WHAT IS MOOD FOR?

Psycholoquy Volume 2 Issue 9.2 November 24, 1991
Target Article for Commentary

Randolph M. Nesse
The University of Michigan
Department of Psychiatry
C 440 Med-Inn Bldg.
Ann Arbor, MI 4809-0840
(313) 764-5348
Nesse@umich.edu

ABSTRACT: What evolutionary advantages have shaped the human capacity for mood? Answers are suggested if moods are seen as specialized states that increase our ability to cope with certain situations. This target article considers the hypothesis that high mood helps individuals take full advantage of the opportunities in propitious situations, whereas low mood motivates them to seek help, be socially submissive, conserve resources, and consider alternative strategies in situations where investments are not paying off.

RATIONALE FOR SOLICITING PEER COMMENTARY: The "skywriting" format requires paring away all but the skeleton of the argument and unfortunately allows few citations. Nonetheless, the format is excellent for my goal of encouraging psychiatrists, psychologists, and evolutionists to recognize that the question, "What is mood for?" is legitimate, important, and answerable. I would especially appreciate comments about (1) the basic approach of seeking evolutionary explanations for emotions in the adaptive challenges of the situations that shaped them, (2) alternative hypotheses about the functions of mood, (3) the plausibility of the "propitiousness hypothesis" and (4) additional ways in which it can be tested.

KEYWORDS: Mood, evolution, natural selection, fitness, emotion, adaptation, function, depression, psychology, psychiatry.

What function, if any, is served by the capacity for high and low moods? The development of new psychotropic drugs makes this question more important, and recent advances in evolutionary approaches to behavior make it more tractable. I shall (1) briefly justify the attempt to understand the evolutionary functions of mood, (2) review major proposals about the functions of mood, and (3) attempt to show how these proposals fit within a broader hypothesis.

The trait to be explained is high and low mood, that is, ordinary happiness and sadness. These are addressed as a single trait because their characteristics appear to be opposite sides of the same coin, and because their brain regulation mechanisms are closely related, as demonstrated in manic-depressive illness. Mania, depression, and grief are not primary objects of explanation here because it is difficult to tell whether they are sub-specialized adaptations, exaggerations of normal responses, or pathological states unrelated to normal mood.

It is now recognized that biological traits require evolutionary explanations of their origins and functions as well as proximate explanations of their mechanisms and ontogeny (Mayr, 1983). Debates continue, however, about how to decide whether or not a trait is an adaptation, how to specify the functions of a trait, what kinds of evidence are admissible, how evidence should be marshalled, and the degree of optimality shaped by natural selection (Sober, 1984). These debates are useful, but so far there is no sign of early consensus. In the meantime, it is essential that we continue, as best we can, to propose and test hypotheses about specific traits.

There are several good reasons to think that the capacity for mood was shaped by natural selection and that it therefore requires an evolutionary explanation. First, mood is a complex, universal trait and thus unlikely to be a product of drift, simple mutation, or any process other than natural selection. Second, the brain mechanisms that regulate mood could have been shaped only for a trait that was itself an adaptation. Third, mood responds in predictable ways to specific situations. Finally, mood consists of stable constellations of behavioral, physiological and cognitive states that have obvious major impact on fitness. These arguments do not prove that mood has an evolutionary explanation, but they justify the search, especially since the best evidence that a trait is indeed an adaptation is the discovery of its function.

Two main functions have been proposed for mood: communication and motivation. Mood has been thought (1) to communicate either a need for

assistance or an individual's rank in a group, and (2) to motivate and regulate the timing and locus of effort.

Of the two communicative functions of mood, eliciting aid is the more straightforward. The infant's cry alerts the care-giver that something is amiss. Later, the toddler's crying signal's separation and motivates the parent and child to stay together, as described by Bowlby and Harlow (Bowlby,1969). In adulthood, expressions of sadness solicit aid from relatives and friends. Many authors have noted that low mood can also be used deceptively to manipulate others. The solicitation of aid cannot, however, explain all aspects of mood. In particular, it cannot readily explain the benefits of happiness, or the physiological and cognitive changes of high and low mood. Furthermore, if the only function of mood is communication, it is difficult to explain the intensity of moods that are experienced alone in the middle of the night.

