

A Stage Model of Coping with Frustrative Stress

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SYNOPSIS AND COMMENTS

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Motivation is concerned with purposive and goal-achieving behavior, and with access to the appropriate goal-objects, such behavior is rewarded and consummated. When there are obstructions to an anticipated goal, instrumental behavior is thwarted, and other forms of activity occur. This change in behavior is assumed to be due to a hypothetical internal activating state such as frustration arising from the organism's reactions to nonreward. In contrast to traditional approaches, which focus on the adverse effects of frustration on behavior, Paul Wong offers a "competence" orientation. Wong's research and theorizing reflect a tradition common in the clinical sciences, in which "animal models" are developed to illuminate comparable processes operating in humans. Although the material in this chapter is less specifically evolutionarily oriented than that in most of the other chapters in this volume, there are interesting implications from it that are relevant to the theme of this book.

In his chapter, Wong elaborates on his stage model of coping with frustration in which the focus is on natural behavioral tendencies that serve adaptive functions. The notion of adaptation as used here is in the context of better "adjustment" of the individual to its environment. This notion signifies an ability to deal effectively with the varied demands of everyday living, including coping with stress. This usage of the term is not quite the same as the evolutionary process of adaptation in the Darwinian sense,

which refers to evolved solutions to problems posed by the challenges of survival and reproduction. However, not all features of behavior or morphology are adaptations. In his chapter, Wong analyzes frustration in the general context of stress processes. *Stress* is defined as "a problematic internal or external condition that creates tension/upset in the individual and calls for some form of coping."

Wong argues that frustration is probably the most common source of stress and that it is important for humans to know how to cope with the former. Thus, he offers a model that posits an adaptation process involving three stages, of which each stage is characterized by dominant behavioral strategies. In the first stage, the organism deals with frustration by "trying harder," coupled with the mechanism of perseveration. If this strategy proves unsuccessful, the organism will explore all available coping options by "trying something else." Aggression most likely occurs during this stage because it is one of the instrumental options. The third stage of coping is called *resolition* and occurs when the organism ceases all efforts and becomes helpless or switches to a substitute goal, if one is available. Helplessness, according to this model, serves an adaptive function for the individual and may have fitness-enhancing potential. Resignation is more adaptive when the organism faces an unsolvable problem because it conserves energy as well as lessening distress. This state is nonadaptive only when it occurs prematurely or when it generalizes to situations involving solvable problems.

Wong conceptualizes the coping mechanisms in each stage as preprogrammed adaptive reactions that are generated in frustrating situations. In that respect, they may be regarded as adaptive specializations exhibited by individuals in a species. Although Wong did not deal with coping mechanisms from a comparative perspective, it is assumed that they are manifested only among species capable of forming expectancies and thus of experiencing frustration. These coping mechanisms enable the organism to survive in an environment where dwindling resources and intraspecific competition act to thwart its ability to attain relevant goals.

Support for the stage model comes from studies on experimental extinction by Wong's group in which rats were presented with a choice of various routes leading to different goal objects. At first, the animals perseverated in the habitual pattern for several trials before switching to alternative routes. Wong found that extinction increased both temporal and sequential variability such that the rats showed a gradual increase in hole exploration and biting behavior. Later in the series, the rats switched to a substitution activity of sand digging that Wong regarded as indicative of Stage 3 in his coping model. He also described data from other investigators that are congruent with the stage model.

A number of motivational phenomena can be explained by Wong's stage model of coping with frustration. When a response fails to enable an organism to attain its goal, it often explores new ways to deal with the situation.

The creative expansion of the animal's repertoire and the maintenance of goal persistence are adaptive consequences of frustration-induced exploration. Another reaction to frustration is aggression and such reactions often enable the organism to achieve important objects or goals. Thus, aggressive behavior may be instrumental to the animal's success in attaining its goal. According to the stage model analysis, when the alternatives to aggression involve dismal prospects, the organism resorts to aggressive behavior. Wong also considered the possibility that aggression may serve some cathartic function but conceded that this hypothesis has been challenged by contrary evidence.

Goal substitution is interpreted as an activity occurring during the third stage of coping with prolonged frustration. When the original goal is blocked, animals tend to substitute one incentive object for another. This phenomenon has been analyzed in a different theoretical context by Falk (1977) as "adjunctive behavior." One can also analyze goal substitution in terms of the ethological concept of "displacement activity." When the consummatory act appropriate to a motivational state (i.e., eating) is thwarted by the absence of a proper releasing stimulus (e.g., exteroceptive food cues), another act (e.g., drinking) will be secondarily activated by either an increase in its action specific energy or by a lowering of its reaction threshold. The secondarily activated behavior is referred to as either *appetitive* if it makes the occurrence of the blocked consummatory response possible, or *displacement* if it does not. From another ethological perspective, McFarland (1965) suggests that it makes functional sense for an animal to "switch attention" from a fruitless activity (trying to get food when none is available) to a fruitful one. Alternatively, Lucas, Timberlake, and Gawley (1988) view adjunctive behavior as part of a natural food-getting sequence in which rearing and drinking appear to be transition behaviors occurring between postfood focal search and more general search or withdrawal. Schulze's chapter in this volume suggests that there may be homeostatic mechanisms underlying adjunctive behavior.

P. Wong argues that helplessness/depression following repeated failure can be averted if substitution incentive objects are readily available. In contrast to Seligman's cognitive interpretation of helplessness that focuses on the presentation on noncontingent events (Seligman & Allenor, 1980), Wong posits that only prolonged frustration operations result in this state. Whereas the interpretation emphasizing cognition of response-outcome independence would lead one to predict ready transfer of reactions from one situation to the next, the frustration interpretation stipulates a more restrictive set of boundary conditions for the transfer of helplessness. Following the frustration experience, transfer will occur only when the initial helplessness treatment is long enough to trigger the resignation mechanism and when the test situation contains sufficient frustrative cues to instigate resignation prematurely. The evidence on the generality of learned helplessness, particularly

that of cross-situational appetitive transfer, is very limited. Prior exposure to uncontrollable events in one task does not automatically result in transfer of helplessness in other situations.

From the applied perspective, factors that immunize the animal against the onset of helplessness are of great importance. While learned helplessness theory points out the facilitating effects on prior exposure to consistent reinforcement, frustration theory differs in its predictions. Prior experience with consistent reinforcement may make the onset of the removal of response-outcome contingencies more disrupting. If the animal has previously been exposed to degraded reinforcement contingencies and has learned how to cope with frustration, then it is less likely to be helpless. More specifically, partial reinforcement should be more effective than continuous reinforcement as an immunization procedure against helplessness. The efficacy of partial reinforcement as immunization and a treatment against learned helplessness has been documented in many experiments.

In general, the stage model provides a means of conceptualizing the processes of behavioral adaptation consequent to the blocking of goal-directed behavior. Although organisms may have been selected with mechanisms that enable them to cope with chronic frustration in an adaptive manner, Wong's model indicates the specific conditions under which nonadaptive coping responses are acquired and generalized. This analysis allows us to understand how a diversity of effects such as response invigoration, aggression, exploration, and helplessness represents different aspects of the same coping process. Wong argues that if all animals manifest a similar sequence of behavior in reaction to different frustrating situations, this is a reflection of coping reactions that have been preprogrammed.

References

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INTRODUCTION

Who has not been frustrated by unfulfilled ambition, unrequited love, or unsolvable problems? Who does not know the bitter taste of failure and rejection? Life is a continuous drama of how to narrow the gap between reality and aspiration. To be alive is to be acquainted with frustration and touched by its varied effects.

Winding resources and rising inequality are likely to make its presence more keenly felt individually and collectively (Clark, 1967).

Given the prevalence of frustration, it is not surprising that there is a long and venerable tradition of frustration research. Many of the older findings have been summarized by Yates (1962) and Lawson (1965). More recent research is largely an outgrowth of Amsel's (1958, 1962, 1967) frustration theory which has exerted considerable impact on contemporary psychology (see Garfield, 1978). The present stage model is an extension and reformulation of Amsel's frustration theory.

Past research on frustration tends to focus on its adverse effect. A variety of pathological symptoms have been attributed to frustration (Freud, 1908/1959; Miller & Stevenson, 1936; Parker & Kleiner, 1966; Yates, 1962), and only the deleterious effects of frustration on learning and performance have been noted (Lazarus, Deese, & Osler, 1952; Posman & Bruner, 1948; Sears, 1942).

In contrast to this traditional deficit model, a competence orientation is favored here. The main thrust of the stage model of coping is that organisms are predisposed to exhibit qualitatively different response patterns in different stages of coping with frustration and that these natural behavioral tendencies serve an important adaptive function.

Frustration Defined

Frustration is typically defined in terms of the operations that produce it. Dollard, Doob, Miller, Mowrey, and Sears (1939) define frustration as "an interference with the occurrence of an instigated goal-response at its proper time in the behavior sequence" (p. 7). According to Amsel (1958, 1962), frustration occurs only when nonreward follows a history of reward in that particular situation. For Buss (1961), the blocking of any instrumental action leads to frustration. Yates (1962) proposes that "the term frustrating situation should be restricted to those situations in which an organism is prevented by a physical barrier from attaining a physical goal by the performance of responses which previously led to the attainment of the goal" (p. 176).

Other psychologists favor a broader definition. Rosenzweig (1934, 1944) recognizes that both obstruction to an anticipated goal and unfulfillment of a felt need may trigger frustration. In a similar vein, Maslow (1941) proposes that both deprivation of needs and threats to need fulfillment may occasion frustration; he also points out that human needs are not limited to biological ones (Maslow, 1943).

