transformations.

In brief, those identified with the semantic movement, either in current linguistics or in cognitive psychology, give priority in grammar to the meaning of the utterance, holding that syntactical, lexical, and phonological rules are developed primarily to express meaning. To the syntactician, uncovering the deep structure of the sentence, "They are eating apples," accounts for the ambiguity without specifying the semantic interpretation. To the semanticist, the most obvious way to determine the syntactic structure is to take account of the meaning; in fact, if the meaning cannot be accounted for, the syntactic structure cannot be determined. As for actives and passives, the semanticist points precisely to the subtle shades of meaning revealed in each form. "The boy was hit by the truck" is held to emphasize the kind of thing that hits the boy, in a way that the active form, "The truck hit the boy," does not impart. The passive sentence form is usually processed psychologically in a more laborious or inexact way than is the active form—for example, in recognition memory or reaction time—thus supporting the idea that it is less basic, that it is transformed. But under appropriate contextual circumstances this is not the case (Olson and Filby, 1972), suggesting that actual cognitive processing of these passives by reduction to and then retransformation from the base structure is not necessary.

TG theorists hold that semantic interpretation is a relatively late or subsidiary stage of the generation or comprehension of sentences. Furthermore, specific semantic evaluations, as required by syntactical form, are relatively trivial and are handled by a separate means. Lexical entities, in the course of experience, become marked with the appropriate semantic properties. Thus, "boy" carries with it the necessary implications of male, human, young.

Research by Clark and Card (1969) suggests that lexical marking is an important phenomenon but that syntactic theory does not necessarily handle it. For example, in many paired terms (man, woman; large, small), one term is more general (man, large) in its range of reference, and the other is narrower in its range or more distinctive (woman, small)—hence, marked in a second sense. The comprehension of sentences and probably their construction in spontaneous language reflect these subtle referential differences. Then, too, the TG position that semantic interpretation is a separate and relatively superficial domain and that it consists of the user's learning necessary properties or features implies that sentences like, "My son is a young boy," are, formally, tautologies and, hence, meaningless. This implication is questionable. These considerations, together with some of those mentioned above, show that the semantic domain is limitless and that no lexical item can ever be finally and definitively marked. Much of what is involved in constructing sentences—length, complexity, word order, and syntax—may be an accommodation to semantic imperatives—associations, implications, presuppositions—of the meaning that is to be conveyed.

The theoretical position of generative semantics goes beyond the problems of analytical sufficiency inherent in TG grammar: it amounts, in its strongest form, to assigning priority or at least equal status to meaning, to what a sentence is going to be about. Once again, evidence from first-language acquisition is relevant. The general theoretical position is that the small child uses the language he hears as a gloss on the events that he already comprehends in other ways. He attends first to the most prominent lexical items in those sentences, infers their referents, then compares linguistic regularities (structure) to the already appreciated structure of events, objects, and so on in his nonlinguistic environment. As his nonlinguistic experience accumulates and reaches cognitive representation, it is progressively easier for him to work out, from his knowledge of what is going on, the main semantic intentions of speakers and thus to master elementary grammatical rules—for example, word order somehow expresses who is doing what to whom. When he himself begins to use language productively in direct communication with others, his more advanced or more abstractive attempts to express linguistically what he comprehends otherwise are confirmed, disconfirmed, or guided by his interlocutors, especially when what the child is talking about cannot be checked by the child himself against ongoing events (Macnamara, 1972). Brown (1973a) points out, in developing a similar argument, that, in all languages thus far studied, children at the earliest stage of acquisition, beyond the production of single words, deal almost exclusively with a small, regular set of semantic relations and appear to try to express particular meanings, even in their earliest sentences. Roughly speaking, these relations correspond to the sensorimotor schemes of Piaget's first stage.

Schlesinger (1971), in claiming that semantic deep structures are the child's first basic level of acquisition, emphasizes that the child first understands binary relations, such as actor-object, by inferring the parent's semantic intentions. (The corresponding syntactic relation, subject-predicate, is more abstract than the semantic relation, since not all subjects are actors, and not all predicates are objects.)

It remains to be shown to what extent children really do grasp semantic intentions and perform the kind of structural analysis that is summarized here. It is unlikely that deep syntactic and deep semantic processes or forms can be absolutely differentiated. However, certain generative-semantic formulations of normal adult language, where one would expect the two realms to be even more interpenetrated, are remarkably consonant with the acquisition model suggested above. For example, Fillmore (1968) assumes an underlying semantic sentence structure built on the case relation (or proposition) of a verb and its surrounding nouns. The proposition as a whole is modulated to express mood, tense, negation, interrogation, and so on. Cases themselves are relations involving agent, object, indirect object, location, and the like, and these are substantially the subject matter of the stage I speech of the children studied by Brown. In Fillmore's view, cases "comprise a set of universal . . . concepts which identify certain types of judgments about such matters as who did it, who it happened to, and what got changed."

