The Procedural Organization Of Emotions: A Contribution From Cognitive Science To The Psychoanalytic Theory Of Therapeutic Action

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Recent research in cognitive science has demonstrated that there are different types of memory processes. While declarative memory refers to memories for facts or events which can be recalled, procedural memories underlie skills yet encode information which cannot be recalled. This paper extends this distinction to the nature of emotions and emotional memories. Its implications for psychoanalytic theory are then examined, yielding fresh views of transference, defense, and treatment. Infantile amnesia is found to result partially from the immaturity of the declarative memory system, yet procedural memories encode transference expectations and provide continuity in emotional functioning from early childhood onward. In this light, psychoanalytic treatment is conceptualized as the modification of emotional procedures. Two general methods for modifying procedures are then described, which provide a new model, grounded in current memory research, for understanding therapeutic change through insight and through a new emotional experience with the psychoanalyst.

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A CENTRAL QUESTION POSED by psychoanalytic developmental theory is how early experiences affect mental functioning, when few memories remain from early childhood. Freud's explanation, of course, was that memories are repressed during the resolution of the Oedipus complex. An alternative hypothesis, however, has been raised by recent research in cognitive science. We now know that there are multiple distinct memory processes which develop at different rates in childhood. In particular, one currently prominent hypothesis is that there are two distinct types of memory, termed procedural and declarative memory. Procedural memory refers to the information which underlies skills and forms early in childhood, and declarative memory refers to information which can be recalled consciously, such as recollections of facts or events, but forms only later in childhood. In this paper, the hypothesis will be presented that procedural memories underlie transference and defense, form early in childhood, and withstand the effects of infantile amnesia. By recasting portions of psychoanalytic theory in terms of modern memory research, we can take a fresh look at emotions and their organization, the interpretation of transference, and the theory of therapeutic action.

Multiple Memory Processes in the Brain

Clinical Amnesia

Procedural and declarative memory are dissociated when the hippocampus is damaged in a neurological syndrome called clinical amnesia, and this has provided a model system for research. Amnesic patients, despite their startling deficits—including being unable to remember that they met someone a few minutes before—can retain certain kinds of information (for reviews, see Richardson-Klavehn and Bjork, 1988); (Mayes, 1988); (Squire, 1987); (Cermak, 1982); (Lynch et al., 1984); (Squire and Butters, 1984). While there have been a large number of studies to date, the findings will be illustrated using one important experiment. Cohen and colleagues (Cohen, 1984); (Cohen et al., 1985) studied adults who were learning to solve the Tower of Hanoi puzzle. This puzzle consists of three vertical pegs on a board, and the left-most peg has five concentric
rings of varying radii on it, so that a smaller ring always lies on top of a larger one. The task is to transfer all of the rings from the left peg to the right one. Only one ring can be moved at a time, and a larger ring cannot be placed on top of a smaller one. Amnesic patients, even though each time they work on the puzzle report that they have never seen it before, can learn to solve the puzzle and retain their skill over time as well as normal adults. In general, it has been shown that amnesic patients can acquire complex perceptual, motor, and cognitive skills and demonstrate conditioning and priming effects. The data are complex, and controversies remain as to the best way to explain the findings (for valuable discussions of these controversies, see Schacter, 1987; Richardson-Klavehn and Bjork, 1988; Roediger, 1990; Roediger et al., 1990). Squire and Cohen (1984); (Cohen and Squire, 1980); (Squire, 1986), however, have postulated that procedural knowledge is retained, while declarative knowledge is lost in clinical amnesia. This theory will be reviewed in detail in order to lay the groundwork for explicating a psychoanalytic theory of affects, transference, and treatment based on modern memory research.

Declarative and Procedural Knowledge

Declarative knowledge refers to information that can be learned, stored in memory, and later recalled. It stores memories for facts or events that have been experienced, and it is represented either in language or in sensory images, such as mental pictures. Declarative knowledge is symbolic, in that the thought always refers to something else, its meaning, or referent. Declarative knowledge, however, may be conscious, preconscious, or unconscious.

Procedural knowledge is different. We have many skills, but we are rarely conscious of the knowledge which underlies our skills. For example, we typically do not have to think where third gear is before we shift from second gear. We do not have to access consciously that information in order to shift gears. We can skillfully adjust our performance when a road is icy or a hill is steep precisely because we do not have to think about what we are going to do before we do it. This is procedural knowledge. It is the information we acquire when learning a skill. It is demonstrated by our performance, not by recalling facts or experiences. Procedures are flexible in that they can respond to multiple contingencies, and they are organized around obtaining goals.

Squire (1986) has suggested that procedures are encoded directly in the neural program which underlies the skill. This is not symbolic knowledge; procedurally encoded information does not stand for anything else. It cannot be stated in language directly, although the procedural program can be translated into declarative language. While declarative knowledge can be made conscious, procedural knowledge cannot. Declarative knowledge can be remembered; procedural knowledge can only be enacted. Declarative knowledge enables us to be aware of the outcome of our thought processes, but we are not conscious of how the procedures actually function.

Cohen and Squire (1980) hypothesize that amnesics' procedural knowledge is intact but that the declarative memory system is impaired. Amnesic patients know how to solve the Tower of Hanoi puzzle, but they have forgotten that they learned how. No memory of learning the puzzle nor memory that they can solve it is retained, but their skill, supported by procedural knowledge, is intact. Squire (1986) argues that the hippocampus is necessary for the consolidation and storage of declarative information. Because the hippocampus is damaged in clinical amnesia, declarative memory is impaired. But the procedural knowledge which supports the skill is unaffected. Complex procedures can organize how we think, even though the actual procedural mechanisms remain outside of conscious awareness. This is as true whether we are driving a car or, as I hope to show, negotiating our way within an emotionally complex relationship or our intrapsychic world of internalized objects.