Berkowitz (1989) emphasizes expectancy as the necessary condition for triggering frustration reactions. In other words, blocking a person from some goal is frustrating only to the extent that this person anticipates the satisfaction of goal attainment. Such expectancy may be the result of prior success, instructional set, social norm, parental expectations, or personal aspirations. It makes sense to assume that any goal-directed activity implies some expectancy of success, because it is unlikely that anyone would pursue a goal that is totally unattainable.

Simply put, any operation that prevents an expected goal attainment occasions frustration. Such a definition is capable of encompassing a wide array of situations that engender frustration reactions. Lawson (1965) has identified the following operations that have been used in the laboratory to produce frustration: (a) nonreinforcement after a history of reinforcement, (b) preventing completion of a reinforced response sequence, (c) preventing a response aroused by goal stimuli, (d) delayed reinforcement, (e) unfavorable changes in incentive conditions, (f) failure, and (g) hypothetical or simulated frustrating situations.

Coleman and Hammen (1974) have identified five sources of frustration in real-life situations: (a) delay when time is valued, (b) lack of resources that are made attractive or necessary by advertising, (c) loss of friendship or loved ones through death, (d) failure in a competitive society that values individual success and achievement, and (e) difficulty in finding meaningful and fulfilling jobs.

All of these operations presuppose the existence of an expected goal object. Even the search for a life goal implies its existence. The presence of any goal, whether tangible or intangible, can be inferred from goal-directed or "persisting until" behavior (Tolman, 1932). It is only when a goal-directed behavior is blocked that frustration occurs.

Frustration typically accompanies the pursuit of goals, because there are always some obstacles that stand between where you are and where you want to be. These obstacles include unavailability of needed resources, lack of opportunities, social barriers, discrimination, and stiff competition. Personal characteristics can also prevent or delay goal attainment; these include insufficient effort, inadequate skills, or inappropriate strategies.

The present operational definition of frustration can even be extended to situations in which the expected goal is relief from pain or pressure. Maier and Ellen (1955, 1959) consider persistent, inescapable punishment as frustrating situations. Amsel (1967) has proposed a fourfold classification of unconditioned goal responses (reward, frustration, relief, and punishment) and has hypothesized that frustrative nonrelief from punishment may have similar properties as frustrative nonreward. This hypothesis has been supported in a number of studies (McAllister, McAllister, Brooks, & Goldman, 1972; Millard & Woods, 1975; Sgro, 1977; Woods, 1967).

So far, I have focused on the *stimulus* aspect of frustration and defined it as failure to attain an expected goal, be it a rewarding object or relief from punishment. Concerning the *response* aspect, frustration may be conceptualized as an emotive-motivational state, which predisposes the organism to certain patterns of reactions. For example, Yaes (1962) has offered this definition: "Organisms placed in objectively defined frustrating situations will experience frustration to varying degrees and will manifest varying responses to this state of frustration" (p. 175).

A variety of responses have been linked to the organismic state of frustration. These include invigoration (Amsel & Roussel, 1952), aggression (Dollard et al., 1939), escape (Daly, 1969), fixation (Maier, 1949), and exploration (Wong,

1979). The present stage model attempts to specify the conditions under which various frustration reactions will likely occur.

In sum, frustration is treated as a hypothetical construct that is anchored to any operation that prevents the attainment of an expected goal, and a specific set of observable reactions to such operations.

Frustration and Stress

In this section, I attempt to place frustration within the larger context of stress research. It will be argued that frustration is stressful, and that most stressful situations involve frustration.

Stress is typically used as a catch-all term to cover conditions that involve aversive stimulation or excessive demands on the coping resources of an organism (e.g., Lazarus & Folkman, 1984; Mechanic, 1970; Selye, 1980). It is also used to refer to the internal state of the organism under stressful conditions. For the purpose of clarity, conditions that induce a state of stress will be called *stressors*.

Early stress research focused on various physical stressors, such as extreme heat, noise, or virus, although frustrations and conflict were also recognized as having similar effects on physiological processes (Selye, 1976). More recently, increasing attention has been given to psychological stressors, such as uncontrollability (Glass & Singer, 1972; Seligman, 1975; Weiss, 1971a, 1971b), frustration (Brown, 1980), life changes (Holmes & Rahe, 1967), and lack of meaning in life (Wong, 1989). In view of these diverse sources of stress, a more comprehensive definition of stress has been proposed by Wong (1990): "Life stress can be defined as a problematic internal or external condition that creates tension/upset in the individual and calls for some form of coping" (p. 70).

There is now considerable evidence that frustration *per se* can activate physiological responses known to be elicited by physical stressors. For example, several human studies have demonstrated that frustration increases physiological arousal as measured by various autonomic responses, such as galvanic skin reflex and pulse rate (Freeman, 1948; Hokanson & Burgess, 1964; Hokanson, Burgess, & Cohen, 1963; Thiesen & Meister, 1949). Frustration of the need for love and protection may lead to peptic ulcers (Alexander, 1950). In animal research, extinction induces changes in both testosterone and behavior in chicks (Archer, 1974) and frustrative nonreward increases pituitary-adrenal activity as measured by an elevation of plasma corticosterone (Coover, Goldman, & Levine, 1971; Davis, Mommt, MacFadden, & Levine, 1976; Levine, Goldman, & Coover, 1972). It should be noted that plasma corticosterone is also sensitive to other kinds of stressful situations, such as maternal separation (Coe & Levine, 1981), avoidance learning (Natselson, Krasnegor, & Holdaday, 1976), and uncontrollable loud noise (Hanson, Larson, & Snowdon, 1976).

The aversive property of frustration has been established in behavioral studies as well. For instance, animals learn to escape from cues associated with frustrative nonreward (e.g., Daly, 1969; Terrace, 1971) and from the unbailed goalbox

during extinction (Rosellini & Seligman, 1975; Wong, 1977a, 1978a). Pigeons and rats also give themselves time-out in a progressive ratio schedule when response requirement for reinforcement is progressively increased (Azrin, 1961; Dardano, 1973; Thompson, 1964). Generally, the degree of aversiveness of frustration is related to variables known to determine the amount of frustration. For example, the amount of urine excreted by rats, which is an index of aversive emotionality, is directly related to the number of reinforced trials prior to frustrative nonreward (McHenry, 1973).

A number of investigators have even proposed that frustration and fear share many similar properties (Gray, 1987; Wagner, 1967). Some similarities in the effects of discomfort and frustration have also been documented (Berkowitz, 1989); in his frustration-aggression reformulation, Berkowitz proposes that "frustrations are aversive events and generate aggressive inclinations only to the extent that they produce negative affect" (p. 71).

Frustration as a source of stress has long been recognized in the clinical literature. For example, Ariei (1959) listed failure in an important relationship and failure in achieving important life goals as among the major stressful situations that cause depression. Similarly, Brown (1980) has included a number of frustrating situations, such as chronic unemployment, socioeconomic impoverishment, and failure to fulfill one's aspirations as sources of stress. Kanner, Kafry, and Pines (1978) have also argued that the lack of positive conditions—the deprivation or unattainability of various rewarding goal events—is a major source of stress that demands closer attention.

Uncontrollability enjoys a great deal of vogue in stress research, thanks largely to the influential learned helplessness theory (e.g., Maier & Seligman, 1976; Seligman, 1975). This theory posits that the perception of noncontingency between response and outcome (uncontrollability) leads to expectancy of noncontingency, resulting in cognitive, emotional, and motivational deficits that interfere with subsequent instrumental learning. Shock is almost exclusively used in animal learned helplessness research. According to the present analysis, inescapable shock is more stressful than escapable shock, simply because the former involves the additional frustrative stress. Inescapable shock should be viewed as an unsolvable problem in which attempts at securing relief are repeatedly frustrated. It may be argued that it is the experience of frustrative nonrelief rather than perceived noncontingency that is responsible for the interference effects. A case may be made that uncontrollability per se does not necessarily lead to stress, and that uncontrollability is stressful only to the extent that one desires and anticipates gaining control but fails.

Another source of psychosocial stress is known as life events or life changes (Holmes & Rahe, 1967). An impressive amount of evidence has been collected to substantiate the linkage between life events and health outcomes (Dohrenwend & Dohrenwend, 1974). However, a number of investigators (Mueller, Edwards, & Yarvis, 1977; Sarason, Johnson, & Siegel, 1978) have shown that only undesirable life events, such as marital separation and job loss, have a negative impact on

one's mental and physical health. Most of the undesirable life events involve failure and frustration. It can be argued that the detrimental effects of stressful life events may be mediated by extinction-related behavioral mechanisms.

More recently, everyday hassles have become recognized as a major source of stress. Lazarus and his associates have shown that the frequency and intensity of these hassles are positively related to both physical and mental health (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982; Lazarus & Folkman, 1984). Some of the most frequently cited hassles include concerns over wasting time, anxiety over meeting high standards of performance, and various forms of interference. It does not require any stretch of imagination to recognize that most of these hassles are frustrating conditions that interfere with the pursuit and prosecution of life tasks.

The previous analysis serves to make the point that frustration is probably the most common source of stress. In the current social context, economic recession, rising unemployment, and spiraling rates of inflation all conspire to frustrate an individual's quest for security. On a global scale, inequality of wealth among nations, rising expectations brought about by education and television, population growth coupled with dwindling natural resources, all combine to escalate frustration and conflict between nations. As alluded to earlier, frustration is a two-edged sword—it either sharpens our wits or defeats us. Therefore, individually and collectively, it is important to know how to cope with frustration in a way that maximizes its benefits but minimizes its harms.