The innate-learned controversy and the syntactic-semantic controversy do not logically reduce to the same thing. However, the semantic position presently seems more open to explanations involving gradual, situationally relative, or environmentally directed processes than does TG grammar. The semantic position also provides more opportunities for experimental verification.

To generative semanticists, meaning units combine and condition each other, and the role of syntactic transformations is primarily to coordinate meanings in well formed sentences. The sequential, hierarchical, and implicatory coordination of meaning that language provides, if this model is at all correct, may remind one of the familiar notion that thinking is a matter of coordinating concepts (reordering, collapsing, combining) or that having an idea involves fitting a particular example to a pre-existing structure, thereby slightly altering the structure. In the notion of semantic features or markedness, there may be suggestive parallels to the kind of distinctive conceptions, as opposed to logical classes, discussed above. Again, linguistic as well as nonlinguistic cognitive processes and structures can be investigated to especially good effect through research on
abstractive hierarchy is erected from attributes by a consideration of possible relations among attributes. Abstraction from possibility is the recognized method for extracting implications from assumptions, as in logic, law, philosophy, and mathematics. Whitehead points out:

Simple external objects represent the extreme of abstraction from an actual occasion, whereas [they] represent the minimum of abstraction from the realm of possibility. It will, I think, be found that, when a high degree of abstraction is spoken of, abstraction from the realm of possibility is what is usually meant—in other words, an elaborate logical construction.

Many schizophrenics can evolve rather elaborate logical constructs (abstraction from possibility) but fail on conceptual tests because they are unpredictable in abstraction from actuality, often defining category boundaries in an unusual fashion or selecting an incidental attribute as a basis for classification, rather than a commonly recognized property. In this respect, their behavior shows high eccentricity but not necessarily low abstract ability.

In an experiment by Chapman and Taylor (1957), schizophrenics were asked to sort cards bearing the names of fruits, vegetables, and birds. The correct category, as established by the first card shown to the patient by the experimenter, was fruits—that is, fruits were to be separated from vegetables and birds, which together made up the complementary category. The patients sorted fruits into the experimentally designated category but also included vegetables—although not birds—to a far greater extent than did normal subjects. Thus, the schizophrenics were overinclusive in their categorizing but in a manner that showed that they were responding to commonalities across stimulus classes (fruits, vegetables) that are conceptually and culturally of high probability but in this case irrelevant. In a second part of the experiment, schizophrenics were given the same cards and asked to sort edibles together—that is, to include fruits and vegetables in the same category and to exclude birds. The first trial, performed by the experimenter, showed only a fruit being so categorized, thus potentially biasing the patients’ performance toward including only some edibles, falsely excluding vegetables, but the schizophrenics performed about as well as normal subjects. The experiment shows several important aspects of schizophrenic conceptual behavior. First, it shows the patients’ conceptual ability to be adequate under certain nontrivial conditions, and it shows their ability to think abstractly. The second test, with its basis in edibility, was at least as demanding in this regard as the first. Second, it shows the often noted tendency of schizophrenics toward a loosening of conceptual boundaries and toward overinclusion. Here the results are evidence for the overinclusive pattern, first offered by Cameron (1938) as typical of schizophrenics, rather than a corresponding claim for overinclusion, put forward by Goldstein (1939), who suggested that schizophrenics, like brain-damaged patients, are stimulus bound, rigid, and overconcrete in their thinking. Most experimental evidence in schizophrenia argues against the notion of concreteness; as for the issues of inclusive-exclusive, a number of authors (Chapman, Broen) have pointed out that this issue depends on the content of the negative category or categories and the kind of linguistically or culturally mediated response interference—that is, logical equivalence or similarity of attributes—created in the experiment, as well as on recent life experience. The experiment also shows errors that are far from random either in the sense of being sporadic in a given subject or in the sense of being uninterpretable. However, schizophrenics do vary in their propensity toward overinclusion, and it appears that the behavior is most typical of acute, reactive, early schizophrenics. Chronics generally appear normal, narrow focused, and underinclusive on tasks like these. But here it is difficult to separate conceptual from motivational factors or those involving task comprehension (Payne, 1962).