Controlled and Automatic Procedures

Shiffrin and Schneider (1977); (Schneider and Shiffrin, 1977); (Shiffrin and Dumais, 1981), in their elegant studies of visual search mechanisms, have demonstrated that there are two types of procedures, controlled and automatic. Consider how we learn to shift gears. As is characteristic of controlled procedures, initially we are slow and our coordination is poor. The neophyte has to remind herself of the rules of the procedure (e.g., third gear is upwards, to the right and up) prior to executing the program. A great deal of attention is required. With practice, our
skill improves and the procedure becomes automatic. A skillful driver's movements are fluid, rapid, and efficient, and she does not have to recall consciously the rules of the procedure in order to execute it. Indeed, Shiffrin and Schneider (1977); (Schneider and Shiffrin, 1977) have demonstrated that automatic procedures do not require any attention, which is why we can accomplish more than one task simultaneously once the skill has become automatic. From a representational standpoint, the central distinction between controlled and automatic procedures is that the former requires that declarative knowledge be conscious during execution of the procedure. With automatic procedures, all of the information is encoded in procedural, or what is sometimes termed compiled (Neves and Anderson, 1984), form. In practice, the amount of attention required during execution of a procedure varies along a continuum (Anderson, 1985).

Controlled and automatic procedures each have advantages and disadvantages as ways of representing information in the brain. While controlled procedures are flexible and readily modified by altering the declarative input, they are slow and poorly coordinated. Automatic procedures, while smooth, rapid, and efficient, are difficult to modify. Once initiated, they tend to go to completion.

The capacity to select one procedure over possible alternatives is itself a procedure, and it has been referred to as a control structure (Rumelhart, 1984). The ability to shift to third gear is a procedure, but the procedure which decides when to shift gears is a control structure. The central research question here is how best to model the functioning of control structures. In keeping with one of the most exciting areas of current interest in cognitive science, Horowitz et al. (this volume) suggest that control structures are best modeled within the framework of parallel distributed processing (Rumelhart et al., 1986); (McClelland et al., 1986). While this is a key question for all theories of mental functioning, it will not be discussed further here, other than to speculate that a control structure itself may be controlled or automatic. Flexibility in intrapsychic processing refers to the ability of control structures to select the procedure which best fits a given situation, and this is as true in the emotional realm as it is in the cognitive, perceptual, or motoric realms. A central goal of all dynamic psychotherapies is to increase the flexibility of a person's emotional control structures.

The Development of Procedural and Declarative Knowledge in Early Childhood

Clinical amnesia dissociates procedural from declarative knowledge in adults, permitting their study. These two memory processes also develop separately. While the ability to store procedural knowledge is present soon after birth, the capacity for declarative representation does not mature until approximately the fifth year of life. This will have important implications for psychoanalytic theory.

The separate development of these two memory processes will be demonstrated by briefly examining two domains: Piaget's description of infant cognition, and the role of the developing hippocampus in the consolidation and storage of long-term memories. Piaget (1952) described the period from birth to 2 years of age as the "sensorimotor period," in which infants make use of sensorimotor schemas, which are goal-directed plans for action, such as reaching for an interesting mobile or engaging in a game of reciprocal smiling with a parent. Infants learn to coordinate their perceptions and actions, but they cannot yet think without acting. In Mandler's (1983) words, infancy "is a most un-Proustian life, not thought, only lived."

Piaget believed that the sensorimotor period ended around 2 years of age when the infant developed the capacity for recall, a central feature of the declarative memory system. The schemas of the sensorimotor period are perceptual-motor-affective procedures. They enable babies to interact with their parents, but infants cannot think about them in their absence. In the language of modern cognitive science, we would say that procedures are present soon after birth, but the declarative memory system does not emerge until the end of infancy (Mandler, 1983); (Schacter and Moscovitch, 1984); (Nadel and Zola-Morgan, 1984).

Although the capacity to form declarative memories begins by the end of infancy, the system is not fully functional until around the age of 5, when declarative memories can be consolidated and stored in a form which permits later retrieval. Preschool children are limited in their capacity to recall declarative memories, and adults have few memories from before the age of 5 (for a recent review, see Pillemer and White, 1989). Freud (1899); (1905) first described this phenomenon, termed it infantile amnesia, and theorized that repression blocked access to the memories of early childhood. We now know, however, that early childhood amnesia is more complex.
Nadel and Zola-Morgan (1984) suggest that postnatal hippocampal maturation underlies the growing capacity to store declarative information. At birth, the human hippocampus is immature. It develops throughout early childhood, undergoing major changes after 18 to 36 months (Jacobs and Nadel, 1985). The studies of adults with clinical amnesia indicate that the hippocampus is necessary for registration of declarative information. While other areas of the brain are probably involved in the storage of declarative information, the hippocampus is certainly part of the neuroanatomic pathway (Teyler and Fountain, 1987). Additionally, Mishkin and colleagues (1984); (Bachevalier and Mishkin, 1984); (Malamut et al., 1984) have demonstrated similar findings in nonhuman primates. When the amygdala and hippocampus are resected in Rhesus monkeys, they retain what these researchers call "habits" while losing memories based on recognition or associations. Furthermore, the habit system develops prior to the recognition system in nonhuman primates, quite analogously to the findings in humans.