A STAGE MODEL OF COPING WITH FRUSTRATIVE STRESS

Coping covers a wide range of responses, both learned and unconditioned, that assist living organisms in adapting to demanding or stressful situations (Coelho, Hamburg, & Adams, 1974; Mechanic, 1970). In studying the physiological mechanisms of coping with stress, Selye (1976) discovered the general stress syndrome, which consists of three qualitatively different stages. The initial stage is called *alarm reaction*, which involves activation of the autonomic nervous system and discharge of norepinephrine and epinephrine from the adrenal gland. The organism is said to be in a state of shock or arousal. During the second stage, bodily resources are mobilized to cope with the stress at the expense of other bodily functions, such as sexual behavior. This is called the *resistance* stage. However, if stress is prolonged, *exhaustion* sets in, resulting in a general weakening of resistance to disease and other sources of stress. *Exhaustion* does not necessarily mean depletion of physiological coping resources.

In this section, I describe the model of coping with frustration that is based on behavioral studies of coping reactions. Supporting evidence is presented in the following section. In its simplest terms, the stage model posits that the adaptation

process involves four orderly stages, and each of these stages is characterized by certain dominant behavioral strategies. In the *initial habit stage*, when an individual first encounters a frustrating situation, the dominant strategy is *try harder*. Typically, the individual becomes aroused by the negative encounter and tries again with greater vigor the same behavior that has been successful. In a novel situation not associated with any particular habit, however, initial frustration will result in the invigoration of general activity of an ongoing behavior.

The coping mechanism of perseveration is often concomitant with invigoration. When a habitual way of responding runs into difficulty, rarely does the individual give up this habit immediately. The habitual response will persevere for some time albeit with greater vigor. How long the response will persist depends on a number of factors, such as the strength of the habit, strength of competing habits, and so on.

At this point, it is important to bear in mind two kinds of persistence: response persistence and goal persistence (Wong, 1978a). The former refers to repetition of the same response, whereas the latter refers to continued pursuit of the same goal by whatever means. Throughout this chapter, perseveration of habit is equated with response persistence.

Habit mechanism operates in many life situations: We may continue to turn left even when our new address calls for a right turn; we tend to follow certain routines even though a change in our present practice may improve efficiency. Habits are perpetuated as long as they continue to serve our needs. The advantage of habit mechanism is quite apparent in terms of cognitive economy: It frees the individual to devote his or her attention to more pressing and more complex matters. In most frustrating situations, response repetition with enhanced vigor (i.e., "try harder") serves an adaptive function. It is only when perseveration becomes unduly prolonged in spite of repeated failure that it becomes unadaptive, and this sort of perseverative behavior has been regarded as an index of brain damage (Reitman & Darison, 1974). In normal functioning organisms, the initial habit stage is typically transitory as it inevitably gives way to the more sustained trial-and-error stage.

When the habitual mode of responding proves to be ineffectual, the frustrated individual will mobilize his or her resources and explore all available coping options. During the *trial-and-error stage*, the organism adopts the strategy of "try something else." This may take the form of exploring alternative means or attacking the obstacle. The availability of different coping options helps sustain goal striving.

A number of investigators have recognized the important role of *hope* in coping with stress (Reker & Wong, 1983; Scheier, Weintraub, & Carver, 1981; Stotland, 1969; Tiger, 1979). There are different conceptions of hope. For example, Farber (1967) views hope as jointly determined by one's sense of competence and perceived threat in a given situation. Mowrer (1960) considers hope as based on prior experience with reinforcement and equates hope with the mechanism of conditioned goal anticipatory responses, such as salivation in anticipation of food.

According to the present analysis, hope is simply a summary term for the expectancy of attaining a particular goal, and hope depends on the totality of coping resources available in a particular situation. Broadly speaking, there are internal and external coping resources. Internal resources include one's competence, knowledge, past experiences, response options, and the creative capacity of trying novel solutions. External resources include whatever opportunities and help are available. Hope is kept alive as long as there are still some coping options to be explored.

Aggression most likely occurs during the trial-and-error stage, not only because of the build-up of anger, but also because it is one of the instrumental options. Hostile display or actual attack is often effective in removing an obstacle. The distinction between instrumental and hostile aggression made by Feshbach (1964) has been widely accepted. Aggression tends to take precedent over other instrumental alternatives, when (a) all nonaggressive solutions have failed; (b) aggression has been reinforced in dealing with similar frustrating situations; (c) there are no nonaggressive outlets for pent-up emotions; (d) there is a ready target for aggression; and (e) the individual does not anticipate costly consequences for aggression.

The second stage is also called the conflict stage because two kinds of conflict take place during this state: response conflict and approach-avoidance conflict. Response conflict involves competition between various response tendencies directed toward the same goal, whereas approach-avoidance conflict involves competition between approach to or avoidance of the same goal. The former conflict tends to predominate in the early part of Stage 2, while the latter intensifies toward the latter part of Stage 2.

The final stage of coping is called *resolution*, because the approach-avoidance conflict is eventually resolved. When all instrumental efforts fail to secure the incentive object, the tendency of goal-substitution will increase. Failure to find an acceptable substitution goal should instigate the resignation mechanism, at which point the organism ceases from all efforts and becomes helpless.

A great deal of confusion now exists concerning the usage of various terms such as *helplessness* and *depression*. For example, cessation from instrumental activities and a low level of general activity have been taken as evidence of depression (Klinger, Kemble, & Barta, 1974). These behavioral patterns have also been referred to as evidence of learned helplessness (Mäler & Seligman, 1976; Seligman, 1975). To clarify matters, the following definitions are proposed:

Helplessness is used to describe the result of an *unconditioned* resignation coping mechanism triggered by prolonged failure. An individual does not require any prior learning to become helpless. One automatically becomes helpless when one has exhausted all personal coping resources.

Learned helplessness, on the other hand, refers to the transfer to helplessness to a new situation in which the problem is soluble. If a person has failed repeatedly, and given up many times, he or she has learned to give up prematurely in the face of frustration in a new situation. Learned helplessness is a conditioned re-

action, when the resignation mechanism is triggered prematurely and inappropriate by frustrative cues in a different situation. Therefore, *learned helplessness* means *generalized helplessness*. The extent of generalization depends on the similarities between situations as well as the strength of the learned tendency to become resigned.

The relationship between helplessness and depression also needs clarification. There are different kinds of depression (Friedman & Katz, 1974). Here, we are only concerned with reactive depression. Depression has been equated both helplessness (Klinger et al., 1974) as well as learned helplessness (Seligman, 1975). Seligman and his associates reformulated the learned helplessness theory and proposed that depression occurs only when an individual attributes uncontrollable events to internal, stable, and global causes (Abramson, Seligman, & Teasdale, 1978). Thus, depression depends on how a person explains events. It needs to be reiterated that neither helplessness nor learned helplessness is evidence of depression; one must take into account a variety of cognitive factors, such as hopelessness (Beck, 1967; Kovacs, Beck, & Weissman, 1975).

According to the stage model, helplessness serves an adaptive function (Engel, 1953, 1962; Klinger, 1975; Price, 1972). Although instrumental activity is generally more effective than passivity in reducing stress (Gal & Lazarus, 1975), resignation is obviously more adaptive when the problem is insolvable, not only because it conserves energy (Engel, 1953, 1962), but also because it lessens distress (Gatchel & Proctor, 1976). Helplessness become unadaptive only when it occurs prematurely or generalizes to situations in which the problem is solvable.

The response patterns associated with each stage are conceptualized as coping mechanisms in the sense that there are preprogrammed adaptive reactions that occur automatically in frustrating situations. It is difficult to imagine how any organism not endowed with these coping mechanisms can long survive in an environment in which dwindling resources, competition, and social barriers often frustrate one's basic needs. A summary of the stage model is shown in Table 8.1.

At this point, an astute reader may have detected a parallel between Selye's general stress syndrome and the present stage model of coping with frustrative stress. There is certainly some basis to speculate that the three stages of physiological reaction as outlined by Selye accompany or subserve the three stages of behavioral coping. The initial *alarm* stage seems to coincide with general arousal and behavioral invigoration observed in many frustrating situations. The second *resistance* stage seems compatible with the trial-and-error stage in which the frustrated organism mobilizes all its coping resources to remove frustrative stress. Finally, the *exhaustion* stage seems equally applicable to physiological exhaustion as well as the exhaustion of behavioral coping resources and the ensuing helplessness when goal substitution cannot be achieved.

It seems plausible that Selye's general stress syndrome and the present behavioral process of coping represent different levels of analysis of the same adaptational process. Health outcomes of coping may depend on the interaction between behavioral and physiological reactions. For example, the availability of

TABLE 8.1. Different stages of coping with frustration

Stages	Coping mechanisms	Motivation	Learning
Habit	Invigoration Perseveration	Increase in arousal and effort	Facilitates performance; interferes with new learning
Trial and error	Exploration Aggression	Increase in arousal and effort	Facilitates new learning
Resolution	Goal substitution Resignation	Decrease in arousal and effort	Interferes with performance and new learning

larger behavioral coping resources may also enhance one's physiological resistance to stress.

EMPIRICAL EVIDENCE FOR THE STAGE MODEL

It is not possible to document all the relevant evidence within the space of this chapter. Therefore, the review of the literature has to be selective. I will first report some of the results from my laboratory.

The paradigm that I have used extensively to study frustrative stress is experimental extinction—the procedure of discontinuing reward after various conditions of rewarded learning. Experimental extinction has much to recommend itself as a coping paradigm for the following reasons: (a) It represents the extreme case of delay of gratification (where delay is infinite), and it allows the psychologists to identify the maximum degree of delay tolerated by an individual. (b) It permits the study of the entire coping process in dealing with chronic frustrative stress. (c) It resembles many life situations in which one's wants and desires remain unfulfilled, no matter how hard and how long one strives.

Traditional studies of experimental extinction have not told us very much about coping, because these studies treat extinction as a measure of associative learning and pay little attention to the kind of coping behaviors that naturally occur in the course of extinction (Hall, 1989). In contrast, these coping behaviors have been the focus of my own investigation. Some of the preliminary results have already been published (Wong, 1977a, 1978a).