What is the likely basis for the kind of overresponsiveness, response interference, loosening of conceptual boundaries, or the like that may be demonstrated here? Bleuler (1950) suggested that in schizophrenia the psychic functions are split or fragmented, that associations are loosened in their stability and influence, and that thinking becomes unguided. Loss of total context means an interference with the proper selection of appropriate associations from all existing or potential associations. In general, Bleuler’s theory and the work of his followers are in accord with finding errors of schizophrenics to be associative errors and with the idea that schizophrenics as a group and as individuals are more variable than are normal subjects. It focuses, that is, on response disorganization and the loosening of boundaries. Cameron’s somewhat similar theory, which particularly stresses social disorganization, predicts that conceptual looseness is most notable with socially toned or socially experienced tasks and materials. There is much evidence that this is so but no proof that only socially governed experience is most susceptible. Neither theory, however, suggests why particular patterns of associative error, such as overinclusion, should occur.

Chapman and Chapman’s more recent theory (1965) emphasizes the predictability, as to content or form, of schizophrenic errors, which amounts to saying that, far from all associations being haphazardly weakened, some are relatively strengthened. Their view is that schizophrenic errors are an exaggeration of normal association biases and, in particular, reflect or are mediated by dominant meaning at the expense of subordinate but contextually more appropriate ones. The Chapman’s theory is, thus, a semantic one, and most evidence for it comes from experiments with verbal materials. However, the importance of words as mediators, and the close relation in conceptual behavior between habit-family hierarchies and meaning or verbal-association hierarchies, offer a potentially rich field of application for the theory.

Dominant meaning responses, as an interpretation of observed schizophrenic errors in language and language-mediated behavior, is a difficult notion to specify. It does not refer to statistically most probable word associates or verbal responses; if it did, schizophrenic behavior would be described as statistically predictable or even stereotyped, which it is not. The notion has to encompass over-determined or formulaic responses (black: white; father: son: Holy Ghost), responses that are easily available but too loose or at too high a level of superordination for the situation (a bicycle is the same as an airplane because one can go places on both of them). This is the sense that best accommodates the evidence of overinclusion studies—for example, the semantic compound “fruits and vegetables” predominating over the narrower category, and meaning responses that reflect, quite dramatically, the special mental experience of the subjects involved (obsessions, distortions, idées fixes). The suggestive power of the theory can best be put negatively: The associative hierarchies or lattices of normals’ and schizophrenics’ meaning responses are substantially the same, but normal persons, unlike schizophrenics, take into account the total context. Thus, normal persons are able to bypass the dominant (most probable or most readily available) response or mediator and use the weaker but more appropriate one; they are able to assess the necessary level of generality or abstraction more appropriately, to separate personal or situation-bound meanings from those in the common cultural realm.

The Chapman’s theory seems to account for a number of observed behaviors—for example, the schizophrenics’ tendency to call similar things identical or synonymous, overlooking fine distinctions or shades of meaning; to fail to understand the difference between literal and metaphorical meanings; to fail to comprehend puns or other verbally ambiguous material; and to make antonym substitutions (“hot” for “cold”; each is a high probable covert meaning response for the other but only in some circumstances is a suitable replacement). The theory can correctly predict both overinclusion (grouping things together inappropriately when the dominant meanings are the same) and overinclusion. In the case of overinclusion, when the basis for inclusion is
structured interviews for assessing psychopathy (Spitzer et al., 1964).

Dismayed by the bankruptcy of clinical testing, researchers turned to the classical categories of behavior into which experimental psychology had classified human behavior responses—physiological, sensory, perceptual, psychomotor, and conceptual (Burdock et al., 1958). Researchers also specified the kind of stimuli that psychologists applied to elicit these responses under controlled laboratory situations and leaned in the direction of selecting those techniques that minimize prior experience, since they felt that the experience of the schizophrenic is so different from that of the normal person that the results would not be comparable. Experience played such a prominent role in performance that researchers tried, as far as possible, to deal with responses that occurred within the first 1,000 milliseconds after stimulation, hoping that responses occurring with such rapidity would be touched by prior experience to a very small degree, if any (Zubin and Kietzman, 1966).