Before the hippocampus is mature, young children are unable to store declarative memories in a fully retrievable form. While we begin developing procedures soon after birth, and can retain them throughout our lives, the declarative memory system is not fully functional until the end of the preschool years. Although repression clearly plays a role in early childhood amnesia, so does hippocampal immaturity. It is interesting to note (Emde, personal communication) that Freud (1915a) foreshadowed this research in his discussion of primal repression, which blocks initial access of instinctual derivatives into consciousness. According to Freud, the information which has been (primarily) repressed then draws conscious contents into the unconscious during secondary repression. Primal repression, then, results in an unconscious procedure which affects mental functioning, even though the information which underlies the procedure cannot itself be made conscious. Later it will be argued that clinical amnesia, early childhood amnesia, and repression are inextricably linked.

The Development of Emotional Procedures in Early Childhood

How is this related to emotional functioning and its development? We can now develop the concept of an emotional procedure, drawing from research on perceptual, motor, and cognitive procedures. This will provide a foundation for discussing transference, ego functions, and psychoanalytic treatment from a procedural perspective. This discussion will lead us to the conclusion that the emotional procedures which develop in infancy and early childhood can withstand the effects of early childhood amnesia and provide continuity in emotional functioning across the life-span, and that modification of maladaptive emotional procedures is central in psychoanalytic treatment.

Cognitive procedures organize how we think, and emotional procedures organize how we feel. Just as nonaffective information and experience are processed with cognitive procedures, emotional information and experiences are processed with emotional procedures. This is not to imply that cognition and emotion refer to disjoint sets of mental activities, as emotions typically (and often necessarily) involve cognition (see Horowitz et al. in this volume for a further discussion of this point of view).

The mental processes which culminate in an emotional state, as well as the consequences of that emotional state, are procedurally organized. Let us look first at how emotions organize subsequent behavior. When a baby experiences an incentive stimulus for an emotion, motoric procedures are initiated. If a frightening figure suddenly approaches, emotion will be expressed through contraction of facial musculature, a gasp of fear, and avoidant movements. The expression of emotion in the face is genetically governed (Izard, 1971); (Ekman et al., 1972), and the other component processes may well be, too. Emotional procedures organize behavioral expressions through multiple channels such as gestures and vocalic intonations. This is accomplished outside of awareness and is procedurally organized. We use this clinically: when different channels carry contradictory messages, we infer the presence of hidden (multiple) emotions (for a discussion of this issue, see Shapiro in this volume). With development, emotions will influence not only how we act, but also how we think as well as how we process further emotional information and experience. Children will develop characteristic ways of thinking, feeling, perceiving, and acting in response to different emotions. The processes which govern these responses will be organized procedurally. Emotional procedures regulate our responses to emotional
The processing of the antecedents of emotional experience are also procedurally organized. Affective procedures process the meaning, significance, or value of a stimulus to the individual (Arnold, 1960); (Campos et al., 1989). A simple stimulus such as a loud noise may regularly elicit a specific emotion such as fear. More complex stimuli will require interpretation before the emotion is experienced. These emotional interpretive procedures are dramatically illustrated by the phenomenon of social referencing in the latter part of the first year (Campos and Stenberg, 1981); (Feinman and Lewis, 1983); (Klinnert et al., 1983). An infant, upon encountering uncertainty—for example, the approach of a toy robot which makes noise and flashes lights—will look to an adult for an emotional signal to use in regulating her behavior. If the adult expresses fear through facial expression or voice, the infant will not approach, but if she expresses interest or pleasure, the infant will be encouraged to approach the robot (Klinnert et al., 1986). With cognitive-emotional development, children will respond not only to external stimuli but to internal wishes, fears, and fantasies as well. Through regularities in the child's care-giving relationships, the child will come to interpret certain situations in characteristic ways. Both how the child tends to react to emotional situations and how those emotions constrain further thinking, feeling, and behavior will be encoded in affective procedures.

We can further our understanding of the procedural mechanisms of emotion processing by examining the concept of heuristics, which has been studied extensively in the cognitive realm (Kahneman et al., 1982). Heuristics are strategies employed to solve a problem or to reach a goal. For example, we make use of the clarity of a visual image in judging an object's distance (Tversky and Kahneman, 1982). Like most heuristics, this processing strategy developed through trial and error. It developed within a specific context, and it was not formed solely by inference (Polya, 1945). Like most heuristics, this strategy will work most of the time, and therefore it can be adaptive. However, heuristics often encode suboptimal solutions to problems (Tversky and Kahneman, 1982), and they can lead to systematic distortions in how information, and emotions, are processed.

Four features of cognitive heuristics which will be relevant to our discussion of emotional processing can be illustrated by returning to the Tower of Hanoi study (Cohen et al., 1985). First, amnesic patients had no difficulty generalizing their skill and transferring the rings to the middle peg instead of the right one, a task which requires different moves. Second, although the impaired subjects were unable to recognize intermediate positions along the way to the optimal solution (after they had learned to solve the puzzle), they were able to solve the puzzle from those intermediate positions. Third, the puzzle consists of a set of subproblems which are formally equivalent, although each subproblem requires different moves. Amnesic subjects learned to treat the subproblems equivalently. These three results, taken together, demonstrate that amnesic patients are able to develop interpretive procedures which extract regularities from the complex stimuli present in the Tower of Hanoi, and transform those rules into strategies for solving the puzzle. Fourth, nonamnesic comparison subjects' verbal reports lagged behind their acquisition of increasingly sophisticated, problem-solving strategies, demonstrating that their interpretive procedures and strategies developed without conscious declarative planning. These procedures and heuristic strategies are encoded procedurally and form in both amnesic and nonamnesic adults.

