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Biology of Family Systems and Mood Disorders

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Ethology offers psychiatry and family therapy an alternative perspective for understanding hierarchical dysfunction and individual psychopathology and the relation between them. Dominance and submission behaviors—descriptions from ethology—represent communicational mechanisms that play pivotal roles in maintaining the stability of the family group. When conflict becomes acute, dominant and submissive states are experienced as euphoria and mild depression respectively. Smooth functioning of these communicational mechanisms at the individual level enhances cohesion at the group level. Feelings of inadequacy and inferiority may be manifestations of submissive patterns and may function to maintain negative or corrective feedback loops, which preserve group stability. However, these communicational mechanisms may exhibit positive feedback runaway effects such that family crises result. These and other clinical implications of the model are explored.

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THIS ARTICLE demonstrates how a biological perspective provides a model for understanding mood disorders and family interactional patterns that may contribute to mood disorders. Biological psychiatry has traditionally focused on the within-organism study of individuals rather than on behavior in multiperson groupings. In contrast, we view a comprehensive biological approach as having a broader focus such as that used in the field of ethology, the branch of biology that studies animal behavior in the natural setting and is not restricted to within-organism processes.

We suggest that a comparative approach enriches the field of family therapy. The disciplines of ethology and family therapy already possess in common an emphasis on behavioral observations, adaptation, and analyses of communicative modes and methods. This article proposes that the biologically based field of ethology may be readily integrated with family systems and provides linking concepts.

ETHOLOGICAL CONCEPTS

Ethology is "the study of whole patterns of animal behavior in natural environments, stressing the analysis of adaptation and the evolution of the patterns" (45, p. 584). As a subset of "natural history biology," ethology focuses on the whole organism or groupings of animals; the field concerns itself less with cellular-molecular mechanisms than with evolutionary theory, population genetics, and functional

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gross anatomy and physiology integrated over various body systems.

Though the natural history approach and modern medicine share a biological focus, these two fields have developed largely independently of each other. Natural history biology has historically been connected with evolutionary theory and the Darwinian revolution while modern medicine has a close tie to cellular-molecular biology (23). However, the Nobel Prize *in Medicine and Physiology* was awarded in 1973 to three pioneering ethologists (Lorenz, Tinbergen, and von Frisch) who had studied nonhuman animals exclusively, and none of whom had contributed in any direct way to the solution of medical problems. However, this Nobel Committee decision seemed to reflect a perception that natural history biology has important potential relevance to the field of medicine.

Another definition of ethology stresses that the field conducts "comparative or across-species study of animal behavior. . . " (26, p. 2). We believe that insufficient attention has been paid to similarities of human groupings, such as families, to nonhuman groupings. There is not space here to review the enormous literature even on nonhuman primate family structure, but the reader's attention is directed to several excellent recent surveys (10, 11, 19, 31, 35, 43). More recent data on bonding and object relations provided by infant researchers have led to abandonment of earlier "tabula rasa" assumptions; for example, newborn infants within hours of birth can respond in kind to adult affective facial expressions (12). Over the last decade, attachment theory has generated impressive findings regarding continuities in early socioemotional development. The notion that "harmoniousness of the mother child relationship contributes to the emergence of symbolic thought" in both direct and indirect ways receives strong support from attachment theory (38, p. 78).

Agonistic Encounters

Agonistic behaviors are defined as "behavior that is adaptive in situations involving conflict between two or more members of the same species" (37, p. 193). Agonistic behavior includes dominance and submissive reactions between competing group members. "Any activity related to fighting, whether aggression or conciliation and retreat" can be described as "agonistic" (45, p. 578).

Bonding

Two sets of biological mechanisms serve the function of maintaining family cohesion and stability. One contributes to bonding, the other to hierarchy formation. We will briefly describe how the quality of attachment influences the individual's reactions to agonistic encounters and will then contrast functional and dysfunctional family hierarchies. We will consider how a dysfunctional family hierarchy can generate a disturbance in individual family members and also impair the functioning of the family as a whole.