Generally, the early literature often came to the conclusion that the mentally disordered person suffering from a functional disorder is relatively intact in his sensorium but that his mood or thought or volition is disturbed. In fact, schizophrenia is defined in terms of deviant behavior occurring in a person with a clear—that is, perceptually intact—sensorium. Generally, early work found that the simple sensory thresholds of the mentally disturbed do not differ from the thresholds of normal subjects. Only in more complex tasks involving sensory, perceptual, and conceptual processes were differences observed, mostly to the detriment of performance in the mentally disordered (Maher, 1966; Salzinger, 1973). However, most of these defective performances, when examined, could usually be attributed to lack of motivation, attention, or comprehension of the task—characteristics that are frequently found in the mentally disordered and that can be observed more readily without elaborate testing. Much of the early literature on psychophysical measures in schizophrenics, for example, reported significant differences between them and normal persons, but, when signal detection techniques were applied, these differences were found to reflect differences in criterion, rather than sensory differences. The newer findings, however, present a new perspective on perceptual processing through the senses in normal persons, as contrasted with the mentally disordered.

SENSORY-PERCEPTUAL RESEARCH AND PSYCHOPATHOLOGY

The current view is that some psychiatric patients display unique or malfunctioning sensory and perceptual behavior. The more obvious differences between patients and nonpatients in such sensory phenomena as hallucinations illustrate this fact. The literature, both scientific and autobiographical, contains numerous examples of patients' reports of profound changes during psychiatric illness, particularly during the early stages (Gross and Huber, 1972). Reports by McGhee and Chapman (1961) and by Silverman (1969) have documented some of these changes and have even suggested how patients experiencing such changes may, in an interaction with their environments, develop additional symptoms. These studies also show that, in the course of psychiatric illness, from its onset to periods of remission or recovery, sensory changes of a variety of types may be displayed by patients.

Although there seems to be little doubt that some psychiatric patients do experience profound sensory and perceptual changes during their illnesses, numerous complex difficulties arise when scientific attempts are made to measure these differences precisely and to interpret their significance unequivocally.

Difficulties and limitations. Numerous researchers (Allport, 1955; Garner et al., 1956) have stressed that perceptual responses, by their very nature, are subjective; the interest is in what the subject experiences. Therefore, to obtain measures that are truly sensory or perceptual, one must use indirect techniques; an objective response measure does not always represent the best or even the most appropriate way to measure sensation or perception. It has been suggested that the most valid way to measure what is intrinsically subjective is to design experiments that use converging operations to measure the sensory and perceptual responses of interest (Garner et al., 1956). A simple model of stimulus-response relations in which only the relation between the energy presented to the subject and his corresponding response is investigated is no longer, in itself, adequate for describing the complexities of sensory and perceptual behavior. This consideration is particularly important in the area of sensory-experimental psychopathology, in which the behavior of the patient as a subject—his cooperation, his motivation, and his understanding of instructions—is not always under the same experimental control as that of normal subjects.

To evaluate sensory-perceptual research in psychopathology, one must ask the fundamental question: Is there any evidence that unequivocally demonstrates sensory and perceptual differences between psychopathological patients and normal subjects? Or instead: Is it not usually the case that apparent sensory differences are simply due to differences in such factors as motivation and cooperation or to various response biases of the subjects?

Consider, for example, the numerous studies that have attempted to relate the measurement of the critical flicker frequency (CFF) threshold to psychopathology. The voluminous literature on CFF (Landis, 1953 and 1954; Ginsburg, 1970) includes more than 2,000 investigations, many of which are concerned with differences among various types of subjects. Numerous CFF studies in the 1940's and 1950's suggested genuine sensory differences between psychiatric and normal subjects (Goldstone, 1954; McDonough, 1958), and this suggestion led several investigators to interpret such differences as being indicative of physiological differences or of differences in the rate at which psychiatric subjects can assimilate stimulus information (Miller, 1960; Lehmann, 1966). It seemed, at last, as though a systematic and sustained difference between psychiatric and normal subjects in the sensory domain had been discovered. Thus, it was with considerable chagrin and disappointment to experimental psychophysicists that a later series of investigations seemed to indicate that the observed differences in CFF between psychiatric and normal subjects were probably not sensory differences but, instead, were largely due to differences in the subject's response criterion, a nonsensory factor having to do with the subject's willingness to say that he saw the presented lights as flickering or fused—that is, a nonsensory factor (Clark et al., 1967; Clark, 1966).