Mood also communicates social rank. High mood communicates dominance, low mood, submissiveness, and these signals prevent useless fights that would only harm both combatants. John Price has long advocated this function for mood (Price, 1967), and support has come from others (Gardner, 1982). In vervet monkeys, lowered status decreases activity in serotonergic brain mechanisms and the administration of serotonergic antidepressants can increase dominance rank (Raleigh, McGuire, Brammer, Pollack, & Yuwiler, 1991). Low mood motivates behavior to placate dominants, while high mood motivates high-status individuals to act in ways that maintain and increase their position in the hierarchy. Although mood undoubtedly serves these functions, several simple observations suggest that this cannot be its only role: some events that profoundly influence mood do not involve social position, some low-status people are happy, and many high-status people are unhappy.

Mood also has motivational and regulatory functions. One function is to adjust the timing of effort. When investments are not paying off, it is wise to stop investing in order to conserve efforts for a later time. The "conservation-withdrawal response" fits in this category (Engel & Schmale, 1972), as do analogies between low mood and hibernation. Less well appreciated are the benefits that high mood offers by increasing investments at times of high payoff.

The other motivational function of mood is to regulate the locus of investment. If a strategy is not paying off, or if a goal seems unattainable, it is wise not only to conserve resources for a more propitious time, but also to reconsider the viability of the strategy.

Emmy Gut takes this argument the farthest with her suggestion that depression is an adaptation that motivates social withdrawal in order to facilitate a reconsideration of how or whether to pursue receding goals (Gut, 1989). This would explain Bibring's observation that depression arises from the inability to give up unattainable goals (Bibring, 1953). Behaviorists propose a similar function in describing reactions to decreased reinforcement. The maladaptive aspects of Seligman's helplessness-hopelessness response have been emphasized (Seligman, 1975), but its foundations may lie in the benefits of not wasting time and energy on futile efforts.

These four functions of mood are all correct, in part, but none is sufficient. An explicitly evolutionary approach suggests a broad hypothesis that integrates the functions of mood. Like other emotions, high and low mood are behavioral subroutines, specialized states that have been shaped to increase fitness in certain situations. An evolutionary explanation of an emotion does not just consist of describing its functions. Instead, the explanation must first specify the situations in which the emotion offers advantages, and then show how the emotion's characteristics increase fitness in the face of the specific adaptive challenges that arise in those situations (Nesse, 1990, 1991). The characteristics of fear, for example, are useful in situations that are dangerous. Mood is more complicated. Because it is a continuum from high to low, we must look, not for a single situation, but for some varying aspect of the environment whose different levels require different behavioral strategies. This approach follows the behavioral ecological model of searching for the environmental cues and cognitive mechanisms that regulate various aspects of behavior (Krebs & Davies, 1984). A primary goal is discover what environmental variable is tracked by mood.

The environmental variable that seems most likely to regulate mood is the perceived propitiousness of current circumstances. In propitious situations, small investments have a high likelihood of a large payoff. In unpropitious situations, any amount of effort is likely to be wasted. The propitiousness of a situation influences mood, which in turn adjusts cognition, physiology, and behavior in coordinated ways that increase the ability to cope effectively with the situation at hand. Propitious situations induce high mood, which communicates high or increasing status, motivates increased energy and risk-taking in order to get full advantage from short-lived opportunities, and motivates increased investment in whatever strategies are working well. If the opportunity is social, the confidence of high mood motivates new relationships and status challenges that are risky but that might now

pay off. Unpropitious situations induce low mood, which communicates the need for aid and submissive social withdrawal, and motivates conserving resources and considering other possible strategies or goals. When a previously rewarding strategy suddenly stops paying off, frustration induces a short burst of aggressive energy to see whether additional effort is likely to overcome the obstacle. If not, hopelessness may be adaptive when it leads to considering other opportunities.