Bowlby (3) reformulated early psychoanalytic, theoretical notions in ethological terms by attributing the development of attachment between parent and child to a combination of social releasers and innate response mechanisms. He said that one should have a secure and loving human attachment in infancy in order to become a secure adult. Moreover, many studies have demonstrated that attachment is a basic need not only of humans but of many animals, particularly mammals. Animals that miss early attachment can suffer a range of "personality" problems in later life (16).

Several researchers have concluded that behavior elements related to affection or bonding develop first, those related to submission, second, and those related to aggression and dominance, last (17, 34). Moller, Harlow, and Mitchell (28) found that rhesus

monkeys reared by mothers that had been deprived of mothering, and monkeys with repeated separations from their mothers early in life, showed more socially submissive behavior than did monkeys raised by normal mothers. This demonstrates that an absence of bonding or disruptions of bonding in early life can effect motivation during social encounters in later life and in subsequent generations. Parents have the task of teaching the young child to adapt his or her dominant responses to social reality. For example, the parent teaches a 3-year-old that screaming because he can't have a particular toy will not help him obtain what he wants.

Relationships between the type of bonding and reactions to winning or losing agonistic encounters can be considered from the perspective of the psychoanalytic school of "self-psychology." Kohut (20) pointed out that a "strong self allows us to tolerate even wide swings of self-esteem in response to victory or defeat, success or failure. . . . If our self is firmly established we shall be neither afraid of the dejection that may follow a failure or of the expansive fantasies that may follow a success—reactions that would endanger those with a more precariously established self" (20, pp. 414–415). Psychoanalysts who lean toward self-psychology believe that the child's early object relations help determine whether the child has a cohesive versus a fragile "sense of self." In ethological terms, the quality of the child's bonding affects the child's "sense of self," which, in turn, affects the child's subsequent ability to handle success and failure in agonistic encounters. Evidence suggests that more secure bonding fosters a more positive "sense of self," which increases the individual's ability to handle successfully his or her own dominant and submissive responses. More research must be done on the relationship between bonding and agonistic behavior to clarify the relations between these interpersonal processes.

Social Rank Hierarchies

According to Wilson (45), dominance orders were first explicitly recognized by a Swiss entomologist, Pierre Huber (18), in his pioneering study of bumblebees (although their caste system is hardly comparable with dominance hierarchies). A dominance hierarchy is a social order accepted by the group whereby members regulate access to environmental resources. Since Schjelderup-Ebbe (36) first discovered the pecking order in birds, some form of status (often dominance) behavior has been found in virtually all mammals, most birds, and many fish. Status differentiation also occurs in all established human groups, including preschoolers (25), a statement causing no surprise to family therapists. Once established, hierarchy serves important functions. A smooth functioning of the family dominance hierarchy provides adaptive functions for the whole group by reducing overall conflict and facilitating mutual cooperation. Because dominance hierarchies are so widespread, we speculate that ritual agonistic behaviors may have evolved at an early stage so that the messages are primitive and details of how they are sent vary across species.

Depression may weaken bonding, as in human sexual rivalry. For example, a suitor jilted in favor of a rival may react with depression that renders him still less attractive (40). This will further weaken any remaining ties between the rejected suitor and the object of his affections, but the bond between the rival suitor and the object of the rivalry may as a result be strengthened. The unsuccessful suitor's depression may promote the stability of the group by reducing possible conflict with his rival.

As illustrated by this example, parent-offspring bonding alone is not the only regulatory communication structure under-

lying a cohesive and smoothly functioning group. We follow ethological tradition by examining human social competition and regulation as this occurs through the operation of social-rank hierarchies. Lorenz (24) and Tinbergen (44) described the manifestations of social competition and dominance hierarchies in birds and fish, and more recent ethologists such as DeVore (9) have described similar behaviors in nonhuman primates. Intensive investigations of the last three decades have produced evidence of how subtle and complex such nonhuman communication can be (21). Considerable work on human social hierarchies ranges over many age groups (29). Human communication also is subtle and complex. We propose that some of this complexity may be better understood by examining communication within a hierarchical context.