Psychophysiology is generally characterized as having begun in the year 1860, with the publication of Liebner's book, Elements of Psychophysics, which outlined the fundamental problems and techniques of the field. One hundred years later, an influential article (Swets et al., 1961) introduced the theory of signal detection to the general, psychological scientific community. This theory represented a genuine challenge to earlier psychophysical theory and methodology. During the years since the Swets et al. article, numerous studies have used signal detection methods, and these studies illustrate the important fact...
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that are in some way fundamentally related to the psychiatric illness. This possibility could take a general form, similar to that suggested by Zubin and Sutton (1970). In trying to account for several minutes and seemingly unrelated sensory and perceptual differences between patients and normal persons, they stated that such differences may be the building blocks from which a psychiatric illness gets a start and on which further elaboration of the illness may grow. Broen (1968) also has suggested that a person's reactions to small differences in functioning can contribute markedly over an extended period of time to the development of severe psychopathology. An alternative but perhaps related exploration of the relationship between sensory differences and psychopathology suggests that a fundamental impairment in behavior pathology is in the person's information processing (Frith, 1973). In this case, sensory and perceptual responses would provide excellent techniques for investigating such an impairment, and differences in sensory and perceptual responses may help to clarify the nature of the information-processing disorder.

Approaches. There have been at least three general approaches to sensory-perceptual research in psychopathology, with each approach representing a certain research strategy and a particular theoretical emphasis.

Perceptual-personality approach. This approach to psychopathology has emphasized research using certain perceptual responses to measure aspects of personality. The plethora of research activity of this type in the 1940's and 1950's is well illustrated by the publication of such books as Personality Through Perception (Witkin et al., 1954) and Perception: An Approach to Personality (Blake and Ramsey, 1951). Generally, as personality-through-perception approach has stressed the investigation of normal subjects, although an implicit assumption is that there is a relation between the personality of the subject and his behavior, be it normal or abnormal. More directly held is the assumption that personality factors may be important in explaining abnormal behavior. Numerous attempts have been made to investigate different psychodynamic factors and mechanisms through perceptual measures. For example, the phenomena of perceptual defense and subliminal perception (Eriksen and Eriksen, 1972) have been interpreted with reference to and have strong implications about psychodynamic mechanisms. Further examples are provided by the projective techniques.

Frequently, perceptual personality research measures errors of perception or misperceptions in order to show individual differences, which is to say that in these studies the dependent variables are essentially measures of error (Guilford, 1959). Frequently, the error under investigation is small relative to the variation produced by the physical stimuli, so that what an investigator is trying to study has to be teased out, and this may require large groups of subjects or refined methodological procedures or both. Furthermore, error is determined by a number of factors, only one of which may be in the individual differences of the subjects. It can be seen, then, that the study of misperception in relation to psychiatric subjects has certain limitations and requires unique methodological considerations, especially since patients are noted for their greater variability, regardless of the responses being measured.

One way to evaluate the perceptual-personality approach is to consider the tenability of the assumptions made by the researchers in this field. How reasonable are these assumptions in the light of the available empirical evidence? The first and foremost assumption made by workers in this field is that perception is determined more by a person's internal or inward state than by the external stimuli. This assumption is held by many psychologists, especially those interested in projective techniques. Researchers differ in the extent to which they would place internal states over external stimuli as determinants of perception. Gibson and Gibson (1955), particularly, have argued that perception is not an enrichment of the stimulus based on a person's predispositions or past experiences but is simply a finer differentiation of the physical stimuli by the subject after repeated associations with those stimuli. The attempts to make perception simply and solely a reflecting board of the internal states of the person have been rejected not only by Gibson but by Klein (1956), Allport (1955), and others. A broader view is needed and the question resolves itself into a consideration as to what degree and under what conditions the person's internal state determines what he perceives.

The next closely related major assumption of the perceptual-personality approach is that the differences in perception or in the errors of perception reflect stable individual differences that can be related to personality characteristics or to psychiatric illness. The important fact is, so the argument goes, that people perceive the same things differently. It seems well established that individual differences in perception do exist. Less clear is the evidence that these differences are caused only by personality differences. It is likely that the major individual differences have multiple causes.

The final assumption is that differences in perception are responsible for the performance differences displayed by the subjects. This assumption entails the same problem mentioned earlier of how to determine whether differences in performance are correctly interpreted as indicating true perceptual differences and not simply as reflecting other nonperceptual differences. Admittedly, the study of perception necessarily involves the study of behavior. It is possible, at least abstractly, to conceive of a situation in which the perceptions of a group of subjects are essentially the same and yet the resulting behavior differs.

A group of children may see an ice cream cone exactly as a group of adults see it, and yet—because of the differences between the children and the adults in motor control and coordination, attitude toward sweets, past experiences with ice cream, and so on—the resulting response to the stimulus differ. In this hypothetical example, it is difficult to understand the value of considering the response to the stimulus—ice cream—as a perceptual investigation of personality factors if, in fact, the perceptions of the stimuli do not differ, and what differs is simply the person's responses to the stimuli for a variety of nonperceptual or conceptual reasons. Gradually, experimental techniques and data analysis procedures are being developed that allow refined measurement and separation of perceptual and non-perceptual behavioral components.