Just as subjects in the study can extract regularities from the puzzle and develop strategies for solving the problems it presents, young children can decipher the rules by which their families operate and develop strategies for meeting their needs within their families. In general, children do this in one of two ways. They may formulate their strategies consciously and then implement them. However, most of the time, young children develop their emotional procedures directly, without any intermediate declarative steps, just as both amnesic and nonamnesic subjects learned to see patterns in the Tower of Hanoi and developed strategies to solve those problems without intermediate, conscious, declarative processing. These interpretive procedures and heuristic strategies are encoded procedurally outside of conscious awareness. For example, some physically abused children are avoidant in their interpersonal interactions (George and Main, 1979), but they do not need to formulate these strategies consciously in order to implement them. Indeed, it may be the case that strategies which are developed unconsciously have more motivational force than those which are consciously formulated when learned. Like all heuristic strategies, however, they may be adaptive in some contexts and not in others. Procedurally encoded, maladaptive heuristics will lead to systematic distortions in the subsequent processing of emotions and experience, just as ascertaining the distance of an object by
the clarity of the image will occasionally lead to errors in judgment. Heuristics develop outside of awareness, are encoded procedurally, affect subsequent processing of emotions and experience, and may be adaptive depending on context.

- 360 -

Young children are not only interested in discovering how their family functions in order to meet their needs, but they are also concerned with moral rules, with what is considered right or fair in their families (Emde et al., 1988), (and in press). They will decipher and encode these rules and develop heuristic strategies in order to act in accordance with them. With development, moral behavior will become regulated by moral emotions such as pride, shame, or guilt, and these emotions will incorporate the procedural heuristics which the child has developed.

Emotional heuristics, whether they are developed to help the child meet her needs or to act morally, are intrinsic components of the mental complexes we call emotions. Conscious feelings, which are also components of emotions, affect the course of mental functioning in part because they are inextricably linked to emotional heuristics.

Such a view makes sense of the difficult problem of unconscious emotions, which psychoanalysts and philosophers have grappled with since Freud (1915b), (1926); (Pulver, 1971); (Dilman, 1988). Emotions may be unconscious, in general, for one of two reasons. First, affects may be warded off defensively. Second, when controlled emotional procedures have become automatic with practice, the conscious feeling no longer needs to be experienced in order to execute the procedure, as conscious attention is no longer required. This is useful, as consciousness processes information and experience too slowly to support quick, adaptive responses to stimuli (Kihlstrom, 1987); (Horowitz, 1988a). For both reasons, automatic defensive functioning can proceed without conscious awareness of the feeling state.

When emotions are activated, the component emotional heuristics are also engaged. Even if the feeling is unconscious, the activated emotional heuristics will affect the course of mental functioning and behavior. Within this frame, emotions, whether they are conscious or not, may play causal roles

- 361 -

in mental functioning due to the activation of the procedurally encoded heuristics.

We can further our understanding of emotional procedures by taking another look at their development. Once again, we can benefit by examining how complex, cognitive, problem-solving skills develop. Anderson (1982) studied how students learn geometry. The problem they faced was to know when to apply which Euclidian axiom in order to prove various theorems. Anderson found that the students would repeat the axioms to themselves over and over, in different contexts, until the procedure became automatic and it was "intuitive" which axiom had to be applied in which situation. Each individual axiom had to be applied many times in multiple situations before the procedure became automatic. Similarly, new emotional procedures will be used in multiple situations. Isolation of affect, for example, may be useful in avoiding many different painful emotions. One procedure may come to serve multiple motivations or goals. For each goal, the control structure will develop heuristics which regularly initiate certain procedures in order to meet that goal. Multiple motivations or goals may characteristically initiate only a limited number of procedures. A process akin to natural selection may occur in development, where the different motivations "select" a procedure found to be useful, strengthening the procedural heuristics between the motivation or goal and the procedure which is initiated. However, this natural selection process yields a probabilistic hierarchy: All procedures survive, but those procedures which best fill open niches in the mental ecology become more likely to be implemented than others. Procedures which are selected are overdetermined in the sense that they can serve many goals and have been incorporated into multiple motivational structures. Different control structures, serving different goals and using multiple heuristics, will share a small number of procedures as their final common pathway. We observe the procedures which are selected as the patient's characteristic coping strategies.

- 362 -

The procedures which are selected are shaped by the interactional patterns within the family. Reiss (1989) has called these patterns the "practicing family," the array of repetitive interactions which occur within families. This type of representation has a special status, in that it reflects both the individual family members' procedures, as well as the precise dovetailing of procedural interactions which results from the procedures having formed in relation to each other. Both family therapists and psychoanalysts work with these patterns. Family therapists intervene directly by
disrupting these precise transactional patterns during family therapy sessions. Sandler (1976), in his discussion of role responsiveness, has described these patterns within the context of transference-countertransference interactions. These procedural patterns are central to psychotherapeutic treatment.

A clinical example will illustrate these ideas. The vignette comes from ongoing research on moral development and affective representation in maltreated preschool children that Robert Emde, Helen Buchsbaum, Sheree Toth, Dante Cicchetti, and I are currently conducting. The study utilizes a technique developed by Buchsbaum and Emde (1990) and Bretherton et al. (1990), in which the first part of a story is told to a child using a doll family, and the child is then asked to complete the narrative. Story stems are designed to elicit specific issues such as empathy or restraint of aggression, or to challenge the child to make moral choices. The children's responses are then videotaped and coded blindly. In one of the stories, the boy is hungry but Mom warns him not to get too close to the stove. He cannot wait, and he knocks the pot of hot gravy off the stove and burns himself. Timmy, a 3½-year-old severely neglected boy, completed the story by having the mother doll clean up the mess. The mother then scolded the boy doll for being too close to the stove. In a painfully plaintive voice Timmy had the little boy respond: "But the gravy burned me." The mother in the story did not respond, and Timmy then had the boy take it upon himself to step away from the stove. In Timmy's other stories, the parents repeatedly ignored the boy's needs. Only rarely did Timmy have a child doll ask them for help.