Studies of primates, both human and nonhuman, show that hierarchies may have complex structures. Among chimpanzees and wolves, coalitions often determine which animal is dominant (13). Humans are generally members of a number of hierarchies at the same time, sometimes ranking high in one and low in another (the dominant man at the office can be subordinate to his wife at home). An individual may therefore try to compensate for a loss of status in one arena by trying to raise his or her status in another.

Though helpless infants are at the bottom of the family hierarchy, their helplessness and bonding to the family enable them to enjoy a lot of power. The family provides the setting for young children to learn to test their mettle and master new developmental challenges. Success in this arena enables them to rise in the family hierarchy. A functional family system is a context for the development of bonding and, in addition, provides the younger members with support for learning how to regulate their ritual agonistic behaviors by helping them learn how to deal with conflict. This includes learning when it is appropriate, how far to challenge, and when to yield. This has the effect of maintaining the cohesiveness and flexibility of the family system, which has a positive implication for the functioning of both the individuals within the system and the system as a whole.

There is a general consensus among mental health practitioners on the importance of healthy bonding. Those familiar with family work agree that some hierarchical differentiation of members is conducive to good family functioning (27). At the least, parents should have authority over young children. Sometimes, older siblings may help in exercising authority over younger siblings.

The nature of the family hierarchy has a major influence on how conflicts are resolved. Clear boundaries and well-defined lines of authority contribute to orderly functioning of the family hierarchy. However, a cross-generational coalition between a grandparent and child against a parent may result in a message to the child to challenge the parent. In this case, the child who rebels against the authority figure is not provided the support necessary to be successful. Conflict is promoted while resolution is impeded.

Ritualized Communications

Gardner (14) and Price (32, 33) have described biologically based communicative behaviors in agonistic interactions, indicating that communication is not only important in bonding, but also in agonistic (that is, dominant and submissive) interactions. Focusing on communication, "ritualization" is an ethological concept that refers to the "evolutionary modification of a behavior pattern that turns it into a signal used in communication or at least improves its efficiency as a signal" (45, p. 594). Fighting between animals of the same species is typically ritualized. "By precise

signalling a beaten combatant can immediately disclose when it is ready to leave the field and the winner will normally permit it to do so without harm" (45, p. 128).

As delineated by Gardner (14) in greater detail, patterns of dominance and submission may depend on primitive biological mechanisms that mediate intraspecific communication. Such biological mechanisms have a more ancient phylogenetic heritage than do more recently evolved species-specific behaviors, such as signal codes specific to particular species. Hence, gestures of triumph and submission may possess a primitive, biological basis that originated before man evolved. Indeed, parallel behaviors seem to be exhibited by reptiles, birds, and fish, as well as by mammals. Not only may gestures of triumph and submission be determined from such systems, but the human feelings of superiority and inferiority may also be described as responses to, or in conjunction with, agonistic encounters. Their activation, which involves neuronal networks and biochemical changes, as when two individuals meet, constitute rituals. These mechanisms determine the mild mood changes associated with victory or loss, and also the residual feelings of superiority and inferiority. Their marginal reactivation, when the two individuals meet again, maintains the stability of the hierarchy.

The individual who is losing an agonistic encounter may react with feelings of inadequacy, helplessness, and hopelessness, which influence him or her to give up the struggle. Through the act of submission, a message is sent to the opponent that the struggle is over. This submissive behavior prevents unnecessary injuries or fatalities and preserves group cohesion. As a rule, the winner responds with euphoria and increased self-confidence, and by ceasing the attack, which in turn leads to termination of the agonistic encounter. Furthermore, the defeated individual afterwards, or after repeated defeats, adopts an attitude of submissiveness toward the dominant one, and the winner continues to demonstrate dominance, which preserves the cohesiveness of the hierarchy. Feelings of inferiority, helplessness, or inadequacy therefore appear to be associated with a biological mechanism that serves to maintain group cohesion. This differs from the prevailing view that these feelings are a product of frustration or failure.