Different from the traditional simple straight alleyway for rats, the runway I have designed was partitioned into nine equal segments, which were numerically coded to specify the route taken by each rat. Three separate swinging doors separated the runway from the goalbox. Thus, the rat could choose any route and go through any one of these doors to enter the goalbox. One side of the runway had a hole leading to an enclosed box to measure exploratory activity. A furry model

animal was mounted on the runway to record biting and aggressive behavior. A sand-digging platform was also made available in the startbox, so that rats might switch to sand digging as a substitution activity. A combination of naturalist observation and electromechanical reading devices were used to obtain various measures of the behavioral field during acquisition and extinction.

I will now briefly summarize the preliminary findings (Wong, 1977a, 1978a) to illustrate how well the stage model can account for extinction performance after different reinforcement conditions. During acquisition partially reinforced (PRF) rats chose a greater variety of routes than consistently reinforced rats (CRF), but most subjects settled on a particular route, which was in most cases a straight path. A more general statement of this finding is that "instrumental learning involves a process of narrowing the behavioral field through dropping out inefficient response patterns (i.e., long routes) and unproductive instrumental activities" (Wong, 1977a, p. 8).

It should be noted that the dominant response pattern that emerged in my complex runway is analogous to reinforcement-induced behavioral stereotypy in pigeons and humans (Schwartz, 1980, 1981, 1982). The paradigm used by Schwartz is as follows: The subject is shown a display of a matrix of light, with the light illuminated at the top left corner as the starting point. Responding on the left (L) key moves the light one step down, while responding on the right (R) key moves the light one step right. As soon as the light is moved to the bottom right corner which is the end point, reinforcement is delivered. Thus, there are many different routes for the light to travel from the start to the end of the matrix. In this situation, individuals tend to fixate on a particular sequence, such RRRLLL or LRLRLR. The dominant pattern is referred to by Schwartz as stereotyped behavior.

During extinction, rats typically perseverated in the habitual pattern for several trials before switching to alternative routes (Wong, 1977a, 1978a). As predicted, overtrained subjects persisted longer in the dominant route (Wong, 1978a, Experiment 2). Contrary to Wong's rat data, Schwartz (1981) reports that extinction has little effect on either sequence completion time or sequence variability in overtrained pigeons. In other words, the second stage of response variation does not occur if pigeons have developed a strong habit. This finding in fact questions the plasticity of learned behavior and equates overtrained sequential operant with species-specific stereotypy. We have tested rats and humans using the same procedure as Schwartz (Peacock & Wong, 1984a, 1984b; Wong & Peacock, 1986). Our consistent finding is that extinction increases both temporal and sequential variability regardless of the amount of overtraining!

It is interesting to note that consistent with the stage model, Wong (1978a) also observed a gradual increase in hole-exploration and biting behavior (indicative of the second trial-and-error stage), which peaked before switching to sand digging (indicative of Stage 3).

In the complex runway situation, I did not observe the invigoration effect, because of the discrete-trial procedure. Typically, rats were given extinction trials

with a 30-minute intertrial interval. The invigoration effect is known to be a rather transitory reaction to frustrative nonreward, and it can be obtained in discrete-trial extinction only when the intertrial interval is relatively short (Jensen & Cotton, 1960).

In the free-operant situation, the testing chamber was equipped with six manipulanda: a panel, a lever, a pair of blades attached to the lever to measure biting and attack on the lever, and a platform for sand digging, as well as a drinking spout to detect time spent in drinking (Wong, 1977b). In this study, following baseline measures of these behaviors, panel pushing was first consistently reinforced with food reward and then extinguished. While reinforcement decreased alternative responses, extinction increased the complexity and variability of the behavioral field, as predicted by the stage model. Further, invigoration in panel pushing was evident only in the first two extinction sessions.

In another series of studies (Wong, 1978b) in which the Skinner box was only equipped with three pushing panels without the opportunity for substitution activities, more than 70% of all the subjects showed an increased rate of pushing the previously reinforced panel during the initial stage of extinction, tried alternative panels later on, and eventually showed signs of helplessness such as passivity, crouching, or sleeping. When reinforcement contingency was restored in the same situation, these rats remained passive and showed learning deficits as compared to rats that had not been exposed to prolonged periods of extinction. I have not been able to obtain evidence of generalized or learned helplessness, however, because when rats were tested in a different situation, such as running or a different Skinner box, following prolonged extinction, they did not show any learning deficit.

Similar patterns of results have been obtained in human subjects and some of these findings were reported in the Leuven Symposium on Cognitions in Human Motivation (Wong & Dimitroff, 1980a). In one of the experiments the subjects were tested in a complex finger maze. The surface of the maze was carved with three grooves that emanated from a common starting point. The nine intersections and the three end points were labeled with different alphabetical letters to identify the routes chosen on each trial. The goalbox was equipped with a small lightbulb and an incremental counter. To complete a trial, subjects used a finger to trace a route of their choice from the start point to one of the endpoints. They were told that a correct route would be automatically signaled by the light on the goalbox and the addition of a point to the counter. Each point was worth five cents.

This finger maze, like Wong's complex maze for rats, allows a variety of routes to be reinforced. Subjects were either consistently reinforced (CRF) or partially reinforced (PRF). Following acquisition training, they were given extinction training before the learned helplessness test. In addition to behavioral measures, we also obtained paper-and-pencil measures of perceived causes (i.e., attributions) of their performance outcomes and their effective states.

During acquisition, PRF subjects showed greater variability in routes and reported greater effort attribution (i.e., claimed that they tried harder) than their CRF

counterparts. Both the variability data and effort attribution indicate that PRF subjects adopted a try strategy (Wong & Amsel, 1976).

During the first 10 extinction trials, there was a significant increase in response speed and in effort attribution as compared with the last 10 acquisition trials for both CRF and PRF subjects, providing evidence for the hypothesis that nonreward initially triggers the invigoration coping mechanism. We also obtained evidence of exploration in that during the second 10 extinction trials, response variation was greater than during terminal acquisition trials.

Prolonged extinction (two consecutive 10-minute sessions of repeated failure) resulted in a decrease in response speed, discontinuation of the task by some subjects, and an increase in feelings of anxiety and depression as measured by Zuckerman's affect checklist. However, when these subjects were given a learned helplessness test in which reinforcement was contingent on pushing a button for 99 times, their rate of reinforcement was not different from that of those who had not been exposed to prolonged extinction. We have also given the subjects other kinds of helplessness tests, such as a different kind of finger maze or anagram problems, but we were never able to obtain evidence of the transfer of helplessness.

To summarize, careful observations of both rats and humans in many extinction situations have produced results that are in basic agreement with the stage model. There is also considerable evidence from other laboratories, which I will discuss shortly. Meanwhile, we must consider two criticisms that may be leveled against the stage model. The first criticism is that the stage model is untestable, because it encompasses all possible outcomes of frustration manipulation—invigoration of the old responses (Stage 1), increase of alternate responses (Stage 2), and a cessation of instrumental responding (Stage 3). This criticism can be easily dismissed because the model does not cover all possible outcomes. For example, one of the possible outcomes of prolonged frustration is the gradual weakening of the previously reinforced criterion response without either the invigoration of the old response or the occurrence of competing responses. In other words, the criterion response simply becomes progressively slower in initiation and execution. This is what is predicted by most theories of extinction except the stage model. Further, the stage model can be rejected if the actual sequence of events differs from that hypothesized by the model. Thus, if response alternation occurs before invigoration, or if passivity occurs before response alternation, then the model is falsified.

A second criticism is that it is descriptive, rather than predictive. Although Hall (1989) has many positive things to say about the model, he nevertheless regards it as a descriptive analysis of experimental extinction. Generally speaking, a model or theory ceases to be descriptive when one can derive test implications. A number of testable hypotheses can be deduced from the stage model. The following are just some of the more obvious ones:

1. Amount of response repetition increases response persistence (the habit stage) but has no effect on goal persistence (the trial-and-error stage).

2. A change in stimulus complex from acquisition to extinction weakens response persistence, but has no effect on goal persistence.
3. Overtraining with large reward increases response persistence because of the habit strength associated with training trials but decreases goal persistence because of the magnitude of frustration associated with holding a large reward.
4. The number of instrumental coping options (such as additional manipulanda) decreases response persistence but increases goal persistence.
5. The greater the "attractiveness" of substitutions, the shorter the goal persistence.

We must now consider findings based on rather different paradigms and reported by other investigators to evaluate the stage model.

Frustration-Induced Invigoration-Perseveration

A classical demonstration of frustration-induced invigoration is the well-known Amsel's frustration effect (Amsel & Roussel, 1952). Amsel and many other investigators have found that when two straight alleyways are connected together (i.e., the double-runway), occasional omission of food reward in the first goalbox increases the speed of running to the second baited goalbox. This effect has been well documented (Amsel, 1958, 1962; Scull, 1973) and has been obtained in many species, ranging from planarians (Micklin & May, 1975) to humans (Ryan & Watson, 1968). It has also been demonstrated in double-lever situations (Marx, 1967; Marx & Tombaugh, 1967; Wookey & Strongman, 1974). As well, the energizing effect of frustration can be obtained when general activity level is measured in rats and children (Gallup & Altomari, 1969; Klinger et al., 1974; Ruiz, 1975).

The initial invigoration effect is also well established in free operant situations and is characterized by a burst of responding following the onset of extinction (Ferster & Skinner, 1957; Margulies, 1961; Notteman & Mintz, 1965). Because the invigoration effect is generally rather transitory, it is obtained in discrete-trial extinction only when the intertrial interval is relatively short (e.g., Jensen & Cotton, 1960). The extinction-induced invigoration effect has also been obtained in humans working on a finger maze for monetary reward (Wong & Dimitroff, 1980a). In some response systems, the initial invigoration effect can be of considerable magnitude and duration. For example, after rats have been reinforced for sand digging, they displaced almost twice as much sand during the first two extinction sessions (10 min per session) as during terminal acquisition (Wong & Dimitroff, 1980b).