Timmy's responses in this story reflect his procedural knowledge of how to cope with this situation. One can infer that he did not expect help from his parents, nor was it in his repertoire to seek help readily from them. He demonstrated his expectation of how parents behave and how he is likely to behave when he is hurt. But note that Timmy did not say: "This is how my mommy acts," or "I remember that my mommy didn't help me when I burned myself." He did not recall declarative memories of his experiences and then act in response to them. He knew how to behave in this situation, how to cope with burning himself, because he had built his experiences into procedural skills. When solving the Tower of Hanoi puzzle, the amnesic patient does not say: "I know how I solved the puzzle yesterday" because she does not recall how she solved it. That is precisely what the amnesic patient does not remember. But the patient can solve the puzzle based on her procedural knowledge. Analogously, Timmy could solve his emotional dilemma which confronted him by utilizing his procedural skills, without relying on his declarative memories. He has developed procedurally encoded coping skills which are adaptive in his family environment. Unfortunately, he has learned that parents are unhelpful, and this will take its toll in his life.

In summary, we have seen that emotional procedures organize our emotional lives. They organize how we interpret emotional situations and how we react emotionally to them. They can develop without intermediate conscious declarative processing, and, when automatic, they function outside of awareness. They are guided by procedurally encoded heuristics which are initially adaptive but may later lead to systematic distortions in the processing of information and experience. Those procedures which are selected in development are observed as the individual's characteristic coping strategies. Emotional

procedures develop prior to the declarative memory system in early childhood, are unaffected by hippocampal immaturity, and are retained across the boundary of early childhood amnesia. Emotional procedures provide organization and community in our emotional functioning across the life-span.

A number of authors have discussed these issues from related perspectives. Shapiro and Perry (1976) organized data which supported the idea of a discontinuity in mental functioning at the onset of latency, suggesting that the amnesia of early childhood reflects a different form of cognitive organization, similar to the recent discovery that the declarative memory system forms by the end of the preschool years. Piaget (1973), extending his work on cognition to affect, suggested that operational schemas underlie the individual's affective capabilities. Bowlby (1980) reconceptualized his view of attachment as the development of "internal working models" of self, other, and the attachment relationship. In discussing the superego, he noted that the rules of appraisal of action, thoughts, and feelings are applied automatically outside conscious awareness. Furthermore, he observed that all skills are slow to change, and he saw this reflected in the pace of dynamic psychotherapy and psychoanalysis. His ideas about internal working models have been extended by Main et al. (1985) in the demonstration of cross-generational continuities in insecure attachment patterns, and Bretherton (1985); (in press); (Bretherton et al., 1990) in linking internal working models to nonsymbolic capacities and motivational-behavioral control systems, thereby suggesting—in the language
used here—that they are encoded procedurally. Stern (1989) has incorporated recent research on categorization (Rosch, 1983) and event representations (Nelson, 1986) into a view of internal working models informed by recent research in cognitive science.

Focusing more directly on psychoanalysis, Gedo (1988) emphasized the role of skill acquisition during treatment. Lichtenberg (1983) saw infant memories as encoded in "perceptual-action-affect responses without symbolic representation." In his recent book, he suggested that procedural knowledge includes rules which govern perception, cognition, and affect, and he postulated that procedural knowledge underlies role enactments (Lichtenberg, 1989). The most extensive discussions of procedural models of emotional functioning can be found in the work of Horowitz and his colleagues (Horowitz, 1987), (1988a), (1988b), (1989; Horowitz et al. in this volume). This pioneering work has integrated research in cognitive science with psychoanalysis. The constructs of person schemas and role relationship models have promoted valuable new ways of understanding both psychoanalytic theory and individual psychopathology. I turn now to an examination of the implications of this new information about procedural knowledge for psychoanalysis.

**Implications for Psychoanalytic Theory**

We will begin with a brief discussion of selected psychoanalytic constructs from a procedural perspective. This will lay a foundation for a procedural view of how emotional procedures are modified in psychoanalysis. Bridging cognitive science and psychoanalysis affords each field the opportunity to modify its theories and generate new hypotheses based on insights from the other endeavor. It also serves to clarify areas of agreement and disagreement, hone our thinking, and help us notice phenomena we have often seen but not fully appreciated or understood. By translating familiar psychoanalytic ideas into the language of cognitive science, I hope that new light will be shed on our understanding of the mechanisms of change in psychoanalysis. I will begin with a discussion of transference.

**Transference**

... the patient does not say that he remembers that he used to be defiant and critical towards his parents' authority;

instead, he behaves in that way to the doctor. ... The patient does not remember anything of what he has forgotten and repressed, but acts it out. He reproduces it not as a memory but as an action; he repeats it, without, of course, knowing that he is repeating it [Freud, 1914, p. 150].

Transference is the enactment of the emotional procedures learned in childhood. This idea is derived from a seminal paper by Matthew Erdelyi (in press). Independently, Grigsby and Hartlaub (1988) have suggested that character is represented procedurally. While transference enactments occasionally are based on controlled procedures operating on unconscious declarative information, more commonly they are manifestations of procedurally organized emotional skills.