THEORETICAL IMPLICATIONS

We propose that smoother functioning of the mechanisms of dominance and submission is related to a more functional family system. In addition, whereas some family structures are better designed to socialize younger members by teaching them to manage their dominant mechanisms, other families are better able to demonstrate mutual caring and acceptance. This leads us to conceptualize families in terms of two orthogonal dimensions. The first dimension, "functionality of the family system," refers to the fact that different families are more or less functional or dysfunctional. Functional families are well-bonded, that is, able to express warm feelings to each other and also able to resolve hierarchical issues smoothly and flexibly. These families have a good capacity to promote the growth and individuation of the younger members. A single family may also vary—it may become more dysfunctional, for example, when it is subject to increasing stresses. When the family becomes increasingly dysfunctional, vulnerability to individual psychopathology may increase. The other dimension, the "communication style" of the family, refers to family rules that influence the type of psychopathology most likely to develop when the family is dysfunctional. "Outward" families have no trouble expressing aggression, but they have trouble expressing warm feelings. "Inward" families express positive feelings well but have trouble expressing hostility.

Families that have problems in bonding are, as we have stated, more likely to have problems in handling agonistic encounters. Such families are situated toward the left side of Figure 1. However, families will also vary in that some, who freely demonstrate aggressive behavior, have more trouble expressing warm feelings. These are the "outward" families. They are situated on the upper section of Figure 1. Other families that are comfortable expressing warm feelings have difficulty handling aggression. These are the "inward" families situated on the lower portion of Figure 1. If the family becomes dysfunctional, members of "inward" families are likely to develop different symptomatology from "outward" families, as portrayed in Figure 1.

Our concepts of "outward" and "inward" families have some common features with the "agonic" and "hedonic modes" that Chance (4–8) has derived from observations of infrahuman, primate societies. In the "agonic" mode, all attention is focused on a central dominating animal or small set of animals. All behavior is undertaken with reference to the possibility of aggression from the dominant(s). This, to some extent, parallels the "outward" family in that both typically relate in an aggressive way. By contrast, in "hedonic" groups, dominance is only occasional; when dominance is manifested, it is not with strictly power-based threat behavior, but with "displays" that the less dominant animals reflect with displays of appreciation. In hedonic groups, there is also a good deal of grooming and hugging. This parallels the "inward" family. The relation between our "communication style" dimension and Beaver's (2) centripetal/centrifugal dimension will be discussed below.

In healthy families, submission and dominance occur flexibly and reciprocally. This characterizes smoothly functioning hierarchies wherein the lower-ranking members accept the dominance of higher rankers.