Consistent with the frustration interpretation, the invigoration effect is related to parameters that are supposed to affect frustration, i.e., number of prior reinforced trials (Marx, 1967; Marx & Tombaugh, 1967) and drive level (Dunlap & Frates, 1970; McHose & Ludvigson, 1964). Available evidence suggests that invigoration is perhaps the most common and most robust coping mechanism.

The initial invigoration effect can also be predicted from Atkinson's theory of achievement motivation (Atkinson, 1957; Atkinson & Feather, 1966) and Brehm's reactance theory (Brehm, 1966; Wortman & Brehm, 1975). According to

these alternative theories, the initial invigoration is derived from higher cognitive constructs. For example, reactance theory presumes the cognition of personal freedom, and the need for such freedom: Nonreward threatens one's freedom to obtain a desired outcome: invigoration is treated as an attempt to regain "outcome freedom." According to the present analysis, frustration of any anticipated need fulfillment should instigate a series of behavioral coping mechanisms, and invigoration tends to occur first. Thus, psychological reactance may be considered as a special case of a more general rule of frustration-induced invigoration.

A related mechanism that operates in the initial stage of coping is perseveration. The force of habit in regulating behavior has long been recognized by psychologists (e.g., Allport, 1957; James, 1890; Skinner, 1938). It has been variously called *habit strength*, *reflex reserve*, or *functional autonomy*. The basic idea is that if a behavior has been practiced or reinforced many times in a situation, it is likely to be repeated in the presence of similar cues. This habitual mode of responding has been described as automatic (Kimble & Perlmuter, 1970) and ballistic (Bindra, 1969). Once a habit is activated, it is assumed to run off to its completion in the absence of incentive (Logan, 1971), and "nothing external to the organism is necessary to ensure that continuation of the sequence, even though external factors are crucial for its initiation" (Mandler, 1964).

Perseveration, coupled with invigoration, is clearly very adaptive in simple instructional learning situations. To react to nonreward by repeating the same response with greater vigor tends to facilitate performance and increase the likelihood of success in such situations (see Scull, 1973, for a review). In complex learning tasks, however, perseveration-invigoration may have a deleterious effect. An interesting experiment by Schneek and Brunning (1968) provides some support for this hypothesis. They used a modified double runway in which the second runway consisted of one short alley directly connected to a complex maze. There was one correct path in the linear maze leading to a baited goal cup. They reported that frustrative nonreward increased the speed in the short alley but also produced more errors in the complex maze. Serum (1973) obtained similar findings in humans when two complex tasks were used in a manner that was analogous to a double runway: Nonreward on the first task tended to increase errors on the second task.

Frustration-Induced Exploration

When a response fails, it is repeated with greater vigor; when the repetition fails, other responses are attempted. This sequence of coping actions accords well with everyday experience. Frustration-induced exploration of alternative responses has been demonstrated under many conditions and in several species (Wong, 1979). It has also been observed (Miller, 1971) that frustration increases perceptual exploration of incongruous stimuli. Thus, it may be concluded that frustration enhances exploration of both the frustration situation and coping options. In other words, frustration broadens the scope of stimulus selection (Sutherland, 1966), as well as response selection (Wong, 1979).

Hull's (1934) concept of habit-family hierarchy is relevant to the present discussion. According to Hull, a divergent excitatory mechanism gives rise to response variation, and competing multiple excitatory tendencies are the result of past associative learning. In coping with frustration, however, organisms not only attempt previously acquired alternative responses, but also explore new ways of responding. In other words, response selection is not only limited to the existing response repertoire, it may creatively expand the repertoire.

Another important adaptive function of frustration-induced exploration is the maintenance of goal persistence. Other things being equal, the degree of goal persistence should be positively related to the number of goal-oriented coping options. There is already some preliminary evidence (Wong, 1981) that during extinction rats persisted longer in entering an unbaited goalbox in a multiple-route runway than in a single alley. Such a finding indicates that competition between goal-directed excitatory tendencies increases rather than decreases goal persistence.

Frustration-induced exploration can also be derived from the dynamic theory of achievement motivation (Atkinson & Birch, 1970, 1974; Kuhl & Blankenship, 1979a, 1979b). According to this view, blocking one of two functionally equivalent responses should increase the motivation to engage in the alternative response. If one considers approach-avoidance conflict also as response competition (Ames, 1967), then there are actually two different kinds of response competitions with opposite effects on goal persistence. Conflict among instrumental possibilities increases goal-persistence, while approach-avoidance conflict decreases it. It is interesting to note that according to Brown and Farber (1951), both types of conflicts are in themselves sources of frustration. Thus, frustration should continue to build up throughout the second stage of coping until conflict is resolved.

Two explanations, which are not mutually exclusive, may be offered to account for goal persistence. First, a larger response repertoire should keep an organism persisting longer simply because it takes longer to exhaust the repertoire. If an organism has learned a number of instrumental responses, such as lever pressing, panel pushing, and so on, then all these responses will be attempted in a frustrating situation. A broader and more cognitive explanation is that the frustrated individual appraises his or her coping resources, which will include both internal instrumental options and external sources of help. "Hope" or the expectancy of goal attainment lives on, as long as coping resources are not yet exhausted. It is this hope that maintains goal persistence.

The present analysis of frustration-induced exploration seems to contradict the familiar frustration-regression hypothesis (e.g., Barker, Denbo, & Lewin, 1941; Mowrer, 1940). According to Barker et al. (1941), regression primarily consists of *primitation*, which refers to regression to an earlier stage of development or a less mature way of behaving. Primitation is evident in a decrease in behavioral variability and organization. In other words, behavior should become less variable and less organized under conditions of frustration. However, the authors did not quantify response variability and they only inferred regression from reduced constructiveness of play when children could not gain access to a set of at-

tractive toys. A number of criticisms may be directed to the measure of constructiveness of play (see Yates, 1962). For example, this measure was subjective and the raters were not blind to the experimental manipulation. Further, alternative interpretations are available. Reduced constructiveness of play might be due to emotional responses and/or alternative instrumental activities. Child and Waterhouse (1952) were able to demonstrate a significant negative correlation between constructiveness of play and time spent in frustration-induced activities. Child and Waterhouse (1952) were able to demonstrate a significant negative correlation between constructiveness of play and time spent in frustration-induced activities, such as trying to reach the inaccessible toys and attempting to escape. In short, there is little unequivocal evidence of frustration-induced regression to an earlier stage of development.

From the present theoretical perspective, regression is only one facet of the trial-and-error stage of coping. As the organism explores alternative instrumental responses, it often returns to earlier patterns of responding that have been successful in coping with frustration. This kind of instrumental regression has been demonstrated in rats (Amsel, 1971; Martin, 1940; Mowrer, 1940) and humans (Barthol & Ku, 1959).

Another controversial issue is whether frustration leads to behavioral variability or unadaptive fixation. I have already documented frustration-induced response variability (Wong, 1979), which is clearly at variance with the well-known finding of frustration-induced abnormal fixation (N. Maier, 1949). How do we reconcile these two contradictory sets of findings? A close scrutiny of the experimental situation employed by Norman Maier may shed some light.

The procedure by Maier used to induce fixation typically involves the following features: (a) pressure or the threat of aversive stimulation from behind, (b) absence of escape routes, (c) an insolvable problem. For example, a rat is placed in the Lashley jumping-stand apparatus and required to jump into either one of two stimulus cards placed side by side. If it jumps on the correct side, the stimulus card will yield and the rat will land on a platform where it is rewarded with food. If it jumps to the incorrect side, the stimulus card is latched, and the rat will bump its nose and fall into a net. Under the insolvable condition, the stimulus cards are latched or unlatched according to a random sequence, and over many trials, the rat will be correct about 50% of the time regardless of which side it chooses. If the rat fails to jump within a certain time, it is punished by an air-blast. It should be noted that this situation is not unlike the coerced approach situation devised by Wong (1971a, 1971b) in which rats were coerced to approach an aversive goalbox by more aversive consequences for goal avoidance. Under such conditions, most rats develop position fixation, jumping consistently to one side. When the problem is subsequently made solvable, and the rat is rewarded for jumping to the alternative side, some rats continue to fixate for many trials, thus exhibiting "neurotic compulsions" or "abnormal fixation." This kind of stereotype does not readily generalize to other situations (Maier, 1949).

Such a phenomenon could be better understood in terms of coping and learn-

ing principles. Response fixation is perhaps the most adaptive coping strategy available when one is trapped in the impossible situation devised by Maier. Even Maier recognized that response fixation "gives the animal a way of responding to insolvable problem situations—a way without which such situations would have remained highly stressful" (Maier, 1949, p. 52). There are several sources of stress inherent in Maier's setup—punishment for failure to jump quickly, the threat of punishment, the approach-approach conflict of choosing between two stimulus cards, the frustration of not being able to solve the problem. These stressful factors should be reduced by a response fixation strategy, because such a strategy eliminates the need for deciding between two response alternatives that yield similar outcomes and, hence, increases the speed of execution and decreases the likelihood of punishment. To put it differently, response fixation predominates probably because this is the only coping strategy that is differentially reinforced by a reduction of various sources of stress.