In recent years, the perceptual-personality approach has lost some of its initial promise; consequently, relatively few investigators are engaged today in research on these problems (Eriksen and Eriksen, 1972). It is possible, in part, the disenchantment may be related to the major conclusion of the numerous studies of perceptual defense and subliminal perception, topics that come from the tradition represented by the perceptual-personality approach. What the investigations of perceptual defense and subliminal perception found was that these phenomena were largely attributable to methodological artifacts, rather than to real perceptual differences. Thus, when techniques eliminated the response bias characteristics of the subjects, the phenomena under investigation disappeared or were markedly reduced. In short, these phenomena were found not to be primarily perceptual phenomena—that is, the percepts were not being modified but were related more to the response bias of the
Section 4.1

processing are impressive, the lack of solid empirical evidence for some fundamental questions—such as the distinct stages of information processing and the techniques that unequivocally enable the measurement of these different stages—calls into question such ambitious predictions. It may be that the attempt at specificity in relating the pathology to information processes is inversely related to the amount of solid empirical evidence.

Progress in the processing approach to understanding psychopathology must depend on substantial progress in the knowledge of perceptual or information processing for normal subjects. Broen (1968) has summarized this position:

It seems likely that in the future a fair amount of thinking about information usage in schizophrenia will use concepts and models that differ in some respects from those that we have emphasized. This is primarily because, as behavioral processes in which schizophrenics show deficits are identified, there should be increasing use of the extensive research on these processes as they work in normals, with the different theories about these processes in normals used in conjunction with specific hypotheses about schizophrenia deficit.

If the relation between processing measures and psychopathology is still largely speculative and if, as Broen contends, progress in the field depends on advances in basic knowledge about processes, one possibility is to focus on data that clearly have to do with sensory and perceptual processing and that can be referred to with considerable confidence because of the quality of the research, as shown by such things as a concern with experimental design and the elimination of possible confounding factors and other possible sources of difficulty.

Recent investigations of visual temporal integration (Sutton, 1973) have been designed to meet many of these objections and still search for genuine sensory-perceptual differences between psychiatric patients and normal subjects and between different types of psychiatric patients. Temporal integration refers to the repeatedly demonstrated phenomenon that only the physical energy of a brief stimulus determines the response to that stimulus, regardless of how that energy is packaged in time; the stimulus may be brief but intense or of a longer duration but less intense. However, this integration of intensity over time has a limiting duration, the so-called critical duration, and estimates of the magnitude of the critical duration can be interpreted as a significant measure of the time constant of processing. Since this temporal integration research uses time both as an independent variable (the duration of a variable-duration stimulus containing the same physical energy) and as a dependent variable (simple reaction time response to the equal energy stimuli), it clearly measures process.

A major finding of this temporal integration research (Sutton, 1973) is that selected psychiatric patients, those displaying a type of thought disorder, show shorter critical durations than do other psychiatric patients and normal subjects. Empirically, this finding has certain implications, since in a way it represents an example of performance in which the patients do better than the normal subjects do. By “better” is meant that patients “discriminate” differences in the stimulus that normal persons are not capable of differentiating. Since a large body of empirical data, both behavioral and physiological demonstrate temporal integration phenomena, an impairment of a difference between normal and patient groups in the time-constant of critical duration is suggestive of a genuine sensory-physiological difference. Further research should enable investigators to better understand the nature of this difference—what other behavioral changes correlate with it and what changes are invariant with respect to it. As knowledge of the temporal integration phenomena increases, one may anticipate greater understanding of possible physiological correlates or mechanisms. It may be possible to relate the integration phenomena to other processing phenomena and to introduce the techniques of measuring integration among a variety of subjects and conditions. Refinement as to what kinds of patients display what kinds of integration differences and how these differences are related to other processing measures, both behavioral and physiological, could represent a major contribution to the understanding of the nature of psychopathology.

Summary and Conclusions

In order to present an overview of the role of cognition and perception in psychopathology we shall content ourselves with illustrating our conclusions through some practical applications. Since tools such as self-assessment inventories, projective techniques, sorting tests and similar clinical tools are in the last analysis dependent for their validity on the results of clinical interviewing, it became necessary to objectify and systematize the interview itself (Spitzer et al., 1964). With this technique as a criterion it becomes possible to investigate the role of cognitive and perceptual behavior in psychopathology more systematically by turning to the classical categories of behavior—physiological, sensory, perceptual, psychomotor, and cognitive.