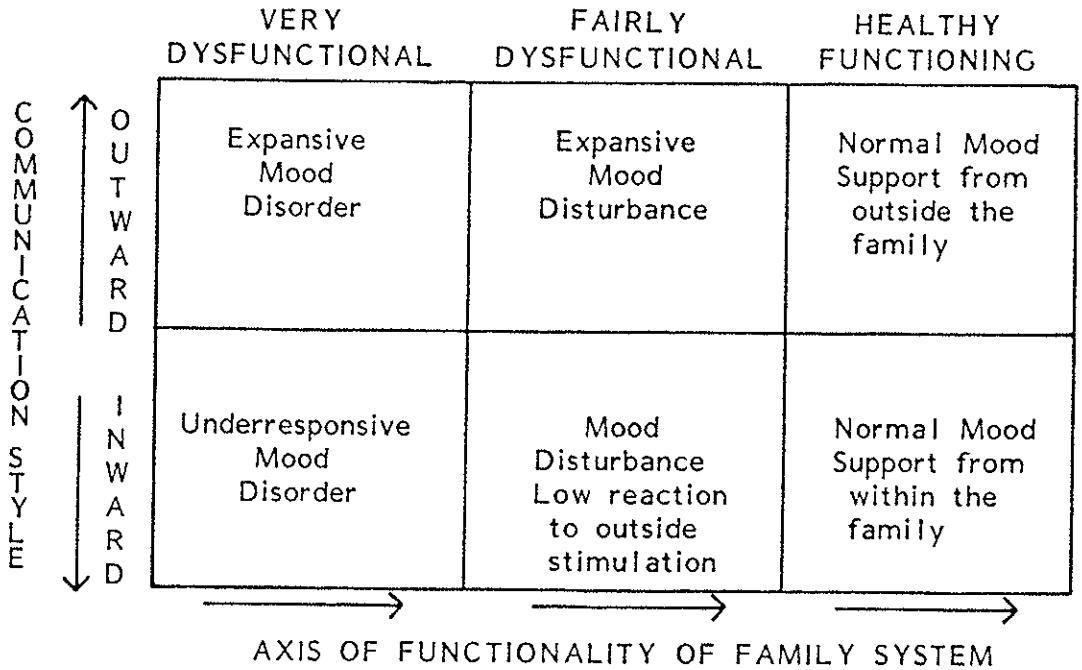

FIG. 1. Healthy and psychopathological behaviors of family members as a function of degree of health and communication style of family system.

These in turn comfortably assert their authority over lower rankers. When conflict becomes more acute, as after the young child has unsuccessfully challenged parental authority, the child may react with a mild loss of confidence that will help to end the challenge. In the absence of conflict, mood changes are only subtly experienced. This implies appropriate acceptance of one's hierarchical position and allows subordinate members to feel self-confident and dominant members to have their self-esteem bolstered by the children's acceptance of their authority.

When dominant or submissive mechanisms escape negative or "corrective" feedback control, various forms of disturbed behavior may result (see Figure 1). Positive feedback mechanisms are initiated and cause the family to become increasingly dysfunctional. Indeed, dysfunctional agonistic behaviors or interactions appear to play pivotal roles in the genesis of many forms of psychopathology. Dysfunctions short of major depression or mania can contribute to a hierarchical dysfunction, which leads to mood *disturbance* in the same and/or other individuals in the system. This formulation, illustrated in Figure 1, incorporates the principles of circularity and feedback that characterize the systemic, cybernetic models of family therapy (42). This positive feedback cycle, according to this model, can culminate in a variety of ways. In a very dysfunctional, "outward" family, one may observe an expansive mood *disorder* such as mania. In a highly dysfunctional, "inward" family, one might observe an underresponsive mood *disorder* like melancholia. When the family is a little less dysfunctional, one may observe a mood *disturbance*, like abuse of family members attributable to alcoholism in the "outward" family or dysthymia in an "inward" family. However, research is needed on how family dynamics interact with other factors that predispose, precipitate, or perpetuate mood disorders. We speculate that family or other group determinants of major depression and mania operate with lower thresholds in persons with a genetically conferred vulnerability.

Interestingly, the two dimensions that we propose correspond with two dimensions of Beaver's model (2). Our dimension of "functionality" of the family system corresponds to Beaver's continuum of health/competence. Our dimension of "communication style" corresponds to Beaver's dimension of centrifugal (outer-directed) versus centripetal (inner-directed) behaviors. Preliminary studies (15) have found that moderately dysfunctional (that is, incompetent) families with an "outward" communication style (in the centrifugal range) are more likely to have offspring with bipolar manic illness, substance abuse, or borderline personality disorders. On the other hand, moderately dysfunctional families with an "inward" communication style (in the centripetal range) have offspring with unipolar depression or severe obsessive neurosis. The findings of Hampson and colleagues (15) are consistent with the model we propose.