The perseveration of a position fixation when a discrimination problem becomes solvable could also be accounted for in terms of learning principles. First of all, the stereotyped response has been partially reinforced and, therefore, should be very resistant to extinction. Second, even though the fixed response is no longer successful in landing on the safe platform, it is nevertheless consistently successful in avoiding the air-blast. If the air-blast is more aversive than bumping the nose against a latched stimulus card, differential negative reinforcement should work in favor of the continuation of a position fixation. Third, the rat might not be aware of the change in reinforcement contingency. If a cue is provided to indicate a contingency shift, the rat might not perseverate and might learn the discrimination problem as readily as if it were placed in a new discrimination learning situation. In short, what appears to be a symptom of an underlying pathology or neurosis, may be simply a coping strategy shaped and maintained by differential reinforcement. This line of reasoning suggests that if one removes the pressure (i.e., a penalty for not responding quickly) and provides salient cues regarding the change of contingency, rats and humans should no longer perseverate when the problem becomes solvable.

We have conducted a study (Quek & Wong, 1983) to test this coping interpretation. According to this coping view, fixation is not "behavior without a goal," as described by Norman Maier, but rather a goal-oriented instrumental coping response. More specifically, we predicted that frustration produces response variability, but fixation would eventually prevail as the subject learns that varying responses does not increase the pay-off, and that fixation is the most efficient strategy to cope with a partially reinforced insolvable problem.

Schwartz's (1982) paradigm was adapted to incorporate critical features of Norman Maier's fixation studies. Subjects were exposed to a 5 × 5 matrix of light and were required to manipulate two buttons to move the light from the upper left corner to the lower right corner. One press on the left (L) button moved the light across one step. One press on the right (R) button moved the light down one step. There are 70 different sequential patterns to move the light to the lower right cor-

ner. The diagonal between the upper left corner and the lower right corner divided the matrix into two equal triangles. For the Discrimination group, any sequential pattern that fell within one triangle was consistently reinforced; any sequential pattern that fell outside the triangle was not reinforced. For example, the sequence LLLRRRR falls within the right triangle, while RRRLLLL falls within the left triangle. For the Insoluble condition, reinforcement randomly occurred 50% of the time for each triangle; therefore, it was not possible for the subject to learn which triangle was correct. In this situation, reinforcement was partially contingent on completing 4 L responses and 4 R responses, but not contingent on which triangle the sequential pattern belongs. This is equivalent to Maier's Insoluble discrimination problem.

We also had a noncontingent condition in which subjects were yoked with Discrimination subjects in terms of reinforcement. In fact, noncontingent subjects could sit passively without pushing a single button and still received reinforcement whenever their yoked discrimination subjects made the correct response. This is equivalent to Seligman's learned helplessness condition, in which reinforcement is completely independent of the subject's behavior. Reinforcement occurred in the form of points accumulated on a counter, exchangeable for money. Half of the subjects in the discrimination and insoluble conditions were also subjected to time pressure such that if they failed to complete the response sequence (four presses on the L button and four on the R in any order), within 4 sec, they were penalized four points. This treatment is similar to Maier's procedure of administering an aversive air-blast to rats for failing to make the jumping response quickly.

As predicted, the PRF Insoluble group made more different sequences than the discrimination group, and 50% of the subjects in the Insoluble group stated that they sought to get as many points as possible by trying different responses, thus demonstrating the exploration strategy. Also consistent with prediction, fixation increased significantly over trials for the Insoluble subjects. Noncontingent subjects also exhibited more response variability than the discrimination group, although both groups received identical patterns of reinforcement. Noncontingent subjects might have been motivated to seek response contingency. In fact, 31% of these subjects thought that they had found the response rules for reinforcement.

Time pressure did not have the hypothesized effect of increasing response fixation in the PRF insoluble condition probably because frustration-induced exploration is stronger than anxiety-induced fixation. In a consistent reinforcement situation that did not involve discrimination learning, time pressure did have the hypothesized effect of increasing sequential stereotype.

During testing, when all subjects were given a solvable discrimination learning task in which the previously nonpreferred triangle was now associated with reinforcement, there was no evidence of abnormal fixation or learned helplessness because the Insoluble and Uncontrollable groups reached the same asymptote of learning as the Discrimination group.

In view of these findings, the discrepancy between Norman Maier's findings of abnormal fixation and frustration-induced exploration may be reconciled by the following hypotheses:

1. Exploration is the predominant coping strategy in a partially reinforced insoluble problem situation; fixation gradually emerges only when trying different responses fails to improve the payoff.
2. Fixation is the predominant coping strategy in situations of extreme pressure because it is faster and safer to repeat the same routine than to try out new ones. It is hypothesized that the tendency to use a fixation strategy is positively related to the amount of pressure, such as the severity of punishment for not responding fast enough. The dominant emotional response to threat of punishment is anxiety; therefore, fixation should be reinforced by anxiety reduction.
3. When a situation involves both frustration and anxiety, which coping strategy will have an upper hand depends on which emotional state is stronger.

In our paradigm, frustration should be stronger than anxiety because the penalty for losing four points or four pennies is really not that aversive. Therefore, frustration-induced exploration is the main coping strategy. In Maier's paradigm, anxiety should be stronger than frustration because punishment by air-blast should be more aversive than failure to receive food reward. Therefore, fixation should be the dominant coping strategy.

On the basis of interviews with our subjects, we found that consistent with our orientation that focuses on competence, they did employ appropriate coping strategies to handle the problem of noncontingency. The coping strategy of exploring different responses was widely used when they were exposed to a partially reinforced insoluble problem or noncontingent reinforcement. Contrary to deficit models such as learned helplessness theory, these subjects did not become helpless or abnormally fixated in subsequent discrimination learning.

Frustration-Induced Aggression

The frustration-aggression hypothesis, with slight variations, has been proposed by many psychologists (see Berkowitz, 1989, for a review). Initially, aggression was considered as an inevitable consequence of frustration, and "the occurrence of aggressive behavior always presupposed the existence of frustration" (Dollard et al., 1939, p. 1). More recently, aggression has been considered a heterogeneous phenomenon, having multiple causes and functions (Moyer, 1976). Further, several investigators have recognized that frustration-induced aggression is dependent on situational variables (Berkowitz, 1974; Geen, 1972).

There is now sufficient empirical evidence that extinction induces aggression in both humans and animals (Azrin, Hutchinson, & Hake, 1966; Frederiksen & Peterson, 1977; Hutchinson, Azrin, & Hunt, 1968; Kelly & Hake, 1970), but aggression does not always occur. Interestingly, it has been shown that consistent with the present stage analysis, aggression is an inverted-U function of extinction trials in animals and humans (Azrin et al., 1966; Naton & Cooney, 1982; Thompson & Bloom, 1966; Wong, 1978a). In other words, the highest frequency of aggression occurs neither at the beginning nor at the end of extinction trials, but somewhere in between. To underscore the importance of frustration, Naton and Cooney (1982) were able to demonstrate that reinforcement parameters known to affect frustration (e.g., schedule and number of reinforcement) actually determined

when the highest frequency of aggression would occur. For instance, they reported that 30 reinforced trials as compared to 10 reinforced trials resulted in greater amount, as well as earlier peaking, of aggression, presumably because stronger expectancy of reward led to faster development and greater amount of frustration during extinction.

Frustration-induced aggression serves at least two adaptive functions: *instrumental* and *catharsis*. Aggression is essential to survival according to rules of the jungle, but does aggression "pay" in a civilized society? The answer seems to be yes. For example, an individual who is prepared to "destroy" anyone who impedes his or her progress is more likely to succeed in a competitive society than those who are submissive or passive. Such an individual is considered civilized as long as he or she does not resort to physical aggression. Further, for many unemployed minority youths in city ghettos, hamstringing by language, educational, and cultural disadvantages, aggression promises to be the only route to survival and self-respect. When the alternatives to aggression are deprivation and degradation, even gentle and peace-loving individuals are likely to turn into violent aggressors.

Although aggression serves an adaptive function in achieving important objects for individuals and groups under certain circumstances, it always poses a threat to other individuals and humanity as a whole. Rules of the jungle will continue to operate in civilized societies unless legitimate and basic needs of all people can be met without resorting to violence. From the perspective of the stage model, violence will remain a way of life for those whose fundamental needs and rights are denied, all attempts at a peaceful solution are frustrated, and aggression is reinforced some of the time. This hypothesis is applicable to both individuals and nations and sounds an ominous note concerning the potential danger of frustration when it cannot be reduced through nonviolent means.

The second function of aggression is *catharsis*. The adaptive value of catharsis has been observed in both clinical and laboratory settings. Baruch (1941) observed that children who were allowed to dissipate their frustration by mutilating clay models of their parents became better adjusted at home. Physiological arousal returned to prefrustration levels when human subjects were given the opportunity to display aggression (Hokanson & Burgess, 1963; Wells, 1970). All of us have experienced the cathartic effect of a variety of angry, aggressive outbursts, ranging from slamming a door to screaming at someone. Denying the expression of angry feelings may result in psychosomatic problems. Therefore, aggression during the second stage of coping is both an outlet of pent-up feelings of anger and frustration, and an instrumental attempt to resolve a problem.

The catharsis hypothesis has not gone unchallenged. Both Berkowitz (1989) and Tavis (1989) have questioned whether the expression of anger has the effect of reducing physiological arousal as well as further aggression. Available evidence seems to suggest that aggression may increase rather than decrease further aggression because it may become conditioned through reinforcement or practice to frustrating or aversive situations (Azrin, Hutchinson, & McLaughlin, 1965; Berkowitz, 1974; Feshbach, 1964; Tavis, 1989). According to the stage model,

prior reinforcement of frustration-induced aggression makes it more likely to be employed as a coping option during the trial-and-error stage.

Frustration-Induced Goal Substitution

The importance of goal substitution as a coping mechanism has long been recognized. Dollard et al. (1939) point out that attainment of an alternative goal reduces the original goal response. Masserman (1961) has observed that individuals become increasingly inclined to accept alternative goals when blocking of the original goal is prolonged. Animals also have the tendency to substitute one incentive object for another (Rachlin, Battalio, Kagel, & Green, 1981). For example, Rachlin and Krasnoff (1983) report that external constraints of eating increase drinking, and vice versa. Wong (1977b) reports that spontaneous sand digging increases when rats are blocked from eating.