For the classification of these various types of responses in relation to the various types of stimuli that can be used to elicit them, a table (see Table I) has been suggested (Burck et al., 1958). Even when no stimulus is applied—that is, when the organism is in the idling state, without any load imposed, mental and muscular activity is in process, and these activities can be classified into the response categories of this table. Thus, physiological activity is ongoing, sensory processes are in operation (unless the person is anesthetized), and perceptual activity, psychomotor activity (tension), and cognitive behavior (thinking) are present. It may be the case that, in the idling state, the greatest differences between schizophrenics and normal subjects are observed; unfortunately, no systematic investigations have been made into this question. It is important in all experiments to determine the idling state activity, if suitable measures can be devised, so that the initial level of activity can be taken into account when the effect of the stimulus is exerted.

The applied stimuli can be of either the energy type, in which the response of the organism is somehow dependent on the intensity of the stimulus, or the signal type, in which the response depends more on the accrued meaning or the significance of the stimulus than on its energy.

Perhaps the most inclusive paradigm for analyzing the role of cognitive and perceptual factors in behavior is to relate these factors to personality in normal subjects and to psychopathology in the abnormal (For the relation between personality and psychopathology see Zubin 1972). Zubin et al. (1965) have proposed the following formula for relating the response to the stimulus situation evoking the response:

\[ R = f(S, T, O, E \ldots P_1, P_2, \ldots P_n) \]

where \( R \), the response, is regarded as a function of \( S \), the properties of the presented stimulus; \( T \), the time of exposure of \( S \); \( O \), the state of the organism, including set, motivation, tonicity, degree of fatigue, health (mental and physical); \( E \), the
the normal subject shows the greater change in average evoked potential. Similarly, when the subject has guessed wrong rather than right, reaction time is affected more in the schizophrenic, but average evoked potential is affected more in the normal. Similarly, a modality switch (when the stimulus shifts from one modality to another) affects reaction time more in the schizophrenic but affects average evoked potential more in the normal person. Thus, the average evoked potential is more sensitive to changes in the normal subject in response to the cognitive load of uncertainty, guessing correctly, and shift in stimulus modality, but these same cognitive states seem to produce greater changes in the reaction time of the schizophrenic. This seeming paradox provides an unexpected pattern that helps to differentiate schizophrenics from normals even more than if the changes went in the same direction. Perhaps simultaneous recording in the same patient of his reaction time and average evoked potential will cast even more light on the nature of the observed differential pattern and lead to fractionation of the global heterogeneous schizophrenic group into homogeneous subgroups.

Adopting the assumption that the differences noted between schizophrenics and normal subjects occur in some stage of information processing, it would be important to determine exactly at what stage the difference does occur. The detection of the stage of processing at which the deviation occurs must await more careful parametric experiments in normal information processing. One such approach which promises well is that due to Sternberg (1969) in which he extended Donders’ method for estimating the duration and order of the various stages in the reaction time response to a stimulus. Although this method now requires considerable cooperation from the subject, which is not always forthcoming from schizophrenics, it is possible to modify the procedure to adapt it to persons with lessened motivation. If we can discover the particular stage of information processing in which the schizophrenic deviates, it could be of help in understanding as well as in intervention.

In the cognitive area itself, direct measures of conceptual responses are so encrusted with prior life experiences that the results cannot be taken at their face value. However, it is possible to develop systematic ways of describing deviant cognitive behavior, such as communicability of speech, by means of the cloze technique. The techniques borrowed from signal detection theory can be used to measure the schizophrenic’s criterion values that determine his response over and above the sensitivity he exhibits, so that degree of caution and other criterial attitudes can be measured by this highly sophisticated technique.

Although cognitive behavior differences between schizophrenics and normal persons have been noted for a long time, their objective measure has not progressed as much as was the case with differences between schizophrenics and normal persons in the sensory and perceptual areas. The reason for this discrepancy is that the cognitive field in normals is not as well developed experimentally as are the sensory and perceptual fields. On the other hand, it is likely that the phenomenology of sensory and perceptual activity in mental patients is far better known than in normal subjects because psychopathologists have long been interested in phenomenology. However, deviations in the cognitive area are more grossly evident and seem to be more readily detected and explained in psychopathology. Thinking disorders, delusional thinking, and autism are regarded as the hallmarks of psychopathology, even though as yet they cannot be measured accurately. On the other hand, one can measure objectively fine differences in sensory responses, but their significance is not as readily understood. What is the significance in the fact that schizophrenics have long latency in response to modality shifts, higher auditory thresholds, and shorter critical durations? These differences are rather small but persistent. What their role is in the development of schizophrenia is problematical. It is possible that these small differences, when combined into the behavior of a given person, single him out from his peers. He begins to appear strange to them and soon wonders why he is so different from the rest. In a highly conforming society, these differences do not go unnoticed. Gradually, the differences grow into querness, and soon the entire sequence of self-doubt and peer rejection begins to develop into a situation that permits the grosser psychopathology to develop. How much of schizophrenia can be explained on this basis is problematical, but, even if only a small portion falls into this category, one may be able to make headway in dealing with it by suitable interventions to prevent the epiphenomena of schizophrenia from developing.