Clearly, the "advantage" of a depressive reaction depends to some extent on its severity and duration. Mild and short depressive reactions may be an advantage to individual fitness, as they may prevent self-assertion when such behaviors could be followed by serious injury or death. In more severe and long-lasting depressions, this advantage is less apparent, particularly in cases where new agonistic encounters are forced on the individual, before recovery from a previous yielding subroutine; as a result, he or she is disadvantaged in these new encounters and enters a vicious cycle of yielding and losing, resulting in depressive or neurotic personality disorders.

The positive feedback cycle that operates with mood disturbance and hierarchi-

cal dysfunction could have an adaptive function. We proposed (39, 41) that apparently "maladaptive" behaviors such as depression could historically have had an adaptive function by increasing the chances of survival of favorable genetic mutations in collateral relatives. We described a mechanism of "difference amplification" whereby winning breeds self-confidence, which promotes further success, losing leads to discouragement, and repeated losses may eventually lead to "maladaptive" behaviors.

We have noted that the loss of an encounter leads to severe depression in some persons and not in others, and that depressive illness may be related to an inability to terminate a conflict by voluntarily yielding when losing an agonistic encounter. One formulation of healthy functioning (avoidance of depression) would be that one must acknowledge and accept on both conscious and preconscious levels that one has lost an agonistic encounter in order to resume one's normal functioning. These ethological ideas and psychoanalytic views of grieving have in common an emphasis on recognition and acceptance of "loss" as necessary for healthy adaptation.

Whereas the DSM-III-R (1) categorizes mood *disorders* as "maladaptive" behaviors (as indeed they are), we contend that it sometimes may be more helpful to conceptualize them as "communicative" disorders. For example, individuals who perceive themselves as being engaged in an ongoing confrontation may react by sending messages of helplessness and inadequacy, which represent a submissive response that persists even to an inappropriate extent. These messages may come to represent a means of having others do things for them.

A deregulation of mechanisms that normally maintain the stability of the hierarchy would be expected to lead to hierarchical dysfunction. We are proposing that affective disorders and hierarchial dysfunction may be closely interrelated. For example, a depressed mother or an alcoholic father may be unable to maintain parental authority. Such disruption of the usual hierarchical checks and balances can contribute to mood disturbance in other family members, who may feel devalued or inadequate. Individuals who experience defeat in every confrontation may also feel that the conflict cannot be ended by simple submission. This may cause them to exhibit submissive behavior to inappropriate or damaging degrees. For example, family members may criticize themselves to avoid attack by a violent, alcoholic father. Escalation of such a cycle may result in another form of depressive reaction. Contrariwise, disturbance in the hierarchy associated with failures in limit-setting may contribute in other settings to feelings of grandiosity, as in "narcissistic" disturbances or mania. Thus, interactions between hierarchical disturbance and inappropriate alpha and omega behavior can initially be understood in terms of interacting loops or cycles. A functional family is able to provide corrective feedback to a member who displays mild mood changes. However, as a mood disorder becomes more severe, the family may respond in ways that accentuate the disturbance; moreover, the family member may then become less responsive to corrective feedback from other family members.

PRACTICAL IMPLICATIONS

We propose that circular mechanisms in functional family systems promote smooth functioning of *agonism* that, in turn, maintains the cohesiveness of the family system. Such smooth functioning implies that individuals can, when appropriate, shift easily from dominant to submissive behavior or vice versa. One example is the older sibling who can assert authority over younger siblings while still accepting the authority of the parents. It also involves an ability to challenge those in authority at appropriate times. A smoothly functioning

agonism also implies an appropriate balance between cooperative and agonistic behaviors in the group.