One can readily identify numerous instances of goal substitution in real life. The familiar "rebound" phenomenon in love relationships is a case in point. A frustrated, rejected lover may readily fall in love with a less desirable person, and wonder why he or she had not discovered that person earlier. Overeating as a way to cope with frustration is also a common observation.

According to the present analysis, the negative impact of failure is attenuated by the availability of alternative goals. One test implication is that the greater the incentive value of alternative goals, the faster the goal substitution under conditions of frustration.

The coping mechanism of goal substitution brings to the fore the importance of ecology. One cannot fully understand adaptation apart from the context in which it takes place. When substitution incentive objects are readily available, repeated failure does not pose a major threat, and helplessness/depression can be averted.

Frustration-Induced Helplessness

Yates (1962) observed that "under extreme and prolonged frustration, a subject may simply resign himself to his fate and refuses to perform any positive action" (p. 23). Maier (1949) considered resignation as the terminal state following prolonged frustration. Similarly, Klinger (1975) observed that "at some point during sustained unrelieved frustration, organisms begin to give up" (p. 10). According to the present analysis, giving up in favor of an alternative goal involves the mechanism of goal-substitution, whereas giving up in the absence of any substitution goal involves the mechanism of resignation.

In animal research, Klinger et al. (1974) reported that prolonged extinction reduced activity level in the runway. Wong (1978b) also observed an increase in passivity in a Skinner box following extended extinction, although different amounts of extinction might be needed to induce a high degree of passivity in different rats.

There is also a large body of evidence that prolonged failure leads to passivity, helplessness, and depression (e.g., Brown, 1972; Ellner, 1970; Klinger,

1975; Left, Roatch, & Bunney, 1970; Seligman, 1975). It has also been observed that patients suffering from chronic renal failure show symptoms of helplessness and depression, such as passivity and negative self-concept (Shanan, Kaplan-De-Nour, & Garty, 1976). These symptoms may be attributed to prolonged frustrative stress associated with the unavoidable hemodialysis treatment and the endless waiting for a kidney transplant.

The literature of maternal separation is relevant to the present stage model. Separation-induced depression has been observed in both humans and primates (Bowlby, 1973; Kaufman & Rosenblum, 1967; Suomi & Harlow, 1977). Some have argued that this is due to the loss of control (Kaufman, 1973, 1977; Mineka & Suomi, 1978), but it could be easily argued that infants suffer not so much from loss of control, as from loss of reinforcement associated with mother. According to the present analysis, prolonged maternal separation is not different from experimental extinction.

It has been observed that monkey infants typically go through a stage of protest before the depression sets in (Mineka & Suomi, 1978; Seay, Hansen, & Harlow, 1962). The protest stage corresponds to the exploration-aggression stage, during which there is an increase in instrumental attempts to reestablish contact with mother as well as an increase in anger and aggression. The depressive stage during maternal separation is equivalent to the helplessness stage during prolonged extinction.

Once the resolution stage is reached, regardless of whether it is due to the mechanism of resignation or goal-substitution, there should be an immediate reduction of frustrative stress because of conflict resolution. In other words, frustration levels should be an inverted-U function of extinction trials. This prediction has been supported by a number of studies (Brooks & Goldman, 1971; Rosellini & Seligman, 1975; Wong, 1978b).

A FRUSTRATION ACCOUNT OF LEARNED COMPETENCE

So far, the focus of my analysis has been on the preprogrammed or unconditioned coping responses. In this and the next sections, I focus on the effects of conditioning different coping mechanisms to frustrative cues, and how an organism can learn to be competent or helpless in coping with new situations.

The concept of competence motive was first thrust to the forefront of motivational research by White's (1959) seminal paper. According to White, the competence or effectance motive is assumed to be global and intrinsic, giving rise to all kinds of behaviors that enable organisms to deal effectively with their environment. White also believes that the competence motive is maintained and enhanced by a feeling of efficacy or competence that comes from mastery over the environment. White's concept has been developed by a number of researchers (Bandura, 1977; deCharms, 1968; Harter, 1978). It is generally agreed that the

competence motive depends on the belief that one can interact effectively with the environment, and that this belief is fostered by some success experience in coping. However, different views have been proposed as to what kinds of success experience are most effective in promoting the competence motive.

According to the *contingency* view, it is the personal experience of contingency of covariance between behavior and outcome that gives rise to the feeling of competence. This view is shared by many psychologists (e.g., deCharms, 1968; Seligman, 1975; Weiner, 1980). There is now some indirect evidence that experience of contingency may contribute to one's sense of competence. For example, Joffe, Rawson, and Mulick (1973) found that rats raised in a contingent environment where food, water, and ambient lighting were controllable by lever pressing were less emotional in an open field test than rats exposed to food, water, and lighting that were presented independently of their behavior. Wright and Katzer (1977) extended this finding and reported that rats exposed to contingent deliveries of food and water subsequently learned an avoidance response faster than rats exposed to noncontingently presented food and water.

The beneficial effects of exposure to contingent events have also been observed in humans (Dweck & Licht, 1980; Gunnar, 1980). For example, Watson and Ramey (1972) reported that infants who could make a mobile spin by pressing their heads against a pillow expressed more smiling and cooing and subsequently performed better in certain tasks than the no-control counterparts.

According to the *learned effort* view, it is not the experience of the contingency per se but the expenditure of effort that is important. Thus, it is effort-outcome covariance, rather than response-outcome contingency, that increases the persistence and vigor of goal-directed behavior. This view as developed by Eisenberger has been supported in numerous ingenious experiments (Eisenberger, Carlson, & Frank, 1979; Eisenberger, Carlson, Guile, & Shapiro, 1979; Eisenberger, Heerd, Handi, Zimet, & Bruckmeir, 1979; Eisenberger, Park, & Frank, 1976; Eisenberger, Terberg, & Carlson, 1979). According to the learned effort hypothesis, effort involves the expenditure of energy and an organism is capable of learning the amount of effort involved in a task, independently of specific responses required to execute the task. The degree of effort necessary for reinforcement in one situation is positively related to the amount of effort expenditure in subsequent and different situations. Thus, transfer of persistence across different situations is attributed to the mechanism of learned effort.

There is little disagreement that exposure to contingent events reduces emotionality and facilitates learning as compared to exposure to noncontingent events. From the standpoint of frustration theory, however, degraded contingencies are better than a perfect contingency in promoting competence. To put it in a lay person's terms, when good work does not always lead to positive outcomes, people learn to tolerate and overcome frustration; their success experience in handling frustration should enable them to be more persistent and effective in coping with subsequent problems as compared to individuals who have never experienced failure.

There is now a well-established body of literature that partial reinforcement

results in greater resistance to extinction than consistent reinforcement (Robbins, 1971). More recent research has also shown that the persistence effect of partial reinforcement is very resilient, capable of surviving prolonged extinction (Amsel, Wong, & Traupmann, 1971; Wong, Traupmann, & Brake, 1974) and increasing the persistence of another response (Wong & Amsel, 1976).

The learned effort hypothesis is correct in recognizing that it is the effort rather than specific response topographies that determines subsequent persistence. However, Eisenberger's conception of effort seems to be limited to the expenditure of physical energy, because he typically manipulates effort in terms of number of responses per reinforcement (Eisenberger, Carlson, & Frank, 1979), and amounts of force required (Eisenberger, Carlson, Guile, & Shapiro, 1979). From the perspective of frustration analysis, the amount of frustration involved is more important than the amount of physical effort spent in determining subsequent persistence. It is possible to manipulate physical effort and frustration independently, and to determine which factor is more important in determining subsequent persistence. For example, the task of carrying a heavy load or depressing a heavy lever definitely involves effort expenditure but not necessarily frustration. Delay of reinforcement, on the other hand, involves frustration but not effort expenditure. Furthermore, learned effort may be reformulated as the conditioning of "try harder" and "try something different" strategies to frustrative cues.

I have previously proposed that under partial reinforcement conditions, organisms acquire the "try" strategy (Wong, 1977a, 1978a; Wong & Amsel, 1976). In fact, organisms learn two kinds of "try" strategies. If reinforcement takes place during the first stage of coping, then the tendency of "try harder" is conditioned, and the organism learns to try harder in subsequent frustrating situations. However, if reinforcement takes place during the second phase, then the tendency of "try something different" is strengthened; the organism learns to explore various response options to solve subsequent problems.

Repeated reinforcement during the second stage of coping should produce greater persistence than reinforcement during the invigoration stage for the simple reasons that the former not only involves a longer period of frustrative nonreward, but also involves the reinforcement of more coping actions. Individuals who have learned to cope with difficulty with greater vigor and persistence are likely to be competent in problem solving.

It may be noticed that the present concept of the "try" strategy is similar to Eisenberger's learned effort hypothesis because both involve reinforcement of a high degree of energy expenditure. There is, however, one significant difference: in the former, effort or "try" is induced by the frustration; in the latter, effort is demanded by task characteristics (such as depressing a heavy lever) that may not involve frustration. My prediction is that reinforcement of frustration-induced effort should be more effective in enhancing persistence and competence than reinforcement of task-related effort apart from frustration.

According to the literature, a number of dependent variables have been used to measure the competence motive; these include emotionality, level of learning or

performance, and goal persistence. A series of studies (Wong, 1981) have provided support not only for the construct validity of these measures, but also for the present frustration account of learned competence. In these studies, the only independent variable was whether maintenance feeding was frustrative or nonfrustrative. Under the frustrative condition, a mesh barrier separated the lab chow from young rats. Frustration occurs under this condition, because the barrier interfered with food consumption. Under the nonfrustrative condition, no barrier was inserted and the rats had ready access to food. In subsequent tests, the previously frustrated group showed less emotionality in an open field and faster rate of learning, as well as greater resistance to extinction. Thus, all three measures seem to be sensitive to the frustration manipulation designed to promote competence.