![Figure 1](image-url) Comparison of reaction time data and evoked potential data on contrasted schizophrenics, depressives, and normal subjects. Top panel: C = certain, U = uncertain. Middle panel: R = right, W = wrong. Bottom panel: I = ipsomodal, C = crossmodal. (Based on R. A. Levit, S. Sutton, and J. Zubin. Evoked potential correlates of information processing in psychiatric patients. Psychol. Med., 3: 184, 1973.)
4.2 Learning Theory

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Introduction

Learning is basic to every form of psychological theory. As E. R. Hilgard observed in his *Theories of Learning* (1956):

Psychologists with a penchant for systems find a theory of learning essential because so much of man's diverse behavior is the result of learning. If the rich diversity of behavior is to be understood in accordance with a few principles, it is evident that some of these principles will have to do with the way in which learning comes about.

When Hilgard asserted that learning theory is critical "if the rich diversity of behavior is to be understood in accordance with a few principles," he was stating as assumption completely in keeping with a scientific method designed for explanations of events in terms of lawfulness and a striving for a minimal set of rational, demonstrable principles to account for these events. In a laboratory science such as experimental psychology, the search for laws of learning has been carried on with just such methods. The leaders in formulating theories of learning— Hull, Tolman, Skinner, Spence, Thorndike, Pavlov, and Guthrie—have all been, to some degree, laboratory scientists committed to research. A major part of their efforts and those of their colleagues has been the definition of learning variables.

Definition

The definition of learning has always been a difficult problem. Kimble (1961) has suggested that there are two roads to definition—factual and theoretical. The factual definitions relate learning to observable events in the physical world. The theoretical definitions are concerned with descriptions of basic processes that the learning theorist believes to be necessary for learning to occur. Hebb, in his *Textbook of Psychology* (1966), illustrated the theoretical definition when he discussed central nervous system (CNS) activities, the neural messages that occur in the CNS pathways: "Learning means a change in the direction of messages in the CNS." Skinner, in *Science and Human Behavior* (1953a), discusses response probability as a basic datum in the learning process, and offers a factual definition: "We may define learning as a change in the probability of response, but we must also specify the conditions under which it comes about." Hebb was postulating changes in the CNS that may be difficult to observe. Skinner concentrated on the frequency and altered probability of a specific observable response under specified observable conditions.

There is a general agreement that somehow learning is a change in behavior that results from practice, with learning representing an intervening process or variable that links organismic states before and after a change in behavior occurs. As Hilgard observed, the definition of learning always assumes a relatively permanent change in behavior, excluding changes resulting from maturation, sensory adaptation, or fatigue.

LEARNING VERSUS PERFORMANCE

The central question has always been that of differentiating learning from performance. Learning is inferred from observed performance. Kimble saw learning as a change in behavior potentiality. The organism may acquire capabilities to perform some act through learning, but the act itself may not occur. Kimble (1961) stated, "Learning refers to long-term changes of the organism produced by practice. Performance refers to the translation of learning into behavior." At this point Kimble introduced another aspect of the definition in observing that practice alone does not produce learning; it is necessary for some maintaining event to occur, and so it is necessary to add reinforcement. Sidman, in *Tactics of Scientific Research* (1960), defined reinforcement as "any event, contingent upon the response of the organism that alters the future likelihood of that response."

REINFORCEMENT

Learning, then, is defined as a change in behavior potential resulting from reinforced practice. Reinforcement, as so considered, becomes an example of an empirical law of effect that is basic to much of contemporary learning theory. The law of effect, as stated by Thorndike in *Human Learning* (1931) says: "Acts followed by a state of affairs which the individual does not avoid, and which he often tries to preserve or attain, are selected and fixedate, while acts followed by states of affairs which the individual avoids or attempts to change are eliminated." The following year, 1932, Thorndike modified his law and indicated that rewarded responses were always strengthened but that punished responses did not always