The therapist should aim to promote the smooth functioning of the family hierarchy. A family system with clear, direct, open communication will provide clear feedback to the subordinate members. In dysfunctional families with a behaviorally disordered child, the parents may instead express feelings of inadequacy about their parenting, which undermines their parental authority. When seeing families, one commonly notes positive feedback mechanisms whereby the parents' depression and anxiety make it more difficult for them to assert their authority over their child, which in turn compounds the problems their child is having (30). Such parents become even more depressed and anxious about their parenting. One needs to assist the parents therapeutically to give up their submissive behaviors and respond in a more dominant fashion. Within our conceptualization, the parents then regain feelings of self-confidence and hopefulness.

In clinical management of this and other cases, the ethologic concept of "termination of response" has been a useful metaphor. This refers to the release of an inhibition process (24), which then terminates a specific behavior. As an example, note how quickly the infant stops searching for the breast when its mouth touches the nipple. When yielding by the loser fails to terminate the aggressive behavior of the winner, this may have a negative consequences for the yielder. Moreover, some yielders may also suffer negative consequences because they cannot terminate their own agonistic behavior. They find it hard to accept their loss, acknowledge defeat, and to move on to more productive activities.

One clinical illustration is that of a young woman who said she felt she "was going crazy." She had been fired from a senior management job secondary to a leadership change in the university. She expressed her intention of "fighting to the bitter end," and said that she wished to avenge herself against the person firing her. After carefully ascertaining that no chance existed of her holding the job, the therapist aimed his intervention at persuading her to acknowledge emotionally this inability to maintain the job, and that her more important recourse was negotiation of better severance pay (a small win within the loss). This brief intervention enabled her to resolve her conflict and better handle the situation.

In summary, one may be able to resolve certain types of individual psychopathology and some forms of family dysfunction by reducing chronic, ongoing power struggles, by establishing generational boundaries, by enabling the family to provide a corrective feedback to its members, and by assisting members to give up excessively dominant or submissive behaviors.

In treating a mildly depressed patient in individual or family therapy, it is often helpful to consider what dyadic or triadic relationships the individual may be protecting through his or her submissive behavior. One might inquire how various other relationships would be affected if that individual were to become more or less depressed. To illustrate, one of us (L.S.) was seeing an attractive, intelligent, 17-year-old female complaining of feelings of inadequacy. Her mother was a chronically depressed, controlling woman, and the two older sisters had suffered from school phobia related to problems of separation. The formulation was that the mother's behavior reflected an absence of generational boundaries, and that the girl's submissive behavior served to protect her relationship with her mother by enabling her to avoid expressing the rage she felt toward her mother. The therapist intervened by telling her that she was empathetic and sensitive to her mother's need to be needed and that being helpless and inadequate was her way of sacrificing

herself to support her mother. He then discussed the possible consequences if she were to decide to stop being so helpful to her mother, and reflected how this could threaten her mother but also help her feel good about the progress her daughter was making. This intervention proved effective.

This case example illustrates how an ethological perspective may enable the therapist to frame more precise systemic interventions. The patient's loss of self-confidence was viewed as a submissive response to protect herself from feared confrontations, because of the anger she felt. The therapist hoped that more self-assertive behavior would facilitate individuation and separation from her mother. Ethology also provides a more hopeful framework in that it implies more obvious conscious control; for example, it is easier to decide to stop being submissive than to decide to give up being depressed.

The evolutionary perspective does not replace existing models, but it does add a new dimension to family therapy theory and practice. It is reductionistic in that it provides a simple framework for understanding complex family interactions. However, it increases our leverage of understanding and therapeutic effectiveness when we integrate this new model with ones already in use.

CONCLUSION

We submit that incorporation of ethological concepts provides a broader, more integrated and comprehensive model of family functioning because it encompasses genetic and biosocial factors within which certain types of individual psychopathology and family dysfunction can be more readily understood. We stress that the smooth functioning of ritual agonistic behavior plays a pivotal role in the prevention of individual disturbance and family dysfunction, reduces and modifies dysfunction if this develops, and permits family members to be supportive of each other's growth and development.

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