**Ego Functions, Defenses, Repression, and the Repetition Compulsion**

Ego functions, defenses, repression, and the repetition compulsion can all be profitably viewed from the perspective of procedural knowledge. Let us begin with ego functions. Another way of viewing this construct would be to consider ego functions as affective control structures. A discussion of self and object constancy will illustrate the productiveness of this approach by casting them as procedural capacities of the well-functioning ego. Mahler (1968) offers a definition:

By object constancy we mean that the maternal image has become intrapsychically available to the child in the same way as the actual mother had been libidinally available—for sustenance, comfort, and love

(p. 222). But object constancy, along with self constancy, do not refer to the experience of a declarative image of mother or of oneself. Rather, they refer to a capacity to self-soothe, tolerate loneliness, and experience oneself as whole in the absence of the important other. They are sets of intrapsychic emotional procedures, organized into complex emotional control structures. The adult with a healthy capacity
for self and object constancy does not recall the innumerable times her parents left her but returned to greet her warmly when she was young, or her many minor childhood injuries which were responded to with loving, attentive care, but she compiled those emotional experiences into proceduralized capacities for self and object constancy. Self and object constancy are operations the healthy ego can perform. Like all ego functions, they are emotional control structures.

Defenses, as a type of ego function, are affective procedures (Erdelyi, in press); (Grigsby and Hartlaub, 1988). Repression, in particular, has the interesting property of making declarative knowledge of an experience unconscious without affecting the associated procedural memories (Erdelyi, in press). The procedural knowledge cannot be made unconscious, as it already is. Repression produces a circumscribed amnesia. It is adaptive in that it protects us from dysphoric emotions while permitting us to enact our emotional procedures. Just as declarative knowledge probably developed after procedural knowledge during the course of evolution (Squire, 1987), repression, too, is a product of evolution in that it took advantage of the fact that the brain stores memories in both procedural and declarative forms. Clinical amnesia, early childhood amnesia, and repression all preserve procedural knowledge despite loss of the associated declarative knowledge.

These ideas can be used to amplify our understanding of the repetition compulsion. To see this most clearly, consider another example of a nonaffective procedure. Think about a man who, after keeping his socks in his top drawer for ten years, suddenly decides to move them into the second drawer. After they are moved, he will probably find himself occasionally looking in the top drawer for his socks. The procedure which reaches for the socks had become automatic, and while its execution was smooth, rapid, and efficient, it is difficult to modify and hard to interrupt once initiated. This example illustrates that a procedure can encode not only an overall goal, such as obtaining socks, but also subgoals, such as opening the top drawer, which it tries to attain in order to reach the main goal. Automatization locks those subgoals in place. The more the procedures are automatic, the more constrained the individual is to use the kinds of strategies that he or she used at the time of automatization.

With this in mind, the repetition compulsion can be parsed into three components. The first two are familiar: Stereotypical behavior is repeated because we retain childhood wishes and goals, and the coping strategies and defenses which are repeated are maladaptive. What is new is that the maladaptive coping strategies function automatically. They do not require conscious attention to be enacted, and, because they are automatic, they are difficult to interrupt or modify. The degree to which emotional control structures and procedures are automatic is reflected in the severity of character pathology. The driven quality of the repetition compulsion in part reflects the automatic nature of the procedure, just as our hypothetical man feels "driven" to reach in the wrong drawer for his socks. When a narcissistic man acts contemptuously, he is trying to reach a maladaptive subgoal in order to obtain his adaptive overall goal, restoration of his injured self-esteem. His maladaptive strategy is repetitively reinvoked because it has been structuralized by automatization.

Therapeutic change in psychotherapy or psychoanalysis occurs not only through the relinquishment of childhood wishes and goals, but by modification of the procedures used to meet those goals. Inadequately functioning, automatic, emotional procedures have historically been dichotomized into those which reflect maladaptive compromise formations and those which reveal what Kohut (1977) and others have called structural deficits, such as an inability to test reality, self-soothe or modulate affect. However, all patients with character pathology have emotional procedures and control structures which are inadequate to handle life's exigencies. Structural change in psychoanalytic treatment always involves the modification and acquisition of new, more adaptive, emotional procedures. I turn now to a procedural view of how this occurs.

The Therapeutic Action from a Procedural Perspective

I will speculate that there are two general ways procedures change. It will then be seen that psychoanalytic change through insight on the one hand, and through a new, empathic relationship with the analyst on the other, are manifestations, in the psychoanalytic domain, of how all procedures are modified.
The Role of Insight in Psychoanalytic Treatment

Consider how a simple procedure can be changed. Recall the fellow who kept looking for his socks in his top drawer. After he moved them to the second drawer, he had to remind himself of the new rule: "The socks are in the second drawer." He converted his previously automatic procedure into a controlled procedure. This enabled him to think before he acted. He made use of the new information and modified his actions accordingly. If he practices this controlled procedure, with time the new information will be compiled, and the new procedure will become automatic. Then he will no longer have to remind himself of the new declarative rule, and he will be able smoothly and efficiently to obtain socks from the second drawer. One general way to modify an automatic procedure is to convert it into a controlled procedure, modify the declarative rule on which the procedure is based, and develop a new controlled procedure in accordance with the new rule. If it is useful and practiced, the new procedure will become automatic.

Emotional procedures can also be modified in accordance with this model. Consider a simplified example of a man who, whenever he considers asking a woman out on a date, feels inhibited and cannot ask her out. Perhaps he fears retribution from his father. Over the years, the procedure has become automatic. He does not have to experience his fear in order to enact the automatic procedure, and conscious attention is no longer required.