A FRUSTRATION ACCOUNT OF LEARNED HELPLESSNESS AND DEPRESSION

Learned helplessness is observed when an organism ceases instrumental activities prematurely in a new learning situation because of prolonged failure experience in the past. To put it simply, the organism learns to give up readily in a difficult or frustrating situation. Conditioned resignation is assumed to subserve learned helplessness.

When the unconditioned giving up mechanism is activated after prolonged failure, this mechanism may become conditioned to frustrative and situational cues. Subsequent encounter with these cues may trigger learned resignation, which operates like a conditioned response and does not necessarily depend on the perception of noncontingency.

Numerous investigators have already proposed that prolonged failure or frustration may lead to helplessness/depression (Boyd, 1982; Coyne, Metalsky, & Lavelle, 1980; Eastman, 1976; Ferster, 1973, 1974; Klinger, 1975; Lazarus, 1968; Lewinsohn, 1974, 1975). The present frustration account of learned helplessness is spelled out in greater detail so that differential predictions can be derived from the frustration account and Seligman's learned helplessness hypothesis. For example, according to the learned helplessness hypothesis, exposure to all uncontrollable or noncontingent events will produce learned helplessness. In other words, learned helplessness is a unitary phenomenon, produced by a single operation—the presentation of noncontingent events (Seligman & Achenbach, 1980). In contrast to this view, the frustration hypothesis posits that only prolonged frustration operations result in learned helplessness, and these include experimental extinction, repeated failure, unnegotiable barriers, and inescapable shock.

Seligman has explicitly stated that "if learned helplessness is cognition of response-outcome independence, it should transfer widely" (Weinraub & Schulman, 1980, p. 482). In contrast, frustration theory has a more restrictive set of boundary conditions for the transfer of helplessness. Following the frustration operation, transfer will occur only when the initial helplessness treatment is long enough to

trigger the resignation mechanism, and when the test situation contains sufficient frustrative cues to instigate resignation prematurely.

The evidence on the generality of learned helplessness is not strong. The best evidence comes from studies that employ aversive-to-aversive transfer. For example, Allenor, Kay, and Richter (1977) reported that exposure to inescapable shock produced a deficit in learning to escape from water, and water immersion produced a deficit in shock escape learning. Weiss (1980) has suggested that such cross-situational transfer may be mediated by stress-induced depletion of norepinephrine. Because prolonged inescapable stress (be it shock or cold water) involves frustrative nonrelief, this transfer may be mediated by frustration instigated resignation.

The importance of frustration as a mediating factor can be inferred from the fact that following inescapable shock, rats will show learned helplessness only when the aversive test employs degraded contingencies that involve either frustrative nonrelief or delay of reinforcement (Maier & Testa, 1975; Maier, Albin, & Testa, 1973; Seligman & Beagley, 1975; Seligman, Rosellini, & Kozak, 1975).

So far, there has been no clear evidence of cross-situational appetitive-to-appetitive transfer. The evidence of appetitive-to-appetitive transfer is very limited and tenuous. For example, Goodkin (1976) reported that exposure to noncontingent food presentation interfered with a subsequent escape test only when noncontingent treatment and subsequent testing took place in the same context. The escape learning deficit may simply be due to competing responses and the competing drive related to food and may not involve the cognitive deficit of noncontingency. In another appetitive-aversive transfer study, Wright and Katzer (1977) found that exposure to noncontingent deliveries of food and water early in life resulted in poor escape/avoidance learning as compared to the contingent group that earned food and water through instrumental responding. This difference may be due to learned competence of the contingent group rather than learned helplessness of the noncontingent group. In the case of aversive-appetitive transfer, Rosellini (1978) found that exposure to inescapable shock produced a transient interference effect when rats learned to bar-press for food; however, interference was obtained only when the reinforcement contingency during testing involved delay of food reward.

In the human learned helplessness literature, the evidence of transfer is even more tenuous than in the animal literature. There is some evidence of transfer of helplessness to new tasks (Hiroto & Seligman, 1976; Roth & Kubal, 1975), but there are also numerous reports of failure of transfer (Douglas & Anisman, 1975; Klein, Fencil-Morse, & Seligman, 1976; Kuhl, 1981; Roth & Kubal, 1975). It is now clear that prior exposure to uncontrollable events in one task does not automatically result in transfer of helplessness to other tasks/situations. The difficulty in obtaining transfer of helplessness in animals and humans is contrary to the learned helplessness hypothesis, but it reaffirms the adaptiveness of living organisms. If exposure to uncontrollable events in one situation automatically renders an organism helpless in all subsequent situation, very few organisms would have survived.

According to frustration theory, all variables that are known to affect the level of frustration, such as number of nonreinforced trials, the incentive value of the goal object, and deprivation level, should affect the learned helplessness. From the perspective of Seligman's cognitive noncontingency view, these variables should not be important determinants. The literature again supports the frustration account. For example, perceived importance of the task is relevant to the development of learned helplessness (Roth & Kubal, 1975; Wortman & Brethman, 1975). Several investigators have also reported a curvilinear relationship between number of helplessness treatment trials and the learned helplessness effect (Roth & Bootzin, 1974; Roth & Kubal, 1975; Wortman & Brethman, 1975). That is, short exposure to failure or uncontrollable events facilitates subsequent learning, while long exposure produces interferences. Such findings are clearly consistent with the present stage model of frustration coping, which posits that short exposure should activate the invigoration and exploration mechanisms, which generally facilitate learning, while prolonged failure should activate the resignation mechanism, which typically has a debilitating effect on learning. Consistent with the frustration analysis, Roth and Kubal (1975) have reported an increase in expressed feelings of frustration, helplessness, and incompetence from short to long exposures to failure.

Rather different approaches of immunization are dictated by Seligman's cognitive theory and the present frustration theory. From the perspective of learned helplessness theory, prior exposure to a perfect response-outcome contingency should immunize the organism against the onset of helplessness. According to the frustration theory, prior exposure to consistent reinforcement may make onset of extinction (i.e., loss of control) more upsetting than without such an exposure, because loss of control can be more frustrating than lack of control. However, if an organism has been exposed to degraded reinforcement contingencies and has learned how to cope with frustration, then it is less likely to become helpless. Therefore, partial reinforcement should be more effective than consistent reinforcement as an immunization procedure against helplessness. The efficacy of the partial reinforcement as immunization and treatment against learned helplessness has already been demonstrated in numerous studies (Jones, Nation, & Massad, 1977, 1978; Nation & Woods, 1980).

CONCLUSIONS

As a theory of coping with frustrative stress, the present stage model is an extension of Amsel's (1958, 1962, 1967) frustration theory and Klinger's (1975) incentive-disengagement cycles. The functional properties of frustration are more finely differentiated here. Active properties include invigoration, perseveration, exploration, and aggression, while inhibitory properties include goal avoidance and resignation.

The present stage model provides a very useful conceptual apparatus to study behavioral adaptation. It has been suggested that how one copes with block-

ing of a goal-directed behavior reflects one's adaptiveness or intelligence (Charlesworth, 1978a, 1978b). The present model directs our attention to qualitatively different behavioral patterns in the course of adaptation. For example, given a solvable problem, invigoration, exploration, and goal persistence are indices of adaptiveness, while response perseveration or premature resignation is unadaptive. Although the present theory posits that all organisms are predisposed to cope with chronic frustration in an adaptive manner, it also identifies conditions in which unadaptive coping responses are learned and generalized.

The stage model is capable of integrating a broad spectrum of frustration-related findings within a temporal sequence of adaptation. Thus, we know how a variety of frustration effects, such as invigoration, aggression, exploration, and helplessness, are related to one another as different aspects of the same coping process. The fact that both humans and animals exhibit the same behavioral sequence in very different frustration situation lends some credence to the proposition that the frustration coping behaviors are preprogrammed for survival.

The frustration account of various psychological phenomena, such as creativity, persistence, competence, fixation, and learned helplessness provides important insights regarding their etiology and transfer. Therefore, the theory provides a useful guide on effective coping with life's many frustrations—it indicates how we can promote and benefit from the positive aspects of frustration while reducing its negative effects. In the midst of conflicts and revolutions fueled by frustration, we can learn something from nature's way of managing unfulfilled aspiration as delineated in this chapter.

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chapter 9

Stable and Chaotic Patterns of Fish Agonistic Activity

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SYNOPSIS AND COMMENTS

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All of the previous chapters have dealt with mammalian species. Yet approximately one-half of all vertebrates consist of fish, and it is fitting that at least one chapter deals with the behavior of this group. This is in keeping with the biological perspectives theme of the volume. Because I assume that many of the readers are not as familiar with research on fish as with that on mammals, I encouraged Lincoln Chew to present his material in a manner that would elicit the interest of the reader. Thus, he wrote a chapter with a style and delivery that is inviting yet scholarly. I hope that you will find the material as well as the style of this chapter as delightful as I do.

The focus of Chew's chapter is the role of aggressive behavior in the establishment and maintenance of conspecific relationships among fish. Social interactions were discussed in previous chapters in this volume, namely, Raible's section on social learning and food selection and Porter and Lévy's on olfactory cues mediating parent-offspring interactions. The present chapter presents a fascinating account of another social behavior of adaptive significance—aggressive interactions. In general, animals fight in order to gain access to resources such as mates, food, or nest sites that may be in short supply. Individuals that fight readily and effectively would have a competitive edge over their rivals. Despite the obvious advantage to the animals in gaining limited resources, they do not always engage in all-out fights. There are intriguing differences in the pattern of agonistic behavior of the different