In sum, mood seems to motivate the allocation of resources away from efforts where they will be wasted, and towards those times, strategies, and enterprises where investments will have a large payoff. In this sense, mood is an algorithm that shapes major life strategies by determining how resources are allocated. Making such decisions well is as crucial to human Darwinian fitness as it is for other animals. Most animals must decide which prey to pursue and how long to stay in each patch. For humans (and for other social species), resource allocation decisions are inordinately complex, because they involve multiple goals, many individuals and groups, and networks of potentially incompatible strategies. Resources, for humans, are mostly social resources. Our investments are mostly in friends, allies and groups, and the rewards we seek are likewise mostly social. This explains why social cues so profoundly affect mood, why social withdrawal so regularly characterizes low mood, and why gregariousness characterizes high mood.

In addition to providing a framework that integrates previously proposed functions of mood, this hypothesis makes several predictions. First, the effects of different environmental situations on mood should be proportional to their effects on anticipated propitiousness. This contrasts with the simpler view that moods are affected by gains and losses and suggests the non-obvious prediction that the effects on mood should be small when gains are not accompanied by new opportunities and when losses involve no loss of future rewards per unit of investment. Second, the characteristics of high and low mood should offer advantages in situations of high and low propitiousness, respectively. Several such functions have been mentioned, but much remains to be done to understand how the characteristics of mood offer benefits. Third, people who lack the capacity for mood should be at a disadvantage compared to normal people. Those who lack the capacity for happiness should be unable to take advantage of opportunities, while those who lack the capacity for sadness should persist, blithely, in efforts that offer few payoffs.

This is a bare summary of a longer paper which is in preparation. I do not claim that the proposed hypothesis for the functions of mood is correct, but only that it is plausible, and that it demonstrates how a modern evolutionary approach may increase our understanding of mood. I welcome comments, especially those about other hypothesized functions of mood that I have not discussed, and ways in which the propitiousness hypothesis can be clarified and tested.

REFERENCES

Bibring, E. (1953). The mechanisms of depression. In P. Greenacre (Eds.), Affective Disorders (pp. 13-48). New York: International Universities Press.

Bowlby, J. (1969). Attachment and Loss, Vol. 1. New York, Basic Books.

Engel, G., & Schmale, A. (1972). Conservation-withdrawal: A primary regulatory process for organismic homeostasis. In R. Porter & J. Night (Eds.), Physiology, Emotion, and Psychosomatic Illness (pp. 57-85). Amsterdam: CIBA.

Gardner, R., Jr. (1982). Mechanisms in manic-depressive disorder. Arch Gen Psychiatry, 39, 1436-1441.

Gut, E. (1989). Productive and Unproductive Depression. New York: Basic Books.

Krebs, J. R., & Davies, N. B. (Ed.). (1984). Behavioral Ecology: An Evolutionary Approach, Second Edition. Sunderland, MS: Sunderland.

Mayr, E. (1983). How the carry out the adaptationist program? Amer. Naturalist, 121 (March, 1983), 324-333.

Nesse, R. M. (1990). Evolutionary explanations of emotions. Hum. Nature, 1(3), 261-289.

Nesse, R.M. (1991). What good is feeling bad? The evolutionary benefits of psychic pain. The Sciences, Nov./Dec., 30-37.

Price, J. (1967). The dominance hierarchy and the evolution of mental illness. Lancet, 2, 243-246.

Raleigh, M. J.,McGuire, M. T.,Brammer, G. L.,Pollack, D. B., & Yuwiler, A. (1991). Serotonergic mechanisms promote dominance acquisition in adult

male vervet monkeys. Brain Research 559:181-190.

Seligman, M. E. P. (1975). Helplessness: On Depression, development, and death. San Francisco: W.H. Freeman.

Sober, E. (1984). Conceptual Issues in Evolutionary Biology. Cambridge, Massachusetts: The MIT Press.