How can we help him modify his emotional procedure? We typically initiate this by interrupting his automatic procedural enactment. This may be done by not fulfilling the role he, in his transference, expects of us, either through our action, inaction, or with a timely interpretation. This focuses his attention on his procedural enactment; in this case, his expectation of punishment. His maladaptive automatic procedure may have been initiated by only the merest trace of a dysphoric emotional signal, but because the procedure was automatic, he could execute it without consciously feeling afraid. In treatment, we help him to titrate that feeling back into awareness. We not only help him to tolerate those painful feelings, but we look at his declarative belief, what he fears his father will do, and we reality test it with him. Is it still true, if it ever was? With psychotherapeutic work his fear attenuates, and he can modify his expectations of what will happen if he asks a woman out on a date. In other words, he develops a new, more adaptive, controlled procedure. With practice, it will become automatic and he will no longer inhibit himself.

The transformation of automatic emotional procedures is an example of this general model of the modification of procedures through the use of intermediate, conscious, declarative processing. Our patient's automatic procedure was interrupted and converted into a controlled procedure, the belief was reality tested, his emotional state was characterized and tolerated, a new controlled procedure was developed, and with practice it became automatic. A key issue is that while cognitive procedures are modified by new information, emotional procedures are modified through insight. Insight is the emotional experience of new declarative information which has the power to change preexisting emotional procedures. It appears that only by emotionally experiencing the new information can neural emotional systems be engaged, thereby modifying the emotional heuristics. The formal method, however, is similar for all types of procedures.

Safety in the psychoanalytic situation enables the patient to hear the analyst's interpretations and not to ward them off defensively. The feeling of safety (Sandler, 1960) also makes it possible for the patient to recall painful memories. In both cases, however, we know that making the unconscious conscious, while useful, is not the goal of treatment. The goal, in this context, is to develop new, adaptive, automatic procedures; making the unconscious conscious is a means to that end. Indeed, genetic reconstructions from early childhood are not always possible because the hippocampus may have been too immature to consolidate and store declarative memories from that era. Only the procedural heuristics remain, and it is these which are modified during treatment.

New procedures, however, do not always replace old ones in treatment, a point also made by Horowitz et al. (1984). During and after psychoanalysis, new procedures often coexist with the old ones without replacing them. In intermediate stages of psychoanalysis as well as in more supportive treatments, we observe the new controlled procedure competing with the old, now only partially automatic procedure. This is similar to a tennis player who is learning a new serve. She will expend a great deal of attention in order to serve using the new controlled procedure in order to avoid using the old one. This occurs during psychoanalysis. Two procedures may coexist, but in a successful
treatment, the new adaptive procedure is more regularly elicited. The reemergence of the old pathological procedure in regressed states reminds us that emotional skills become hierarchically organized in treatment, a view which has a long tradition in psychoanalytic theory (Fred, 1905; Spitz, 1959; Emde et al., 1976).

Working through, from this perspective, requires repeated interpretations of the transference in part because each procedure is linked to multiple motivational systems or goals through multiple emotional heuristics. Repeated transference interpretations are necessary to undo the effects of the natural selection process from childhood. As this is accomplished, new, more adaptive control structures emerge.

The Role of New Emotional Experience in Psychoanalytic Treatment

Procedures can also be modified directly without any intermediate, conscious, declarative processing, and this second general way procedures are altered is analogous to therapeutic change without insight in psychoanalysis. Once again we will benefit from examining how nonaffective procedures can be modified. Then I will review how emotional skills in childhood develop outside of conscious awareness. This will lead to a procedural view of what Kohut (1971), (1977) has called "transmuting internalization" and, from a developmental perspective, Emde (1990) has called "corrective empathic experience," the direct reworking of emotional procedures without the use of insight through a new empathic experience with the analyst.

Consider how we improve our athletic skills. When learning a new serve in tennis, for example, we often try out the new technique directly, without first saying to ourselves how we are going to serve. As Ryle (1949) has observed, we do not have to think before we act in order to act intelligently. Similarly, we have seen that children unconsciously infer the rules of relationships which operate in their family, without first stating those rules declaratively. They develop coping strategies without consciously planning them in advance. Like the nonamnesic subjects learning to solve the Tower of Hanoi, they often develop their strategies first and only later (if at all) reflect upon them.

Furthermore, children may learn more from how their parents act toward them than from how their parents tell them they should act. Commonsense homilies reflect this discrepancy between verbal comments and actual behavior: "Words are cheap," "Action speaks louder than words," and "Do as I say, not as I do." Semantic meaning is the channel most easily dissociated under conscious control from the complex of emotional expression, and it is the channel most readily doubted. A child who has been physically or sexually abused by a parent who proclaims love and concern for her experiences this dissociation between verbal comments and actual behavior. Although this is an extreme (albeit common) example, some degree of dissociation between verbal statements and actual behavior occurs in all families. The learning which accrues from such experiences occurs through the direct modification of emotional procedures without any intermediate conscious processing of declarative information.

In psychoanalysis, new emotional procedures develop directly through genuine emotional experience with the analyst, without insight functioning as a mediating process. People experiment with new ways of relating and new ways of processing their affective states directly, without interpretations or insight. This is supported by the safety of the psychoanalytic situation, just as a tennis player with a supportive teacher is more willing to try out a new serve. People develop new intrapsychic and interpersonal skills without being aware that they have done so. This is often observed during treatment.

The analyst's behavior is central to therapeutic action. It is only because the analyst does not behave in accordance with the patient's procedurally encoded role relationship models that the patient can change during treatment. This is most obvious for patients for whom "words are cheap." Because they suffered gross discrepancies between their parents' comments and behavior, the more primitive and fundamental power of action may be needed. An example would be making ourselves available for after hours calls when working with a patient whose capacity for object constancy is uncertain. What patients learn from the analyst's actions does not always need to be stated declaratively for it to be efficacious. Indeed, discussing the patient's experience of our actions too early may vitiate the intervention, sapping it of its emotional strength. Patients acquire new rules of relationships directly
within the analytic relationship. Emotional heuristics are modified because the patient has a new motional experience with the analyst.

One must be quite cautious, of course, in modifying technique based on new theory. All such modifications must pass through the crucible of clinical experience. These kinds of modifications in technique are not new, however; what the research offers is a way to model the occurrence of therapeutic change through a new emotional experience without insight acting as a mediating process.

Working through occurs not only through repeated insights, but by trying out new procedures in multiple domains. The new procedures must be practiced in order for them to be elicited automatically (for a related discussion, see Horowitz et al., 1984). Working through modifies emotional heuristics through repeated insights as well as through the direct modification of emotional heuristics by repeated practice.

Complex emotional skills change through a series of transactions between learning accrued through insight and learning acquired through direct procedural modification. Understanding both precedes and follows behavioral change. In psychoanalysis, change occurs through a complex interplay between insight and direct reworking of the emotional procedures within an empathic analytic relationship. Structural change in psychoanalysis is a transactional process. This is how all complex skills change.

Conclusions

This paper has brought insights from cognitive science to bear on some of the central questions of psychoanalytic theory. Along the way some of the theory and data of cognitive science have been simplified, and there has been much speculation. The most important simplification, which exists in the cognitive literature, is in the notion of procedure. And many questions remain unanswered. Does the nature of procedures vary across neural systems? To what extent is Squire's (1986) hypothesis true that procedurally encoded information is represented directly in the neural program which controls the activity? How do procedures which are initially organized at a sensory-motor-affective level complexify into more complex cognitive-affective procedures while maintaining continuity in their functioning? How does discontinuity naturally occur in development, and, from a representational standpoint, how can it be introduced therapeutically? The most important set of speculations in the paper concerns the nature of emotional procedures. The empirical research has mostly ignored affect, yet it has been assumed here that emotional procedures and cognitive procedures are similar. Further research will clarify to what extent this is true.

This paper has translated familiar psychoanalytic concepts into the language of cognitive science. This is valuable in that it supports interdisciplinary communication and enables us to modify theory based on data collected in other fields. Bridging disciplines may serve to disconfirm psychoanalytic hypotheses, point to gaps in our knowledge, or broaden our conceptualizations. For example, the research indicates that not all that is unconscious is instinctual, dynamically repressed, or preconscious, as some unconscious knowledge is procedurally unconscious. When Freud described transference, current information about procedural and declarative knowledge was unavailable. The degree to which these constructs prove useful will be seen in the clarifications it offers, the new ideas that are generated, and the new research questions which can now be asked.

Emotions, we have seen, are procedurally organized, and heuristic strategies are essential components of emotions. This makes ontological sense of the idea of unconscious emotions. When these emotional heuristics are suboptimal, they guide maladaptive defenses and coping strategies. Emotional procedures begin to develop in infancy and early childhood, are unaffected by hippocampal immaturity, and provide organization and continuity to our emotional lives. This is the foundation of transference, the enactment of the emotional procedures learned in childhood. The repetition compulsion, in part because it is based on automatic maladaptive procedures, is difficult to interrupt or modify. And clinical amnesia, early childhood amnesia, and repression all share the same property: Declarative knowledge is lost amidst retention of procedural knowledge. Clinical amnesia provides an experimental model in which to study phenomena of interest to psychoanalysts. Modeling structural change as the acquisition and modification of complex emotional skills provides a conceptual framework in which to conduct such research. Developmental psychology, neurobiology, cognitive psychology, and psychoanalysis can all contribute to our understanding of these processes.
These disciplines can also contribute to our understanding of psychoanalytic treatment. Psychoanalysis, we have seen, works through both insight and direct reworking of the emotional procedures which underlie transference. An automatic emotional procedure can be converted into a controlled procedure by interrupting the automatic procedural enactments, and the resulting controlled procedure can be modified through insight, permitting the development of a new, more adaptive controlled procedure. With practice, it will become automatic. This view places the uncovering of unconscious declarative memories within the context of the analytic goal of modifying maladaptive emotional procedures. These maladaptive, automatic, emotional procedures can also be reworked directly through a genuine emotional experience within an empathic analytic relationship without insight mediating the process. In practice, structural change is a transactional process. Both approaches are essential to psychotherapeutic change.

Emde (1983) has suggested that there is a prerepresentational "affective core of the self" which guarantees our sense of continuity across development in spite of the many ways we change. Intrinsic to the prerepresentational affective core are emotional procedures, which maintain consistency in our emotional experiences in spite of the many emotional and interpersonal contexts in which we live, as well as how we change with development. To modify these procedures is to change who we are, and this is not easily accomplished. It is the task which psychoanalysis continually confronts.

REFERENCES

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FREUD, S. (1899). Screen memories. *S. E.*, 23:


FREUD, S. (1914). Remembering, repeating and working-through. *S. E.*, 12:

FREUD, S. (1915a). Repression. *S. E.*, 14:

FREUD, S. (1915b). The unconscious. *S. E.*, 14:

FREUD, S. (1926). Inhibitions, symptoms and anxiety. *S. E.*, 20:


- 379 -


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